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October 17-19, 2023

ICAR-IIHR, Hesaraghatta Lake Post,
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Preface



It is with great pleasure and enthusiasm that I extend my warmest greetings to all participants, distinguished guests, and fellow enthusiasts of horticulture. As the Director of ICAR-IIHR, Bengaluru, I am delighted to introduce the **International Seminar on Exotic and Underutilized Horticultural Crops: Priorities and Trends**, scheduled to take place from October 17 to 19, 2023.

Allow me to commence by illuminating the pivotal role of horticulture in our nation's agricultural landscape. India stands as one of the world's foremost producers of fruits, vegetables, and spices. In the 2020-21 fiscal year, India achieved a remarkable total horticultural production of 331 million metric tons, with fruits and vegetables contributing substantially to this impressive figure. These statistics underscore the undeniable significance of horticulture in our country, both in terms of its vast production capacity and its potential for growth.

Horticulture has been a vital component of agriculture, addressing the growing need for nutritious and diversified food sources, contributing to the economic well-being of nations, and promoting a sustainable environment. The potential of horticulture in addressing food security and livelihoods cannot be overstated. However, our field continues to evolve, and we find ourselves in a transformative era where traditional crops are being complemented, and sometimes even replaced, by exotic and underutilized horticultural crops. This shift is driven by changing consumer preferences, the need for crop diversification, and the increasing importance of niche markets.

As horticultural enthusiasts and practitioners, it is imperative that we stay ahead of the curve. The primary inspiration for this international seminar stems from the desire to bring together experts, researchers, and stakeholders to delve into the priorities and emerging trends in the domain of exotic and underutilized horticultural crops. Our aim is to foster dialogue, share knowledge, and forge collaborations that will enable us to harness the full potential of these crops and pave the way for their commercial success and sustainable production. The seminar will provide a platform for in-depth discussions on a wide range of topics, including breeding and cultivation techniques, post-harvest management, marketing strategies,

and policy implications. Our distinguished panel of speakers and contributors will share their insights and experiences, providing a comprehensive overview of the current state of exotic and underutilized horticultural crops.

Bengaluru, often referred to as the 'Garden City of India,' is a fitting location for this seminar. The city's rich horticultural heritage and vibrant agricultural research community make it an ideal setting for the exchange of ideas and the exploration of new horticultural frontiers. I look forward to engaging in lively discussions, sharing valuable experiences, and fostering collaboration during this three-day seminar. Let us collectively explore and unlock the immense potential of exotic and underutilized horticultural crops, thereby contributing to global food security, economic prosperity, and environmental sustainability.

I extend my sincere gratitude to all the participants, organizers, sponsors, and partners who have made this event possible. Together, let us embark on a journey towards a more diverse and prosperous horticultural landscape.



(Sanjay Kumar Singh)

Contents

Sl.No	Title	Page No.
1	**Theme - 1** Global Scenario in Horticulture Oral Presentations	1
2	**Theme – 1** Global Scenario in Horticulture Poster Presentations	9
3	**Theme – 2** Genetic Improvement Oral Presentations	19
4	**Theme – 2** Genetic Improvement Poster Presentations	70
5	**Theme – 3** Production Management Oral Presentations	151
6	**Theme – 3** Production Management Poster Presentations	191
7	**Theme – 4** Post Harvest Management and Nutraceuticals Oral Presentations	278
8	**Theme – 4** Post Harvest Management and Nutraceuticals Poster Presentations	318
9	**Theme – 5** Biotic and Abiotic Stress Management Oral Presentations	419
10	**Theme – 5** Biotic and Abiotic Stress Management Poster Presentations	420
11	**Theme – 6** Technology Assessment Oral Presentations	473
12	**Theme – 6** Technology Assessment Poster Presentations	494

Theme - 1
Global Scenario in Horticulture
Oral Presentations

GSH/OP – 1

Mainstreaming the underutilized fruits of Sikkim Himalayas

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ABSTRACT

The Sikkim Himalayas stands out as smallest area covering 0.2% of the geographic area of the country but the area is endowed with rich floral and faunal diversity. The area is considered as mega-fauna and flora since it holds 26% of the country's total biodiversity and has been identified as one of the hotspots in the Eastern Himalayas. In Sikkim Himalayas, nearly 190 wild species are consumed by the local people. Wild edible fruits are considered as healthy dietary supplements and consumed by human beings sincetime immemorial as a natural source of nutraceutical compounds. Inclusion of these wild edible fruits in diet ensures the nutritional security of the tribal population. There are still large number of species which are inexpensive and commonly used by locals and whose nutritional potential have not yet been adequately studied. Hence, the analysis of major nutrients, minor nutrients, toxic and trace elements is essential to utilize these species to their fullest potential. In addition, it can be confirmed that a particular underutilized fruit is not having any toxic element. To ascertain these facts the following underutilized fruits namely Hog Plum (*Spondias axillaris*), Himalayan filberts (*Corylus ferox*), Himalayan olives (*Elaeocarpus. spp*), Bastard oleaster (*Elaeagnus latifolia*), yellow Himalayan raspberry (*Rubus ellipticus*), Indian butter tree (*Diploknema butyracea*), jack (*Artocarpus heterophyllus*), and citrus and it's wild relatives were subjected to elemental finger printing which has revealed the presence of different kinds of nutrients. These studies have wider applications in nutritional and environmental security.

Keywords: Ionome profiling, wild edible species, nutrients, underutilized fruits

GSH/OP – 2

Jamun (*Syzygium cumini*): a potential fruit crop

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ABSTRACT

Jamun is commonly known as Malabar plum, Java plum, black plum, jaman, jambul, or jambolana. It is an evergreen tropical tree in the family *Myrtaceae* and preferred for fruit, timber and ornamental value. It is native to the Indian subcontinent and Southeast Asia, including Myanmar, Sri Lanka, Bangladesh and the Andaman Islands. It can reach to a height of up to 30 m with lifespan of more than 100 years. It is used in traditional medicines to control the blood sugar level in the patients suffering from diabetes. The tree is rich in phytochemicals like glycoside jambolin, anthocyanins, tannins, terpenoids, gallic acid and various minerals. Thus, jamun is a suitable fruit crop to be used as a nutraceutical due to presence of wide ranges of health promoting compounds. The fruits are purplish black in colour when ripe and have high anthocyanin content. It is a seasonal fruit and is consumed fresh for it's nutrient value. Fruits are also processed to prepare jam, jellies, squash, vinegar and ice cream due to attractive purple colour. The powdered seeds have reputation for being useful in the treatment of diabetes. Jamun seed can be used as concentrate for animals because it is rich in protein, carbohydrates and calcium. It is one of the most hardy fruit crops and can easily be grown in neglected and marshy areas where other fruit crops cannot be grown successfully. Two varieties namely Goma Priyanka and Thar Kranti are released for cultivation and are gaining popularity in the rainfed areas.

Keywords: Jamun, nutraceutical, phytochemicals, seed powder, varieties

GSH/OP – 3

Avocado: from niche to global staple –production and trade trends

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ABSTRACT

Avocado is known as a superfood due to numerous health benefits and has evolved into a global culinary sensation and a thriving industry. This comprehensive study delves into the multifaceted dimensions of avocados, encompassing their geographic distribution, production trends, growth dynamics, decomposition analysis and trade patterns. Over the span of six decades (1961 to 2021), the area under avocado increased from 0.79 to 8.72 lakh ha with a CAGR of 3.66% in the world and the production has surged substantially from 7.16 to 88.10 lakh tonnes (t) with a CAGR of 3.75% during the same time. Notably, more than half of this production is contributed by Mexico, Colombia, Peru and Indonesia. Decomposition analysis reveals that this production growth is primarily area-driven, suggesting untapped potential for yield enhancement. The number of avocado-producing countries has increased to 95 from 48 underscoring its globalization. Global avocado exports skyrocketed from 1, 274 t in 1961 to 31.50 lakh t in 2021, with export values surging from 93 thousand USD to 7.64 billion USD. Exports grew at a CAGR of about 12.62% in quantity and 17.52% in value. In the year 2021, Mexico dominated the export market with a 39% share followed by Peru (17%) and Netherlands (13%). A corresponding surge in avocado imports reflects global demand. Imports grew at a CAGR of about 12.25% in quantity and 16.10% in value. Top importers in 2021 were the USA (37%), the Netherlands (14%) and Spain (7%). India's interest in avocados is growing, with imports worth 55 crores in 2022-23 and local exports of 51 lakhs. This substantial growth in the area, production and global trade highlights the growing demand for this versatile and nutritious fruit in diverse cuisines and diets, its economic importance and consumers' willingness to pay a premium for this sought-after fruit, marking its journey from a niche or exotic fruit to a global staple fruit.

Keywords: Avocado, decomposition analysis, trade patterns, CAGR, super food

GSH/OP – 4

Recent advances in kiwifruit production under Indian scenario

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ABSTRACT

The kiwifruit is a deciduous vine in the family *Actinidiaceae* and is originated in southern China. The kiwifruit was first introduced at Lalbagh garden, Bangalore in the early 1960s. Subsequently, it was introduced from USA in 1963 by the Plant Introduction Division of ICAR at its regional station, Phagli, Shimla (H.P). Himachal Pradesh is the first state to demonstrate its commercial cultivation in the country. It has shown tremendous potential for cultivation in mid hills of entire Himalayan region. The Himalayan region harbours rich plant diversity besides being vulnerable ecosystem to the climate change. Research efforts on improvement in quality and production of the kiwifruit through canopy management, pollination, and use of plant growth regulators have been made in Indian context. Most of the kiwifruit species are regional in their adaptation, performing well in one region and poorly in others. Some of the qualitative characters of kiwifruit are bound to change with the prevailing environmental conditions. Thus, there is a need for the development of new cultivars with desirable traits to satisfy the modern agronomic challenges. A research trial was initiated in 2015 at Parmar University of Horticulture and Forestry, Solan (HP) to develop improved kiwifruit varieties through open selections of yellow fleshed seedlings. In the year 2022, the flowering was obtained in 7 vines which were designated as Parmar Selections 1-7. In 2023, about 15 selections yielded fruits with variable fruit weight, size, shape, flesh colour, quality characteristics and harvest time. Apart from this, few staminate vines were also noticed which exhibited synchronization with some of the pistillate vines.

Keywords: Kiwifruit, adaptability, cultivars, fruit quality

GSH/OP – 5

Dragon fruit: An adaptive option for climate change resilience in sub-Himalayan subtropical region

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ABSTRACT

The sub-Himalayan subtropics are noticeably impacted by climate change. The most widely reported impact is the rapid increase in the short spells of water deficit which usually coincides with the critical fruit developmental stages of major fruit crops resulting in suboptimal yields. The case studies of citrus and mango (the major fruit crops of sub-Himalayan subtropics) narrating the coincide of critical stages of fruit development of citrus with the periods of water deficit and changes in temporal phenology of mango affecting its rhythmic vegetative growth and fruiting potential, have been foreseen as the potential deterrents for commercial production of these crops under the sub-Himalayan subtropics. The preliminary studies conducted at two locations on the vegetative growth pattern, flowering phenology and fruiting capacity of dragon fruit has indicated its potential for cultivation as an adaptive option for climate change resilience in the sub-Himalayan subtropical horticulture.

Keywords: Constraints, growth, phenology, fruit yield

GSH/OP – 6

Global scenario of dragon fruit production: review

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ABSTRACT

Dragon fruit is gaining recognition as a versatile crop capable of thriving in diverse agro-climatic conditions, including degraded land, owing to its ease of cultivation. The global popularity of dragon fruit is steadily increasing due to its well-documented health and medicinal benefits. During 2017-18, dragon fruit production surpassed 2.1 million t in the world from 1.12 lakh ha cultivated area. Vietnam emerged as the dominant producer contributing to 51.1% of global production from 49.36% of the global cultivated area. China and Indonesia account for 33.32% and 10.6% of global cultivated area, and 35.63% and 7.56% of global production, respectively. Vietnam boasts the highest average productivity, ranging from 22 to 35 t per ha annually, surpassing other dragon fruit-producing nations. During 2017-18, Vietnam exported major share of its production (92.21%) amounting to 3940 lakh USD. In India, dragon fruit was initially introduced on a 0.5 ha area during 1990s. The area under dragon fruit has expanded to 400 ha by 2017 with production 4200 t. Gujarat accounts for 39.36% of the area and 33.67% of the country's production, followed by Karnataka with 15.74% of the area and 19.56% of the production. Currently, its cultivation in India spans over 3,000 ha. Consequently, a significant portion of dragon fruits in the Indian market is imported from countries such as Thailand, Malaysia, Vietnam, and Sri Lanka. In 2021, India imported approximately 15,491 t of dragon fruit. In line with the Atmanirbhar Bharat initiative, there is a pressing need to reduce imports and strengthen domestic production capacity. As part of this effort, government policy initiatives are targeting a significant expansion of its cultivation to 50,000 ha within a span of 5 years, marking a pivotal milestone in achieving self-reliance. Dragon fruit's global appeal and India's growth potential make it a crop with a bright future.

Keywords: Dragon fruit, agro-climatic conditions, production, export trends

Theme – 1
Global Scenario in Horticulture
Poster Presentations

The science behind red blood fruit (*Haematocarpus validus*): unraveling and transforming beyond borders

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ABSTRACT

Blood fruit (*Haematocarpus validus*), a unique lesser-known yet potent fruit species belonging to the *Menispermaceae* family, has recently garnered substantial attention within the scientific community due to its exceptional colour, captivating flavour, and potential health-promoting attributes. The use of synthetic food colorants, some of which possess genotoxic or carcinogenic properties, has raised concerns within the food industry. Blood fruit emerges as a potential solution to replace synthetic colorants, spurring the need for increased production efforts since it is currently found only in the wild. In India, natural populations of blood fruit have been confined to few states and UT *viz*., Andaman and Nicobar Islands, Meghalaya, Assam, Arunachal Pradesh, Mizoram, Tripura and West Bengal). As viewed by various researchers, recognizing the global trend toward natural alternatives to synthetic colorants, the potential for income generation among growers through Blood fruit cultivation becomes apparent. A systematic analysis was conducted to perceive its trend for natural food colorant, considering planting trends and grower awareness. Scientific literatures reveal that blood fruit has deep saturated blood-red hue due to the presence of different types of anthocyanins and high content observed makes it a prospective source for both food and dye-based industries. Notably, these coloured pigments have potent antioxidant properties as nutraceutical or pharmaceutical ingredients, conferring antimicrobial effects and potential benefits against chronic diseases. Therefore, the multifaceted attributes of blood fruit position it as a potential superfood, boasting health promoting benefits and vivid red hue suitable for food, dye-based and pharmaceutical industries. This characteristic makes Blood fruit a potential income-generating asset for growers, spurring interest in its cultivation. Thus, in future it is important to identify more areas and expand its cultivation beyond its confined borders is imperative, as doing so could yield substantial economic advantages for local communities.

Keywords: Natural food colorant, antioxidant, nutraceutical, dye

GSH/PP – 2

Beyond the Ordinary: Abiu's Exotic Flavor and Nutritional Wonders

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ABSTRACT

Abiu, a novel and exotic fruit, emerges as a true treasure from the heart of tropical havens. With its alluring appearance and distinctive flavor, Abiu captures the imagination of those seeking new culinary experiences. Encased in a smooth, radiant-hued skin, the fruit's interior unravels a velvety, custard-like texture that melts in the mouth. Its flavor palette is a symphony of sweetness with a touch of tanginess, offering a truly unique taste sensation. Abiu fruit offers a potent blend of nutrients including vitamins and antioxidants, bolstering the immune system, promoting healthy vision, and combating oxidative stress. Its dietary fibre aids in digestion, while its natural sweetness may contribute to balanced blood sugar levels, making it a delectable addition to a health-conscious diet. The abiu fruit's importance stems from its potential to enrich both the palate and health. Its alluring taste and nutritional value intertwine, and offer a multifaceted experience that invites exploration, consideration, and a deeper understanding of nature's abundant offerings. There exist wide variations in the fruit parameters such as size and shape, flavor, TSS content, acidity, varietal differences, nutritional composition, and genetic biodiversity. Thus arises a higher need to explore the genetic diversity of the fruit which can contribute to improving its cultivation technique, enhance fruit quality, and marketability. In conclusion, abiu's compatibility with the tropical climate, fertile soils, and adequate rainfall of South India makes it a promising fruit for cultivation in the region, offering both agricultural and economic opportunities.

Keywords: Novel fruit, dietary fibre, fruit quality

GSH/PP – 3

Strategies for mitigating challenges in Phalsa cultivation: A Review

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ABSTRACT

Phalsa (*Grewia subinaequalis* L.) belongs to family *Malvaceae* and is an important indigenous underutilized fruit crop grown mainly in Northern and Western states of India. It is enormously productive and climate smart by surviving in harsh agroclimatic conditions, and can be established on degraded lands. Fruits of this plant are abundantly available during summer and consumed fresh, as dessert, processed into syrup, and extensively used in the production of soft drinks. Besides, fruits are rich source of antioxidants such as flavonoids, anthocyanins, vitamins and phenolics compounds and act as a good source of vitamin A and vitamin C, with fair amount of minerals like phosphorus, iron. Despite of its immense importance, several crop characteristics hinders its commercial cultivation. Small size of the fruit, low yield per plant, repeated harvesting and highly perishable nature of fruit is the major challenge of phalsa cultivation. However, intense research and new technological interventions mitigate the limitations associated with cultivation. Application of plant growth regulators viz., GA_3, NAA, ethereal, cultivation of high yielding variety Thar Pragti, planting at closer spacing and use of cold storage are evident to address this problem. Therefore, critical review of the research work is needed to resolve the concern of this potential crop. Hence, this review paper explores the current research that deals with challenges pertaining to phalsa cultivation with regard to various limiting factors.

Keywords: Value addition, antioxidants, variety, cultivation

GSH/PP – 4

Sea Buckthorn: A Multipurpose Fruit Crop in the Cold Arid Regions of India

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ABSTRACT

Sea buckthorn (*Hippophae rhamnoides*) belongs to the family *Elaeagnaceae* and is a distinctive and robust shrub that thrives in the cold arid regions of India. Locally, it goes by names such as Chharma (Himachal Pradesh) and Badriphal (Uttaranchal), while Ayurveda recognizes its therapeutic potential under the name 'Amlavetas'. The etymology of "Hippophae" has a fascinating history. It was derived from the Greek words "Hippo," meaning horse, and "Phaos," meaning shining. Historically, the leaves and young branches of this plant were fed to horses to enhance their weight gain and to improve the coat shininess. The plant is known for its remarkable nutritional and medicinal properties. The leaves, berries, and seeds are rich sources of essential vitamins such as A, C, B_1, B_2, E, and K, along with pro-vitamin A. Specifically the berries contain the Vitamin C content of around 300-1600mg/100g. Additionally, it contains unique compounds like nervonic acid, serotonin, and rare fatty acids which are contributing to its therapeutic potential. Notably, Sea buckthorn berries contain Betaine, known for its anti-ulcer activity. Beyond its medicinal uses, Sea buckthorn also serves as a biofence to deter stray animals, ornamental plant, planted for soil stabilization and as a windbreak to mitigate the effects of high wind velocity. Furthermore, it is an oil-yielding plant with seeds containing 8-20% oil and pomace/fruit pulp containing about 1.5-3.5% oil. This oil is rich in linoleic and linolenic acids, serving as a carrier of bioactive substances. In summary, the future of sea buckthorn is poised to flourish as it contributes to health, sustainability, innovation, and market diversification.

Keywords: Thearapeutic, biofence, pomace, sustainability

GSH/PP – 5

Production, consumption, trade, marketing and policy issues of underutilized fruit crops

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ABSTRACT

Underutilized fruit crops, can be referred as orphan crops that represent a valuable potential but have limited commercial cultivation and consumption as compared to other major fruit crop like apples, mango bananas and oranges . The production of underutilized fruit crops that have not received widespread commercial attention despite their nutritional, ecological and economic value. Consumption of underutilized fruit crops offers diverse flavors, textures, and nutritional benefits, making them valuable additions to diets. Promoting these crops as nutritious alternatives can encourage their incorporation into diets, enhancing nutrition and dietary diversity, especially in regions where traditional staple crops dominate. Trade of these crops faces several challenges, including quality standards, regulatory barriers and limited infrastructure for the transport and storage. The establishment fair trade practices, product quality and facilitating market access can boost economic viability among the smallholder farmer and local communities. In order to pique customer interest in marketing underutilized fruit harvests, creative strategies for advertising are needed. To emphasize the distinctive traits and advantages of these fruits, effective branding, packaging, and communication are important. The need for comprehensive agricultural policies that value crop diversity revolves around the issue of underutilized fruit crops. Research and development should be given first priority, as should infrastructural spending and the establishment of incentives for farmers to grow these crops. The underutilized fruit crops possess untapped potential to contribute to food security, nutrition, and economic sustainability. Investing in research, raising awareness, improving market access, and implementing supportive policies are crucial steps toward realizing the full potential of underutilized fruit crops and diversifying the world's food supply.

Keywords: Production, Nutritional value, consumption, economic benefits

GSH/PP – 6

Access to exotic fruit genetic resources and benefit-sharing: Implications for Sustainable Horticulture

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ABSTRACT

Horticulture, with its focus on the cultivation of fruits, vegetables, and ornamental plants, plays a pivotal role in meeting the world's growing demand for diverse and exotic produce. The utilization of genetic resources of exotic fruit crops, however, presents unique challenges and opportunities concerning access and the equitable sharing of benefits. Examination of issues surrounding access to exotic fruit genetic resources in the context of horticulture and the establishment of benefit-sharing mechanisms to ensure sustainability and fairness in this sector. Access to the genetic resources of exotic fruits is essential for advancing horticultural practices. These resources hold the potential to enhance the quality, flavor, and nutritional value of horticultural crops, making them increasingly desirable in global markets. Yet, access must be carried out responsibly and ethically, adhering to international agreements such as the Convention on Biological Diversity and the Nagoya Protocol. A primary challenge in accessing genetic resources for horticulture lies in respecting the rights and interests of provider countries, communities and indigenous groups. The Nagoya Protocol advocates for prior informed consent and mutually agreed terms in access arrangements. This entails that individuals or entities seeking access to genetic resources must first secure consent from the source country or community and then negotiate equitable terms for benefit-sharing that are agreeable to all parties involved. Benefit-sharing mechanisms are integral to addressing disparities that may arise from the utilization of exotic fruit genetic resources in horticulture. These mechanisms encompass a range of forms including financial contributions, technology transfer, capacity building, and support for local communities. By delivering benefits to the source countries and communities, these mechanisms ensure that the exploitation of genetic resources results in tangible improvements in livelihoods and the preservation of traditional knowledge. Moreover, benefit-sharing mechanisms contribute to the conservation of biodiversity in horticulture. They promote responsible resource management, encourage the cultivation of diverse plant varieties, and mitigate the potential adverse impacts of monoculture practices. Access to genetic resources of exotic fruits is fundamental for advancing horticultural innovation and meeting the global demand for diverse and exotic produce. However, such access must be conducted with an unwavering commitment to transparency, fairness, and respect for the rights of provider countries and communities. The establishment of effective benefit-sharing mechanisms is essential to ensure that the benefits of utilizing genetic diversity in horticulture are shared justly and that biodiversity is conserved.

Keywords: Potential, nagoya protocol, diversity

GSH/PP – 7

Promotion of burmese grape as a sustainable livelihood option for tribal communities of Northeastern India

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ABSTRACT

Burmese grape, scientifically known as *Baccaurea ramiflora*, is a tropical fruit that has gained substantial importance in the Northeastern region of India. This indigenous fruit is a valuable resource for the region's agriculture, culture, and overall well-being. Burmese grape has deep-rooted cultural significance among the indigenous communities of Northeast India. It is an integral part of their culinary traditions and is often used in various dishes and chutneys. This fruit plays a role in rituals, festivals, and traditional medicine, highlighting its cultural relevance. This fruit is prized for its impressive nutritional profile. It is a rich source of essential vitamins, including vitamin C, B-complex vitamins, and minerals such as iron, calcium, and potassium. The presence of antioxidants in this fruit makes it valuable for boosting immunity and overall health. In Northeast India, where sustainable agricultural practices are crucial, Burmese grape stands out as an excellent choice. It is well-suited to the region's agroclimatic conditions, requiring minimal inputs for cultivation. This makes it an environmentally friendly crop that contributes to sustainable farming practices. The cultivation of Burmese grape has the potential to generate economic opportunities for farmers in Northeast India. Beyond its cultural and economic significance, Burmese grape offers a range of health benefits. Its consumption is associated with improved digestion, better skin health, and enhanced immunity, all of which are especially important in the region's remote and challenging environments. In conclusion, Burmese grape holds a vital place in the lives of people in Northeast India. It is more than just a fruit; it represents a connection to culture, a source of nutrition, a path to sustainable agriculture, and a means of economic empowerment. Recognizing and further harnessing the potential of burmese grape can contribute to the well-being and prosperity of the region and its communities.

Keywords : Indigenous, Nutritional profile, antioxidants, export potential

GSH/PP – 8

India's fruitful tomorrow: Exploring future fruit crops

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ABSTRACT

Fruits are the choicest gifts of nature to the mankind. The varied agroclimatic conditions prevailing in different parts of India makes it possible to grow a wide range of fruits at any time of the year. Recently, many new exotic fruits which are popular in other tropical environments are gaining popularity in the country. Fruit plants like rambutan, pulasan, avocado, abiu, peanut butter fruit and miracle fruit are finding their places in the backyards of homesteads. Dragon fruit plant is being raised in terraces of urban households for fruit as well as ornamental value. Many of the fruits introduced earlier have now turned out to be our favourite food as well as source of revenue. Fruits, being protective foods have good nutritional (vitamins, minerals, carbohydrates, fats) and medicinal properties (anti-diabetic, anti-obesity, anti-proliferative) and are processed into various value-added products such as jam, jelly, wine, squash, syrups. Industrial uses of fruits include uses in tanning, dye extraction, oil extraction, cosmetic industry etc. However, some of the exotic fruit crops are still cultivated sporadically and are struck by vagaries of climate stress and other constraints. Identification and development of varieties and standardisation of agrotechniques suited to agroecological zones are important for improvement in productivity, acceptability and commercialisation. Some of these fruits may even rise to the status of major fruit crops in the near future.

Keywords: Agroclimatic, exotic, antidiabetic, dragon fruit, rambutan, abiu, pulasan

GSH/PP – 9

Langsat: A little white potato

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ABSTRACT

Lansium parasiticum is said to have its origins in western South-East Asia. Two different botanical varieties exist. The two varieties are var. domesticum, also known as duku, doekoe, or dookoo, and var. pubescens, the typical wild langsat. The langsat is a tropical lowland forest tree that cannot be cultivated over 650–750 metres in height. Fruits are only produced by this seasonal crop from late September to early November. The fruit of the langsat comprises five segments, each bearing one to five seeds. The Philippines' deep affection for the langsat fruit, commonly known as "Lanzones," finds expression in the exuberant Lanzones Festival, an annual celebration occurring in the month of October. This four-day extravaganza is dedicated to honoring the bountiful harvest of the cherished Lanzones fruit, Lansiumparasiticum. Originating in Southeast Asia, this fruit-bearing tree has found a home throughout the region, spanning from southern India to the Philippines, thanks to its delectable fruit. The Lanzones Festival serves as a vibrant testament to the cultural significance and culinary delight associated with this tropical gem, drawing locals and visitors alike to partake in the festivities.The plant, known for its historical use in treating eye inflammation, ulcers, diarrhea, dysentery, fever, spasms, flatulence, worms, insect bites, scorpion stings, and malaria, has found diverse applications in both traditional and modern contexts. Moreover, it serves as a potent mosquito repellent, skin moisturizer, and skin-whitening agent. Pharmacological research has unveiled a broad spectrum of bioactivities associated with this plant, underscoring its medicinal significance. These include its role as an antimalarial agent, an antifeedant, an anti-aging solution, and a facilitator of wound healing. Additionally, the plant exhibits antioxidant properties, cytotoxic effects, analgesic qualities, antibacterial activity, antimutagenic potential, as well as insecticidal and larvicidal properties. This extensive range of bioactivities underscores the diverse and valuable contributions of this traditional remedy to the fields of medicine, skincare, and pest control.

Keywords: Lansium parasiticum, varieties, origin, lanzone, medicinal properties

Theme – 2
Genetic Improvement
Oral Presentations

GI/OP – 1

Genetic variability studies in native germplasm of gundi (*Cordia gharaf* L.) of Maharashtra state

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ABSTRACT

Gundi (*Cordia gharaf* L.), which belongs to family *Boraginaceae*, is an underutilized fruit and an important herbal tree in rural India. During the survey, it is abundantly observed that the habitat is mainly confined to deserted older castle like structures. Natural plants are found in Pune, Solapur, Satara, Ahmednagar, Beed, Jalgaon, Nandurbar and Nashik districts of Maharashtra. In India, it is found in arid zones of Maharashtra, Karnataka, Andhra Pradesh, Gujarat and Rajasthan. Globally, the species range extends from South Africa, through East Africa, Madagascar, West Africa and the Middle East to the Indian Subcontinent and Eastern Indochina. Currently cultivation is not found on commercial basis but fruits are reported to be sold in the desert zone of Rajasthan fetching attractive prices. Gundi bears orange coloured, single-seeded, sweet fruits in cluster having medicinal properties also. Both roots and bark are used to treat variety of disorders. Extensive explorations were made during 2022 to study variability of gundi in Purandar tahasil in Pune, Maharashtra. Germplasm were collected from seven different locations and coded as JWCG-1 to JWCG-7. The analysis of variance revealed that there were significant differences among the collected genotypes of gundi. Wide range of variation was observed for important characters such as plant growth, leaf size, fruit size, fruit quality and yield components. The plant height ranged from 3.28-6.14 m, East-West spread 3.87-5.43 m, North-South spread 3.47-5.18 m, leaf length 7.8-9.3 cm, width 3.1-3.2 cm, petiole length 1.0-1.3 cm. Fruit length ranged from 0.6-1.0 cm, diameter from 0.5-0.8 cm and single seed weight 0.057-0.059 g. Fruit yield per plant was ranged from 10.46-21.67 kg. Looking to the variability among the genotypes there is ample potential for improvement through selection and commercial orcharding for nature's resilient farming under drylands.

Keywords: Economic produce, germplasm, growth, leaf parameters, fruit quality

GI/OP – 2

Performance of dragon fruit under Northern Telangana conditions

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ABSTRACT

The region of Northern Telangana, known for its unique agro-climatic conditions, has emerged as a favorable zone for the cultivation of dragon fruit (*Hylocereus* spp.). The present research on the performance of dragon fruit was conducted on two-yr old dragon fruit plants at the Horticultural Research Station, Sri Konda Laxman Telangana State Horticultural University, Adilabad, during 2021-22 in Randomized Block Design with three cultivars *viz*., red fleshed, pink fleshed and white fleshed. The study examined yield and quality parameters. Among different cultivars, pink-fleshed dragon fruit exhibited the highest fruit weight ((425.25g) and pulp weight (280.5g), closely followed by the white-fleshed variety at 419.75g and 265.2g respectively. The red-fleshed cultivar displayed the lowest fruit weight, recording 410.85g. Furthermore, the white-fleshed variety demonstrated the largest fruit diameter measuring 7.7 cm followed by pink-fleshed closely at 7.3 cm. The red-fleshed variety exhibited the highest number of seeds which also contributed to the yield, with 112 seeds per 5g of pulp, followed by the Pink-fleshed variety with 95 seeds, and the lowest being in white-fleshed variety with 78 seeds per 5g of flesh. Notably, the pink-fleshed variety excelled in average fruit yield, achieving 5kg per pole (with each pole accommodating 4 plants) in the second year. Quality parameters were documented for all three cultivars. White-fleshed variety displayed the highest TSS level (14 brix), highest reducing sugar content (5.30%) and non-reducing sugar content (3.98%), followed by the red-fleshed variety at 11 brix,3.84% and 3.20% respectively. Anthocyanin content and titrable acidity, key colour and flavour components in dragon fruit reached its peak in pink fleshedat 46.85 mg/g and 0.42%, followed closely by red fleshed at 43.60 mg/g and 0.38% respectively. The study also identified the red-fleshed cultivar as rich in ascorbic acid content, with a value of 9.0 mg/100g, slightly surpassing the pink-fleshed variety's content of 8.78 mg/100g. The pink-fleshed variety showed the longest shelf life, extending to 11.80 days, while the White-fleshed variety remained fresh for 9.20 days.

Keywords: Red fleshed, pink fleshed, white fleshed, yield, quality parameters.

GI/OP – 3

Survey, collection and evaluation of avocado (*Persea americana* Mill.) genotypes for yield and quality parameters

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ABSTRACT

An investigation was conducted with an objective to characterize and evaluate avocado genotypes and select elite and promising ones based on yield and quality parameters in Kodagu and Mysuru regions. Around 31 genotypes were selected from the survey using purposive sampling and interview methods during the year 2019 to 2022. The pattern of variability exhibited by the genotypes for various characters was substantially disparate. Pyriform, obovate and narrowly obovate fruit shapes and light green fruit colour were found to be dominant among the genotypes. The genotypes MYH-1 exhibited good fruit characters like fruit weight (507.33g), fruit length (14.09cm), fruit volume (530ml) and pulp weight (447.67g). MMS-1, though small in size, showed highest fruit thickness (21mm) and pulp:seed ratio (13.7) due to low seed percentage. SGR-6 had highest amounts of total sugars (2.07%) and lowest fat content (4.74%). The genotypes SKA-2 had highest number of fruits (550) with high TSS (9.17^0B). SGR-3 had highest fat content (10.2%). Fruit diameter ranged from 5.95 cm in SKA-1 to 9.65 cm in SGR-2. Length of the seed varied from 3.06 cm in SGR-6 to 5.44 cm in VRA-1. The range of seed diameter varied between 2.42 cm in MMS-1 and 5.98 cm in VMS-9. Length of seed cavity ranged from 3.83 cm in MMS-1 to 7.04 cm in VMS-2. Diameter of seed cavity varied between 4.09 cm in SKA-1 and 6.6 cm in VMS-1. Seed weight ranged between 9.80 g in MMS-1 and 98.33 g in VMS-9. The characters exhibited by the ecotypes resembled either West Indian race or Guatemalan race, most of them leaning towards West Indian. The results indicated the predominance of West Indian race and probable natural crosses between West Indian and Guatemalan trees, resulting in the representation of characters of both the races.

Keywords: Fruit shape, quality, TSS, fruit number

GI/OP – 4

Variability in qualitative morphological characters of mangosteen (*Garciniamangostana*L.) grown in Kerala

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ABSTRACT

Mangosteen is a crop native to Southeast Asia and hundred years ago, it was introduced to India. The crop is well suited for homestead cultivation in Kerala. It is highly demanded fruit crop in domestic and export markets. Genetic improvement of the crop is difficult because variability is less due to its obligate apomict nature. However, morphological variability is observed in the crop, in the field conditions. Hence this study was conducted for assessing the variability in qualitative morphological characters of mangosteen grown in Kerala. Wayanad and Thrissur districts represent the major mangosteen growing areas of Kerala. Hence, the study was conducted in the agro ecological units (AEU 10, AEU 15 and AEU 20) of these districts. A total of 153 trees were selected and qualitative morphological characters were recorded from each tree using IPGRI descriptors. Variability was observed in characters like flower and fruit clustering habit, flowering season, fruit size and fruit skin thickness. Accessions with one flower/fruit per cluster, combination of one and two flower/fruit per cluster and combination of one, two and three flowers/fruits per cluster were observed. The accessions flowered at four different flowering seasons viz. February-April, March-April, April-May and May-June. Medium and small sized fruits with thin or medium fruit skin were also reported. Dendrogram based on these qualitative characters by UPGMA method grouped 153 accessions into 6 different clusters at a Euclidean similarity distance measure of 1.5. Clusters I, III and IV together consist of accessions of Wayanad district and had small and medium sized fruits with medium fruit skin. Cluster II, V and VI consist of accessions from Thrissur district only and these accessions had small sized fruits with thin fruit skin. The study showed that variability exists in qualitative morphological characters of mangosteen grown in Kerala.

Keywords: Accessions, growth parameters, flowering, fruit size

GI/OP – 5

Exploring the diversity in jackfruit (*Artocarpus heterophyllus. Lam*) grown in Tamil Nadu with an emphasis on variations in pulp colour

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ABSTRACT

Jackfruit (*Artocarpus heterophyllus* Lam.), which belongs to *Moraceae* family, is an important dryland horticultural crop and requires minimum care and maintenance. India, the motherland of Jackfruit, is the second biggest producer in the world. There is a lot of variation within the species as a result of cross-pollination and the dominance of long-term seed propagation. In Jackfruit-growing regions, many variations in sweetness, acidity, flavor, and taste may be found. Based on the colour of the jackfruit pulp, genotypes may be divided into four groups: pink, orange, yellow and creamish white pulp makes up around 30% of the fruit's weight. The objective of the current endeavor was to gather several accessions from Tamil Nadu's jackfruit hotspots. The desired characteristics were petite, tasty fruits. In surrounding areas of Palur and Pathirakottai, Cuddalore district, 20 accessions (PK-1 to PK-20) on total were gathered. Ten of the twenty were yellow, five were creamish-white, and five were pinkish-red. According to the survey and observations, water availability directly correlates to the colour created because it affects the carotenoid content and sugar:acid ratio. The bright colors, such as orange or pink, may thus be more prevalent in drier areas fetching the higher market preference. As a result of shifting socio-economic and environmental priorities, now there is a worldwide expansion of interest and support for research on conservation, maintenance, genetic improvement, and effective use of less explored fruit tree resources and their products.

Keywords: Conservation, pulp colour, carotenoid, sugar:acid ratio

GI/OP – 6

Uniqueness in diversity of bael (*Aegle marmelos* Corr.) in subtropical region of India

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ABSTRACT

Bael (*Aegle marmelos* Correa) an indigenous, incredible minor fruit of India having wide adaptability to adverse soil and climatic conditions. Being an important underutilized medicinal fruit, it has been explored for its diversity available in the subtropical region (in the states of UP, M P, Rajasthan, Bihar, Chhattisgarh and Jharkhand) of India. A total of 138 (Seedling) and 43 (vegetative multiplied) accessions with distinct traits have been collected, conserved and characterized at ICAR-CISH, Lucknow. After considerable variability for its morpho-biochemical traits, fruit bearing behaviors, the three promising genotypes has been identified at this insitute; viz. CISH-Bael-1, CISH-B-2 and CISH-B-3 (selected from open pollinated seedlings). CISH-B-1 has an average fruit weight of 1.00 kg with pleasant flavored pulp having least mucilaginous and seed (45-60) content. The fruits are suited for processing industry with high pulp (65.57 %), high TSS (38.0^{o}B) and rich in total carotenoids (1.18 mg/100g pulp), total sugar (20.54 per cent), tannins (3.5 per cent), *marmelosin* (596.57 µg g), *psoralen* (102.02 µg g), *aurapten* (53.23 µg g), polyphenols (3.66%), vitamin C (79.00 µg g), *riboflavin* (158 µg g), thiamine (233 µg g) and niacin (1340.00 µg g) content, it confirm this variety adored with high nutritive and therapeutic value. CISH-B-2 has average weight of 2.25 kg and having attractive yellow fruit colour at ripening, enriched with thin shell (0.24-0.26 cm). It has less mucilage and seed (50.12), with high pulp (61.32 %), high TSS (31.98 ^{o}B), total carotenoids (0.99 mg/100g pulp), total sugar (16.33%), *tanin* (2.45%), *marmelosin* (170.08 µg/g), *psoralen* (9.20 µg/g), *aurapten* (9.16 µg/g), vitamin C (93.0 µg/g), *riboflavin* (182.0 µg/g), *thiamine* (165.00 µg/g), *niacin* (717.00 µg/g), that led to preferred for making juice and others processed products. The yield in grown up tree (10-12 years) is as high as 60-90 kg per tree. Likewise, CISH-Bael-3 has also average fruit weight as 1.11 kg and less seed content (60 to 100) with high TSS (38.15), vitamin C (15.81 mg/100g pulp), total carotenoid (2.26) and total phenol contemt (2.85 %). Fortunately, the CISH Bael-3 is tolerant to frost and fruit cracking. Some more diversity is being assessed and has been found that some are thornless, high yielder and rich in riboflavin.

Keywords: Gene pool, yield, fruit quality, marmelosin,

GI/OP – 7

Reproductive phenology of dragon fruit: A critical dimension of plant function

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ABSTRACT

Dragon fruit is one of the highly valued exotic fruit crops of the tropical world. The importance of dragon has increased substantially due to its nutritional significance. Reproductive phenology, the most important component of fruit production, signifies the sequential occurrence of flowering, fruit development and maturation. Reproductive phenology of dragon fruit was defined and described by the extended BBCH scale under eastern tropical region of India. The BBCH scale helps in identification of critical stages and their interaction with environmental factors. The RP of dragon fruit describes the development of flower buds (511-519), flowering (611-619), fruit (711-719) and fruit maturation (811-819). Heat unit requirement of specific reproductive stages was also studied. Bud development, pollination and fruit development are critical stages which needs special attention to ensure quality production. Nutrient management and harvesting of fruit at optimum maturity ensures better fruit quality. The description presented in the paper will act as a tool to provide a consensual unified approach for standardization of phonological stages as well as for executing various agronomic practices such as nutrient management, manual pollination, timely planning of harvesting etc. Moreover the identification of phenological stages is also considered as a key for characterization of germplasm and crop improvement programme. The basic information on phenological stages is also vital to assess the impact of climate variables on vegetative growth, fruit development and fruit maturation of dragon fruit, as phenology has been considered as a key indicator of climate change

Keywords: BBCH scale, flowering, fruit maturation, heat unit

GI/OP – 8

Development of bio-fortified pomegranate var. Solapur Lal for table purpose and Solapur Anardana for anardana purpose

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ABSTRACT

Pomegranate (*Punica granatum* L.) is an important fruit crop of arid and semi-arid regions of the world. It is one of the first five fruit crops to be domesticated by mankind. India is the largest producer and consumer of pomegranate. In India, pomegranate is cultivated over 2.76 lakh ha with an annual production of 31.48 lakh tonnes and productivity of 11.4 t/ha. India is the only country in the world, where pomegranate fruits are available throughout the year. Iron deficiency causes anemia whereas zinc deficiency results in stunted growth. Deficiency of vitamin C causes scurvy. Development of biofortified varieties having nutrients and vitamin could help to overcome such health issues. Crop improvement through hybridization has been attempted with the objective to develop bio-fortified pomegranate varieties in 2008, jointly by ICAR-NRCP, Solapur and ICAR-IIHR, Bengaluru. The hybrid progenies were evaluated for yield, quality and nutritional value. This has led to the identification and release of pomegranate variety Solapur Lal for table purpose and Solapur Anardana for anardana purpose. Solapur Lal is a bio-fortified high yielding (35 kg/tree), hybrid variety for table purpose; It has early maturity (160 days) compared to the ruling variety Bhagawa (Check variety). It has higher TSS (17.6^{o} Brix), ascorbic acid (19.6 mg/100g), anthocyanins (390mg/100g). It has about 60% higher iron and 25% higher zinc over Bhagawa. SVRC Notified variety in 2022 by the Government of Maharashtra & under consideration of CVRC 2023. This has been commercialized to 8 firms (including 2 tissue culture firms & 6 nurseries) with a distribution of about 12 lakh QPM covering about 4000 acres in 10 states of India. This has a protection period of 18 years since 2021, being registered variety of PPV & FRA (PPV&FRA /Reg/2016/1747). Solapur Anardana is a high yielding variety for anardana purpose (32 kg/tree). It has higher titrable acidity (4.8%), ascorbic acid (19.0 mg/100g) and anthocyanin content (456 mg/100g) with better anardana recovery from arils (> 21%) compared to Amlidana. This variety has been recommended / released by Joint Agresco-2023 of SAUs in Maharashtra. (PPV&FRA /Reg/2016/1747). It's under consideration of SVRC-2023, Maharashtra. It is an ideal alternative to '*Daru*', a naturally growing wild variety which is a source of livelihood security to the tribal community in Jammu-Kashmir.

Keywords: Fruit quality, aril recovery, acidity, ascorbic acid

GI/OP – 9

Scientific studies in *Garcinia dhanikhariensis*: An endemic fruit species from Bay Islands, India

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ABSTRACT

Endemic species have potential to play a significant role in the local economy provided their horticultural and economic value is known. *Garcinia dhanikhariensis* is an endemic genetic resource of *Clusiaceae* family having limited distribution in the South Andaman Island. To explore the potential of this endemic species, experiments were carried out during 2015-2023. Explorations resulted in identification of 11 trees including 2 male trees. The collections were characterized for various morphological and biochemical parameters. Results suggested significant variations for fruit morphology, leaf morphology, rind recovery and physico-chemical attributes. Superior genotypes were identified and are being multiplied. Biochemical profiling of the rind revealed it to be a novel source of hydroxy citric acid and anthocyanins. GC-MS analysis revealed that seeds were novel source of industrially important fatty acids. Nursery protocol was standardized and '*Garcinia*-type germination' was reported in the species. Effect of seed treatments, seed size, seed fragmentation and seed source on germination and seedling growth parameters was studied. Value added products were standardized and the crop is being promoted in the islands as a novel crop. Planting material is being multiplied in the Horticultural Plants Propagation Unit of the Institute and more than 60 farmers in the islands have started its cultivation. Tourism being the major livelihood sector in the islands, the species is also being promoted as an component of agro-ecotourism. Thus, using an endemic species, opportunities for employment could be generated apart from conserving this valuable genetic resource.

Keywords: Andaman kokum, anthocyanin, germination, hydroxycitric acid, popularization

GI/OP – 10

Assessment of biochemical variability and shelf life of elite jamun (*Syzygium cumini* Skeels) genotypes

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ABSTRACT

Jamun (*Syzygium cumini* Skeels) is a seasonal perishable berry which is commonly known as black plum or java plum is a boon to diabetic patient. It is an emerging fruit crop of twenty-first century as it yields table fruit that could play an important role in meeting demand of nutritious natural fruit with high medicinal value. In jamun, a lot of variability is evident in nature as it is a cross pollinated crop. To exploit this natural variability, a survey was carried out in eastern dry zone of Karnataka during 2020-2022. Among the collected genotypes, elite types were evaluated for tracing out the biochemical variation. The results from the analysis clearly shown that the genotype KJA-12 had highest total soluble solids (17.00 ºB) and KJA-27 showed highest titratable acidity (1.05 %). The maximum total sugars (20.37 %) and anthocyanin content (62.61 mg/100 g) was recorded in KJA-21, whereas maximum reducing sugar (8.33 %) and non-reducing sugar content (14.66 %) was noticed in KJA-4 and KJA-16, respectively. The genotype KJA-28 showed maximum TSS: acid ratio (28.09) and ascorbic acid (37.75 mg/100 g) content. The maximum total phenolic content (805.20 mg/100 g) was observed in KJA-8.The shelf life of jamun fruits was good (3 days) in 24 accessions, whereas 6 accessions showed moderate shelf life (2 days) and the lowest PLW (30.56 %) was observed in KJA-8. The overall acceptance for organoleptic traits was high in KJA-13 (8.57). The findings showed the presences of variability for different biochemical constituents in jamun which can be further exploited to identify superior genotypes.

Keywords: Anthocyanin, total sugars, phenols, shelf life

GI/OP – 11

Morphological, biochemical and molecular characterization of Indian avocado (*Persea americana* Mill.) accessions

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ABSTRACT

In present study, eight three avocado accessions collected from different parts of Karnataka, Tamil Nadu and Kerala were characterized for morphological, biochemical and molecular traits. The objective of the study is to know the extent of diversity present in Indian avocados. The results revealed the presence of wide variability for morphological traits such as fruit weight, fruit length, peel weight and pulp weight. The maximum pulp recovery was observed in accession PA-082 (85.73 %) which was on par with PA-025 (83.95 %), PA-036 (83.6 %) and PA-012 (82.53 %) and minimum was noticed in accession PA-043 (54.53 %). The biochemical analysis of avocado pulp showed the maximum phenols (148.26 mg GAE/100g), carotenoids (7.17 mg/100g) and oil content (25.49 %) in accession PA-023, PA-026 and PA-044 respectively. The higher heritability and genetic advance values were observed for morphological and biochemical traits which indicated the presence of additive gene action in the inheritance of that characters and can be a reliable and simple selection parameter for avocado improvement. The carotenoids profile of 31 accessions showed the high values for lutein content followed by β-carotene, neoxanthin, violoxanthin and chrysanthemaxan. The highest lutein content was recorded in accession PA-095 (8.36 µg/g) and lowest was noticed in yellow accession PA-026 (0.42 µg/g). Genetic diversity and population structure analyses were also studied for molecular traits by using 25 microsatellite markers. The high allelic diversity and heterozygosity based on SSR markers assays indicated the high level of diversity in the collected accessions. This study witnessed the existence of wide diversity in collected accessions for morphological, biochemical traits and the superior accessions can be utilized in future crop improvement programmes.

Key words: Fruit traits, pulp recovery, PCA, carotenoids

GI/OP – 12

Pummelo (*Citrus maxima* [Burm. f.] Osbeck) improvement for fruit quality and enhanced nutritional properties through interspecific hybridization

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ABSTRACT

The present study aimed to determine the variation in fruit quality traits and nutritional properties for fresh juice of 16 newly developed interspecific citrus scion hybrids between pummelo and sweet orange. A significant variation in the fruit quality traits (fruit, weight, length, breadth, peel thickness, and juice per cent) was observed in the tested progenies. The contents of total soluble solids (TSS), titratable acidity (TA), and TSS-acid ratio at commercial maturity ranged from 8.93 ° to 11.47 °B, 0.72-1.84%, and 5.68 to 12.77 in the fruits of newly developed interspecific hybrids, while the ascorbic acid content varied from 37.86 to 71.15 mg/100 mL of juice. The mineral nutrients concentration in the citrus fruit juice was observed in descending order of K, Cl, P, Ca, Mg, Na, Fe, Zn, Cu, and Mn. The citrus progenies evaluated significantly differed in respect of juice nutrients. Overall, the citrus hybrids namely SCSH-9-6/12, SCSH-9-10/12, SCSH-11-9/13, and SCSH-7-2/12 were found superior in respect of Fe and Zn content in the fruit juice. The antioxidant activity, and the contents of total phenol, carotenoids, lycopene, anthocyanins, flavonoids, and limonoids in the fruit juice too varied significantly, showing transgressive segregation, and some of the scion hybrids exhibited superior physico-chemical fruit quality and higher nutritional properties over parental genotypes.

Keywords: Antioxidant, bioactive compounds, mineral nutrients

GI/OP – 13

Characterization and evaluation of jackfruit (*Artocarpus heterophyllus* L.) germplasm for processing in Kolar district

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ABSTRACT

Jackfruit (*Artocarpus heterophyllus* L.) is a tropical evergreen tree, belongs to the family Moraceae. It is a highly heterozygous and cross pollinated crop and as such seedlings exhibit a wide range of variations which aids in the selection of the superior desirable types. Studies were carried out to characterize and evaluate the jackfruit germplasm of jack garden for processing at College of Horticulture, Bengaluru, during 2018-2022. Results revealed that, all the genotypes showed significant difference among the 42 characters evaluated. Among the genotypes evaluated, Tamaka-5, 10, 22, 23 and 42 are considered to be best for table purpose. Among these genotypes, Tamaka-23 was considered the best among all genotypes with optimum fruit size (8.48 kg), minimum rind thickness (7.41 mm), optimum number of bulbs per kg of fruit (29.67), flake length (49.70 mm), flake diameter (28.19 mm), flake thickness (3.66 mm), deep yellow flakes, with desirable TSS (29.17 °B), acidity (0.57 %), firmness (4.16 N) carotenoids (94.14 µg 100 g^{-1}) and overall acceptability (8.77). During preparation of osmotically dehydrated jackfruit slices, the genotype Tamaka-20 given best results by registering the moisture (12.95 %), instrumental colour values such as *L** value (62.93), *a** value (28.14) and *b** value (51.47) and firmness (65.76 N). Storage studies (6 months) of osmotically dehydrated jackfruit slices revealed that Tamaka-20 is best suited with minimum changes in moisture (13.76 %), instrumental colour changes such as L* value (57.63), a* value (33.65), b* value (47.51), firmness (61.13 N) and overall acceptability (8.06). The genotypes Tamaka-5, 10, 22, 23 and 42 are considered best for minimal processing. Among these, Tamaka-23 considered as the superior genotype for minimal processed jackfruit with minimal changes in the physiological loss in weight (0.64 %) moisture content (67.85 %), total soluble solids (30.45 °B), antioxidant activity (48.28 mg AAE 100g^{-1}), total carotenoids (97.48 µg 100 g^{-1}**)** and firmness (4.16 N), overall acceptability (7.74) and had highest shelf life (18 days) during storage in refrigerated condition. Storage studies on tender jackfruit cubes form different jackfruit genotypes led to conclude that the genotype Tamaka-31 is best suitable for processing into tender jackfruit cubes with minimal physiological loss in weight (0.17 %), moisture (82.84 %), firmness (50.91 N), *L** value (67.33), *a** value (3.29), *b** value (25.20) and overall acceptability (7.10).

Keywords: Fruit quality, carotenoids, antioxidant activity, storage

GI/OP – 14

Assessment of genetic divergence of twenty longan (*Dimocarpus longan* L.) genotypes under North Zone of Bihar

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ABSTRACT

In the present study, the genetic divergence of longan was studied for thirty quantitative morphological and biochemical traits among twenty diverse genotypes at ICAR-National Research Centre on Litchi, Muzaffarpur, Bihar (India). According to the Mahalanobis D^2 statistic, twenty diverse genotypes were grouped into six groups. Among them, Cluster I was the largest with 7 genotypes, followed by Cluster III (6 genotypes) and Cluster II (4 genotypes), while Clusters IV, V, and VI contained only single genotypes. The maximum diversity was found between cluster III and VI (244440.70) whereas, the maximum diversity within the clusters was recorded for cluster III (19026.96) followed by cluster I (14779.36) and cluster II (11600.36) based on the inter and intra cluster distance. The presence of genetic divergence was also tested in cluster means by the significant amount of variability for traits. Cluster VI had maximum cluster mean value for maximum traits (12 traits) followed by cluster V (7 traits), cluster I (6 traits), cluster IV (4 traits). However, cluster III comprised maximum mean value only for single character petiole length whereas; cluster II had not observed maximum mean value for any characters.

Keywords: Clusters, genetic divergence, D^2 statistic

GI/OP – 15

Phenological growth stages in rambutan (*Nephelium lappaceum* L.) based on extended BBCH- scale

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ABSTRACT

This study describes the different phenological growth stages of rambutan (*Nephelium lappaceum* L.) grown in India particularly in the southern states of India. It has become one of the most treasured fruits particularly as a courtyard crop or on its fringes in the home gardens because of its juicy and delicate flesh and appealing taste and flavour. In spite of high nutraceutical and ethno botanical value, phenology is an often-overlooked aspect of rambutan ecology. In the present study, the codes and descriptions of the phenological stages of rambutan as given in the extended Biologische Bundesantalt, Bundessortenamt and Chemische Industrie scale (the BBCH scale) were elaborated using a three-digit system of notation. A total of seven principal growth stages for bud development (stage 1), leaf, and shoot development (stage 3), inflorescence emergence (stage 4), flowering (stage 5), fruit development (stage 6) and fruit maturity (stage 7) are described and illustrated. About forty-one secondary growth stages are also described. The duration of each principal and secondary growth stage was measured in days and quantified in thermal accumulation/growing degree-days. The significance of the primary growth stages for orchard management and crop improvement, in monitoring plant growth and development (especially in the light of the impacts of climate change), and in assessing fruit yield and quality is explained. Moreover, the extended BBCH scale will be a useful tool for characterization of germplasm as well as to standardize the phenophases observed under different environmental conditions of rambutan and it is helps to promote the cultivation of this exotic fruit crop.

Keywords: BBCH scale, phenology, phenophases, degree days

GI/OP – 16

Evolving scope of GMS lines for production of heterotic bacterial wilt resistant hybrids in marigold

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ABSTRACT

Marigold, most popular commercial loose flower crop/landscape plant having a number of F1 hybrids and varieties, is severely infected with bacterial wilt which poses threat to successful cultivation of this crop in Kerala. Hence, a breeding programme was initiated using six testers, including two bacterial wilt resistant lines (KAU M-1 and KAU M-2), and four genetic male sterile lines (GMS), in a line x tester model. F1 hybrids were evaluated in a bacterial wilt sick plot for various vegetative, floral and yield parameters along with their response to wilt incidence. Field evaluation for bacterial wilt resistance revealed that out of 24 hybrids, 13 hybrids involving KAU M-1 and KAU M-2 as testers exhibited bacterial wilt resistance. Mean performance of all the hybrids showed significant differences with respect to all the parameters studied. KAU Ms-6 x KAU M-1 produced largest flowers (9.17 cm) with maximum flower weight (13.50 g). The interspecific hybrid, KAU Ms-6 x KAU M-47 produced highest number of flowers (289) and yield/plant (610.93 g) having smaller flowers (5.22 cm) on shorter plants (39 cm) which make it suitable for both loose flower as well as landscaping purposes. The hybrid KAUMs-18 x KAUM-4 recorded highest total carotenoids content of 1.98 mg/g. Significant relative heterosis, heterobeltiosis and standard heterosis was observed for vegetative, floral, yield and total carotenoids content.

Keywords: Bacterial wilt resistance, carotenoids, heterotic hybrids, male sterile lines, *Tagetes* species

GI/OP – 17

Genetic diversity of native *Dendrobium* species revealed by simple sequence repeat (SSR) markers

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ABSTRACT

Dendrobium is an epiphytic orchid, which is highly valued as a cut flowers. The assessment of genetic diversity is crucial to study the relationship between the species and also to develop the novel hybrids. In this study, 25 cross species simple sequence repeat (SSR) markers were screened for amplification in *Dendrobium* species. Eighteen polymorphic markers were used to estimate the genetic diversity in 15 *Dendrobium* species. The 18 SSR markers generated a total of 55 polymorphic bands, with an average of 3.05 bands per primer. The observed and expected heterozygosity within the species ranged from 0 to 0.62 and 0.30 to 0.86, respectively. Cluster analysis based on the unweighted pair group method with an average led to a dendrogram with three major groups that coincided for morphological characters mostly for flower colour, flower shape and nature of shoot, but did not coincide with their geographical locations. Results revealed that genetic variation exists amongst the 15 *Dendrobium* species, which will be helpful in selecting desirable species as a parent for crossing purpose to develop new interspecific hybrids.

Keywords: *Dendrobium* species, Orchidaceae, geographical locations, genetic diversity, SSR markers, cluster analysis

GI/OP – 18

Isolation and establishment of novel mutant from chimeric ray florets in chrysanthemum (*Dendranthema grandiflora* Tzvelev)

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ABSTRACT

Chrysanthemum (*Dendranthemagrandiflora*Tzvelev) is considered as the second most important floricultural crop worldwide after roses. Mutation breeding is the easy and efficient method for generating genetic variation in chrysanthemum. As a result of gamma irradiation large numbers of novel mutants appear in the form of chimeras with varied flower colours. Isolation of such types of mutated tissue is impossible through conventional techniques. Therefore, an effort was made to develop efficient *in-vitro*regeneration protocol from chimeric ray florets of chrysanthemum in order to isolatenovel mutant.Mutated ray florets from flower-heads were collected and pre-treated with carbendazimand surface sterilized with $HgCl_2$(0.1%).Maximum survival of the explants (80%) was recorded when ray florets were pre-treated with carbendazim (0.1%) for 30 minutesfollowed by surface sterilization with $HgCl_2$ (0.1%) for a duration of 3 minutes.Maximum regeneration of micro-shootswasrecorded on MS medium supplemented with BAP (1.0 mg/L) + NAA (0.1 mg/L). Highest micro-shoot proliferation (85%) was found to be best in MS medium supplemented withBAP (0.3 mg/L), shoot elongation and rooting was maximum in half-strength MS medium supplemented with GA_3 (0.5 mg/L) and NAA (0.5 mg/L), respectively. Successful acclimatization of *in vitro* raised plantlets was done in glass jar with polypropylene cap filled with a mixture of sterilized cocopeatsupplemented with half-strength MS salts. After 3-4 weeksof acclimatization, the plantlets were transferred to jiffy plugsfor primary hardening for 15 days. Later, these plants generated from ray florets were transferred tonaturally ventilated polyhouse for secondary hardening.

Keywords: Chrysanthemum, *in-vitro* regeneration protocol, chimera, mutants

GI/OP – 19

Exploiting the potential of *Heliconia* species for ornamental and landscape uses

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ABSTRACT

A field study was conducted to evaluate the performance of forty-one heliconia types/varieties under agro climatic conditions of Maharashtra for three years during 2017-2020. Uniform sized suckers of heliconia were planted at a spacing of 1.5m x 1.5m. Analysis of variance indicated that morphological as well as floral traits observed differed significantly. Less robust *H.psittacorum* varieties such as 'Lady di', H.'Golden torch','Kathy','Petra','Yellow Parrot' and 'Strawberries and cream' recorded low to medium plant height, highest number of shoots and inflorescences of lesser dimension. They were earlier in flowering, with greater number of flowering shoots. Robust varieties such as *H.caribea* , H.'She', *H.rauliniana* upright, H.'Red' and H.'Irish' recorded higher plant height, lower number of shoots and inflorescences of higher dimension. They were late bloomers with lower number of flowering shoots. Genotypes *H. psittacorum* 'Lady di', H. 'Golden torch', *H.psittacorum* 'Kathy', *H.psittacorum*'Petra', Kenya Red, H.'Yellow Parrot', *H. latispatha distans*, *H.caribea*, Prince of Darkness, Adrian, Tropics and H.'Strawberries and cream' produced maximum number of spikes with excellent visual appearance, good vase life and hence suitable as cut flowers. Guyana Tropics, Alan Carle, H. 'Red and *H. latispatha* produced desirable quality leaves for cut foliage purpose. Longer flowering duration in Golden torch, Lady Di, Kathy, Sassy, Petra, Strawberries & Cream, Kenya Red and Alan Carle makes them more suitable for landscaping in home gardens, avenues, and roadside gardens. Genotypes viz., Jamaican dwarf, Red Christmas, Lady Di, Kathy, Strawberries & Cream, Sassy, *H bihai* and Prince of Darkness are suitable as potted plants owing to their short and compact dense nature. The present study on selection of heliconia varieties based on various traits for cut flower/ cut foliage / potted plant / landscaping purpose will serve to popularise and strengthen heliconia cultivation and is extremely important for future heliconia breeding programs.

Keywords: Heliconia species, varieties,ornamental, landscaping

GI/OP – 20

Underutilized elite inter-specific ornamental banana hybrids (*Musa spp.*) for aesthetics

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ABSTRACT

Banana is an important edible fruit plant of Musaceae family but there are many species where bracts are floriferous and leaves are unique with insignificant fruits settings. These types of plants are very suitable for use as pot plant, landscape uses, foliage, etc. Despite having the above aesthetic value the ornamental type of bananas were grossly underutilized till date. In the present study the inter-specific hybrids (Line 1 to 15) developed by ICAR-National Research Centre on Bananawere evaluated at ICAR-DFR under AICRP (Floriculture) for its utility as ornamentals. The results revealed that maximum plant height was observed in Line 9 (133.33 cm) followed by Line 8 (127.00 cm), Line 13 (119.33 cm) and least in Line 15 (65.33 cm). Plant girth was observed maximum in Line 6 (16.33 cm) followed by Line 8 (15.67 cm), Line 13 (15.33 cm) and least in Line 15 (10.67 cm). Leaf area was observed maximum in Line 8 (222.33 cm2) followed by Line 9 (1993.33 cm2), Line 6 (1829.33 cm2) and least in Line 11 (894.67 cm2). Both Line 2 and Line 4 were early (5.00 days) to shooting and it was delayed in Line 7 (8.33 days). The rate of leaf production was non-significant for all the lines. But it was profuse in Line 13 (10.33) and minimum in both Line 10 and 12 (6.67). In flowering trait, the rachis length was found maximum in Line 6 and Line 7 (33.00 cm) and it was minimum in Line 12 (15.00 cm). The bract folding of all the lines were revolute except Line 4. Days required for degradation of 50% fruit skin colour was non-significant, but it was observed maximum in Line 9 (14.67 days) and least in Line 5 (12.33 days). The number of hands per fruit was found maximum in Line 8 (30.00) whereas minimum in Line 11 (11.00). The side suckers were profuse in Line 7 (5.33 nos) and Line 15 (1.33) was very shy and it was non-significant for all the lines. The vase life of flower was non-significant, but found maximum in Line 7 (7.67 days) followed by Line 4 & 8 (7.33 days) and minimum in Line 13 (4.33). The flower size of Line 13 was large (5.10 cm) followed by Line 1 (4.63 cm) and minimum in Line 2 (3.70 cm). Based on the study it can be inferred that all the lines were suitable for ornamental purpose.

Keywords: Banana, ornamental, inter-specific hybrid, aesthetics

GI/OP – 21

Crossability studies in *Dendranthema* x *grandiflora* for novel chrysanthemum germplasm

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ABSTRACT

An experiment was carried out in the research block of the Division of Flower and Medicinal Crops, ICAR-Indian Institute of Horticultural Research, Hesaraghatta Lake Post, Bengaluru, during 2016-17 and 2017-18. To achieve the compatible successful crosses, twentygenotypes of chrysanthemum were used as female parents and pollen parents. For pollination, emasculation and dusting of mixed pollens were followed. More than 450 flowers head or capitulum was crossed. The different concentration media such as sucrose, PEG4000 and in combination were used before pollination on receptive stigma to achieve successful cross. In order to achieve the compatible crosses, we investigated day to seed set, *per cent* seed set and *per cent* seed germination. The results indicated that seeds collected from only one successful cross IIHR6-41 x MP recorded 25.68% (15% sucrose) to 40.74% (10 % sucrose) seed setting and IIHR6-41 x MP recorded 26.74% (15% sucrose) to 54.12% (control) seed germination. Among PEG4000 concentrations, the seed setting was ranged from 1.57% (Ajay x MP) to 31.35 % (IIHR6-41 x MP). The seed germination in one successful cross IIHR6-41 x MP recorded 54.48%germination. Among sucrose and PEG4000 concentrations, seed setting was observed in five crosses i.e. Ajay x MP, ArkaChandrika x MP, ArkaKirti x MP, LalPari x MP and IIHR6-41 x MP. Seed setting was recorded ranged from 1.69 (Ajay x MP) to 39.32 (IIHR6-41 x MP). Seed germination was recorded in four crosses i.e. ArkaChandrika x MP, ArkaKirti x MP, LalPari x MP and IIHR6-41 x MP, found significant seed germination ranged from 3.27% (ArkaChandrikax MP) to 49.02% (IIHR6-41 x MP)**.** Among crosses and sucrose + PEG concentrations, 10% sucrose + 15% PEG with crosses ArkaChandrika x MP and IIHR6-41 x MP recorded seed set ranged from 3.44% to 52.65%, respectively. Among crosses and sucrose + PEG concentrations, cross ArkaKirti x MP with 5% sucrose + 10% PEG recorded significantly lowest seed germination (6.19%), whereas, cross IIHR6-41 x MP with (10% sucrose + 15% PEG) recorded highest seed germination (60.50%). However, total 54 half-sib progenies were achieved and screened, out of that seven half-sib progenies have superior horticultural traits such as flower colour, dwarf and compact growth habit, disease resistant against white rust.

Keywords: Pollination, emasculation, mixed pollen, half-sib progenies, chrysanthemum

GI/OP – 22

Evaluation of mango ginger (*Curcuma amada* Roxb.) genotypes for yield and essential oil

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ABSTRACT

Mango ginger (*Curcuma amada* Roxb.) is a rhizomatous perennial herb, cultivated as an annual crop in small scale throughout India, Sri Lanka, Bangladesh and in many South-East Asian countries. The rhizomes have a typical mango flavour and are being used in culinary preparations, Ayurveda, and Unani medicinal systems. Being an under-utilized spice crop, there is a lack of systematic crop improvement efforts in mango ginger. India, being the centre of origin for this crop has considerable extent of genetic diversity. In view of the above facts, ninepromising accessions obtainedfrom AICRP on Spices along with a check variety Amba were evaluated in a randomized block design for three years (2020-2021, 2021-2022 and 2022-2023) for plant height, number of shoots, fresh rhizome yield and essential oil content at ICAR – IISR Experimental Farm, Peruvannamuzhi, Kozhikode, Kerala.Pooled analysis of varianceover the yearsindicated that genotypes and G × E interactions were significantly different at $p < 0.05$. Phenotypic and genotypic coefficient of variability were found to be high for fresh rhizome yield/ plant. A high heritability coupled with high genetic advance over mean were recorded for fresh rhizome yield/plant. Among the ten genotypes, Acc. 347 recorded significantly higher fresh rhizome yield of 45.76 t/ha (30% higher) over the years compared to the check variety Amba, followed by NVMG 10 (17%) and NVMG 9 (10 %). The essential oil content in Acc. 347 was 10 percent higher than the check variety. Although the CAM 3 recorded forty percent less yield than the check variety, its essential oil content (0.69%) was 138 % higher than the check variety Amba (0.29%). Hence, the Acc. 347 isidentified as a potential genotype for high yield and CAM 3 may serve as a good donor line to improve essential oil content in mango ginger cultivars.

Keywords: Mango ginger, essential oil, *Curcuma amada,* Zingiberaceae

GI/OP – 23

Domestication efforts in woody pepper from Andaman and Nicobar Islands

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ABSTRACT

The tropical Andaman and Nicobar Islands are known to harbour rich diversity of flowering plants of agri-horticultural significance. Woody pepper is a wild relative of commercial black pepper that is naturally distributed in these islands. The vine grows luxuriantly taking support of large trees in the wild and some home gardens in the islands. The unique feature of the species is that stem pieces are economic part with culinary applications unlike leaves and fruits in other Piper species. In order to domesticate this species and bring it under cultivation in the warm humid regions, systematic studies were conducted between 2016-2023. DNA barcoding was carried out to ascertain the botanical identity of the species. Surveys were conducted and morphological characteristics were documented. Under natural conditions, standards for growing woody pepper were studied. Serpentine and radial serpentine methods for mass multiplication were developed with 98% survival after transplanting to address the issue of quality planting material. To explore the possibility of growing it on commercial scale, trials were taken up in protected condition wherein vines were grown in shade net house and naturally ventilated polyhouse conditions. Significant variations were observed for various morphological and biochemical parameters under these conditions. Biochemical analysis of stem suggested that it contains Piperineand phenolic acids as bioactive molecules. To improve the shelf-life of produce from 5-6 days to 1 year, value added products were developed. These products will serve as a unique ingredient for offering exclusive cuisines in the islands for the tourists. To popularize it among the farmers, nine sensitization and awareness programmesand a National Conference were conducted and planting material was provided to more than 210 farmers of the islands. Thus, woody pepper is being promoted as a novel crop in the islands for offering crop diversification to the island farmers.

Keywords: DNA barcoding, chromatography, novel spice, Piperaceae, piperine

GI/OP – 24

Molecular characterization of native indigenous orchids

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ABSTRACT

Orchids are the largest in the plant kingdom with about 600 - 800 genera, 25000 species and more than one and half lakh man-made hybrids. Genomic resources in these crops are available only for the popular genera, however very less work had been done in case of wild orchid species. Hence this study had been conducted to characterize the wild orchid species using the available markers of commercial orchids. In this study, the indigenous 22 wild orchid species characterized using the data generated by 17 SSR markers. The study revealed the transferability of markers and the genetic diversity across the genera for respective loci. A total of 40 alleles were detected at the loci of seventeen microsatellite markers across twenty-two species. The number of alleles per locus ranged from two to three, with an average of 2.35 alleles across 40 loci. The Un-Weighted Pair Group Method (UPGMA) clustering system generated eight genetic clusters with a similarity coefficient 64.4 per cent. The highest genetic distance was found between cluster I (*Dendrobium aqueum*Lindl., *Coelogyne fimbriata* Lindl., *Dendrobium macrostachyum*Lindl., *Coelogynebreviscapa*Lindl., *Coelogyne nervosa* A. Rich.) and cluster VIII (*Polystachyaconcreta*(Jacq.) Garay and Sweet).

Keywords: Indigenous orchids, molecular characterization, SSR markers, genetic clusters

GI/OP – 25

Assessment of genetic diversity and growth potential of Barleria genotypes: Exploring its untapped potential as a floral gem

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ABSTRACT

Barleria is a remarkably versatile and aesthetically pleasing flower crop. Its vivid and diverse blooms come in an array of striking colours, making it a visually captivating addition to gardens and floral arrangements. Beyond its ornamental value, Barleria also holds utility as a medicinal plant, with certain species known for their traditional healing properties. Moreover, its hardiness and ability to thrive in various climates make it an excellent choice for both amateur and professional gardeners seeking resilient and attractive flora. This study focuses on investigating Barleria's potential for use as a loose flower. The present investigation on evaluation of 15 genotypes of barleria (*Barleria spp.*) with respect to growth and yield parameters of barleria flowers was carried out at College of Horticulture, Sirsi, UHS, Bagalkot for two years from 2019 to 2021. The results revealed that among the genotypes at 120 DAT the maximum plant height was observed in COHS-12 (88.30 cm), number of leaves was more in COHS-7 (994.44), plant spread was maximum in COHS-2 (44.67 cm^2), higher number of primary branches in COHS-6 (13.33), maximum average leaf area was recorded in COHS-12 (21.67 cm^2), longer duration of flowering was recorded in COHS-8 (78.00 days), more number of spikes per plant and more number of flowers per spike was recorded in COHS-5 (110.17 and 9.30 respectively), COHS-12 recorded maximum 100 flowers weight (22.89 g), highest flower yield per plant and also per hectare was recorded in COHS-5 (141.67 g/plant and 393.51 kg//ha).

Keywords: Barleria genotypes, genetic diversity, growth, yield

GI/OP – 26

Gladiolus murielae: an underutilized fragrant species of gladiolus

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ABSTRACT

The fragrant species of gladiolus originally described as *Acidanthera bicolor* and presently *Gladiolus murielae* is valued for its scented star shaped flowers. The present study on morphological characterization, floral biology and volatile profiling of *Gladiolus murielae* was carried out at ICAR - Indian Institute of Horticultural Research, Bengaluru, Karnataka during the year 2022-23. Morphological characterization revealed that the plants are with grassy foliage, reach a height of83.15cm, produce 7.5leaves/plant, takes 124.8 days for spike emergence. The florets are 16.46cm in length and 8.05cm in width. A branched spike having 8 florets/spike.The spike lengthwas67.5cmwith rachis length of 26.5cmandspike yieldof3.8spikes/plant. The flowers arewhite in color with maroon blotch on the throat, anthesis was observed from 8amto 11am followed byanther dehiscence from8:30am to 10:30am. Stigma receptivity was noticed after 1st day of anthesisfrom 11:30am and continued for next 24hours.Anther dehisced with longitudinal slit,produced abundant pollen grains recorded 79.7%of viability.The fragrance profiling studyusing HSGC-MS atbud stage, half open and full openstage revealed wide variation of volatiles among the different stage of flower opening. The volatile compounds toluene and cyclododecanol found only at bud stage whereas;1-propoxy-2-propanol, caryophyllene, cineole, naphthalene, α-pinene, β-thujene, and majorly methyl group compounds are noticed in all 3 stages of flower opening. The gladiolus cut flowers are lack of fragrance and this study would aid in introgression of fragrant in to desirable background for the development of fragrant gladiolus varieties.

Keywords: *Gladiolus murielae*, HSGC-MS, Volatile profiling, fragrant gladiolus.

GI/OP – 27

Evaluation of warm and cool season turf grasses for morphological and quality traits under Eastern dry zone of Karnataka

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ABSTRACT

An experiment was conducted to evaluate different turfgrass species and varieties for their morphological characteristics under the Eastern dry zone conditions of Karnataka. A wide range of variation was observed among the 12 genotypes of turfgrasses in terms of their morphological and quality traits. Among the various characteristics studied, *Cynodondactylon* 'Triploid' and *Cynodondactylon* 'Panam' showed the shortest time for sprouting stolons. This indicates that these two varieties quickly develop new shoots from their stolons, which can contribute to faster establishment and coverage. *Cynodon dactylon* Tfway 419 exhibited a gradual increase in ground cover percentage. This suggests that this particular variety gradually spreads and covers the ground, potentially leading to a denser and more uniform turfgrass surface over time. Tif dwarf, another turfgrass species, displayed the longest stolon length and the highest chlorophyll content compared to the other varieties. Longer stolons can contribute to better vegetative spread, while higher chlorophyll content indicates better photosynthetic activity. *Eremochloaophiuroides* L., another species evaluated in the experiment, recorded the highest number of nodes per stolon.

Keywords: Turf grasses, morphological characters, ground cover percentage, chlorophyll content

GI/OP – 28

Expression analysis of photoperiodic flowering genes *DgCRY2*, *DgCOL,* and *DgLFY* in photo-sensitive and photo-insensitive chrysanthemum (*Dendranthema* x *grandiflora* Tzvelev) genotypes

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ABSTRACT

Chrysanthemum (*Dendranthema* x *grandiflora*) is a typical short day (SD) plant and it is one of the important floriculture crops in the world which is used as a cut flower, potted plant, and in landscaping. In the present study, photo-sensitive (Gulmohar) and photo-insensitive (Marigold) chrysanthemum genotypes were subjected to SD conditions and their floral primordial transition were observed under stereomicroscope. Further, correlation of transcriptional expression of photoperiodic flowering genes in chrysanthemum *viz*., CRYPTOCHROME, *DgCRY2*, CONSTANS LIKE, *DgCOL* and LEAFY, *DgLFY* in photo-sensitive and photo-insensitive chrysanthemum genotypes were studied. Findings of the study revealed that photo-sensitive (Gulmohar) and photo-insensitive (Marigold) chrysanthemum genotypes when subjected short day (15 hours SD) treatment exhibited significant variations in expression patterns of *DgCRY2*, *DgCOL* and *DgLFY*. The expression level of *DgCRY2* was significantly higher in photo-insensitive genotype Marigold (2.31 folds) at involucre differentiation stage, whereas, expression level of *DgCRY2* was significantly downregulated in photo-sensitive genotype Gulmohar at this stage. At initiation of floret primordial stage, *DgCOL* (1.95 folds) and *DgLFY* (4.71 folds) genes showed the higher level of transcriptional expression, while, the expression of these genes decreased in Gulmohar. This result provides evidence for the role of *DgCRY2*, *DgCOL* and *DgLFY* in controlling floral transition and laid a foundation for the further elucidation of the functions of these genes in chrysanthemum. Further, these genes could serve as a vital target for the genetic manipulation of flowering time in chrysanthemums.

Keywords: Chrysanthemum, photoperiod, flowering genes, floral transition

GI/OP – 29

The unexplored ornamental wealth of India -Diversity and potential

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ABSTRACT

India possesses an enormous a wealth of ornamental plant genetic resources and possesses a long-standing history of floriculture, dating back to ancient times. The Indian subcontinent is one of the twelve worldwide agricultural plant diversity regions. India has high species, genetic, and habitat biodiversity. About 426 biomes exhibit habitat variety, making it one of the world's richest plant genetic resource centers. Comprehensive study spanning over a decade has led to the identification of over 17,000 species of ornamental plants in different regions of India. The most widely represented families are Poaceae, Leguminosae, Orchidaceae, Acanthaceae and Euphorbiaceous, Asteraceae Lamiaceae and Rubiaceae. This extensive research endeavor involved multiple groups, who diligently collected and analyzed data to achieve these findings. It has been found that each of these plants possesses the requisite qualities to be utilized as an ornamental. India boasts a diverse array of annuals, shrubs, and trees, which all contribute to the nation's abundant genetic diversity of aesthetically pleasing flora. The potential holds great promise. Despite India's biodiversity, the floriculture sector largely grows non-native plants. India needs scientific and technical knowledge of potential indigenous wild ornamental plant species. Variations in distinct populations of potential species, augmentation, and ex-situ multiplication require to be investigated further. Indigenous plant species must be used more in planned landscapes to maintain biodiversity in urban areas. The availability of ecologically suitable and economically viable aesthetic plants is a major barrier to native species landscaping. The contemporary landscaping trend of sustainability, biodiversity, and low maintenance requires native plants in managed environments. This paper reviews the current state of the collection of native ornamentals across India.

Keywords: Ornamental genetic resources, biodiversity, indigenous plants, landscaping

GI/OP – 30

Studies on genetic variability in gomphrena (*Gomphrena globosa* L.) genotypes for productivity and quality traits

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ABSTRACT

An investigation entitled "Studies on Genetic variability in Gomphrena (*Gomphrena globosa* L.) genotypes for productivity and quality traits" was conducted during 2022 in the experimental block of Floriculture and Landscape Architecture at College of Horticulture, Bagalkot. The field experiment was laid out in a randomized block design (RBD) with three replications using thirteen Gomphrena genotypes for variability, character association and path analysis studies. Significant differences among the genotypes for all the characters under the study indicated higher magnitude of variability. The *per se* performance of different Gomphrena genotypes indicated, the genotype AGS-4 had highest mean for plant height (66.80cm), stem girth (11.31mm), plant spread in E-W and N-S direction (53.53 and 56.13cm), duration of flowering (67 days), minimum number of days to flower opening (8 days), number of flowers per plant (279.53), yield per plant (763.57 g) and individual flower weight (3.19g). High heritability coupled with high genetic advance as per cent of mean was recorded for plant height, number of secondary branches, number of leaves, stem girth, days to bud initiation, inflorescence length, individual flower weight, number of flowers per plant and yield per plant. At genotypic level, the flower yield was positively correlated with individual flower weight (0.820) followed by number of flowers (0.603), stem girth (0.756), duration of flowering (0.660), inflorescence length (0.527), plant spread in N-S direction (0.513), plant height (0.539), secondary branches (0.541) and stalk length (0.442). Path analysis disclosed direct positive effect of stem girth on flower yield (1.0159) followed by plant height (0.7882), number of primary branches (0.3449), duration of flowering (0.7123), stalk length (0.5385) and individual flower weight (0.3673).

Keywords: AGS, gomphrena, variability, yield

GI/OP – 31

Genome sequencing, microsatellites characterization and genetic diversity analysis of *Pterocarpus santalinus*L. f.: An economically important endangered tree of Eastern ghats, India

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ABSTRACT

*Pterocarpus santalinus*L.f. is an endemic, endangered, and economically significant tree species, and distributed in the Eastern Ghats in Andhra Pradesh, India. There is a high demand in the international market for the timber of this tree because of its blood-red color. As a result of its high timber demand, Red Sanders is illegally logged resulting in fragmentation and depletion of its natural population. For conservation efforts to be prioritized, identifying distinct populations of Red Sanders in their natural habitat requires assessing their genetic diversity. A total of 2,82,918 SSR loci were identified using whole genome sequencing from *P. santalinus* leaf tissue. A total of 28 SSRs were selected for polymorphism analysis across the 52 individuals belonging to three populations of *P. santalinus*. Identified sum of 502 alleles with polymorphic information content of 0.83; Observed heterozygosity (Ho) 0.42 and expected heterozygosity (He) 0.69. A genetic differentiation coefficient (FST) of 0.19 (FST < 0.25) indicates moderate genetic differentiation among the populations. Six SSRs from *Pterocarpus indicus* Willd. and*Pterocarpus erinaceus*Poir. were successfully amplified in *P. santalinus* and produced 131 alleles. Further, our study explored the genetic variation and population structure of the 22 natural populations of *Pterocarpus santalinus*using 16highly polymorphic SSRs. Among the 22 populations, CPV exhibited the highest genetic diversity (He=0.869), and the lowest was PVT (He=0.436). The analysis of molecular variance (AMOVA) results showed a high level of genetic variation within populations (72%) and low variation among populations (28%). STRUCTURE analysis, neighbor-joining tree cluster analysis, and principal coordinates analysis suggest that the 361 individuals from 22 populations were clustered into three groups. The Mantel test showed a positive but insignificant correlation between genetic and geographical distances (r = 0.199; *P* = 0.001). The findings of the study offer crucial information on understanding the genetic diversity and population structure of *P. santalinus*, which holds paramount importance for the conservation and management of this endemic species.

Keywords: *Pterocarpus santalinus*, Red Sander, Eastern Ghats, Genetic diversity, SSR, microsatellite, population structure.

GI/OP – 32

Induced tetraploid reveals improved yield and enhanced phytochemical profile in *Centella asiatica* (L.) Urban: An underutilized green leafy vegetable

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ABSTRACT

Centella asiatica (L.) Urban belonging to the family Apiaceae is a high value medicinal herb cum neutraceutical vegetable. The therapeutic uses involve memory enhancement, wound healing, radioprotective, antioxidative, antirheumatoic etc. The herb is valued for its leaves containing the triterpenoids namely asiaticoside, madecassoside, asiatic acid and madecassic acid. It is also consumed as a neutraceutical vegetable in many countries like India, Malaysia, China, and other parts of Asia. Polyploidy has found to play a significant role towards improving the morphological traits and biosynthesis of active metabolites in the medicinally important plants.The present investigation has successfully induced tetraploidy in the diploid *Centella asiatica* variety Arka Prabhavi thereby improving its biomass yield and secondary metabolite yield per unit area. The tetraploid was obtained by treating the shoot tips of diploid genotype (Arka Prabhavi) using 0.05% colchicine via cotton plug method. Tetraploid plants regenerated after six months showed significant changes in morphological traits like stolon length, intermodal length, leaf length, leaf width, petiole length and biomass yield. Tetraploidy was further confirmed with the cytological analysis showing doubling of the number of chromosomes and from the increased stomatal size, decreased stomatal density and increased size of pollen grains. Tetraploid and diploid genotypes were found to be on par for the asiaticoside content (2.72%, 2.9% respectively) but since the biomass yield was almost doubled (71.4% increase), the asiaticosideyield also doubled in the tetraploid which is an added advantage for the cultivators. Analysis of the micronutrient (vitamin and minerals) content in the diploid and teraploid genotype showed significant increase in the total carotenoid and micro mineral content of tetraploid over the diploid genotype inferring that polyploidization has improved the nutrient levels also making it a promising green leafy vegetable.

Keywords: *Centella asiatica*, induced tetraploid, biomass yield, phytochemical profile

GI/OP – 33

Studies on inter varietal immature seed germination under *in vitro* conditions and conformation of hybridity in Nerium (*Nerium oleander* L.)

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ABSTRACT

Nerium oleander L. is an evergreen flowering shrub belongs to the family Apocynaceae. Nerium is an urbanite plant widely used for landscape purpose *viz*., highway landscaping, city and street gardens, public gardens and hospitals apart from this it is cultivated commercially for loose flower production. In India, only few colours are available and low genetic diversity was reported among them. Inter varietal hybridization could be exploited to create genetic variability and to produce diverse coloured and multipetal flowers. However, Nerium takes minimum of eight months from pollination to seed maturity prolonging the breeding cycle. To minimize the breeding cycle, immature seeds of nerium were collected at 60, 75 and 90 days after pollination (DAP) and *in vitro* germination study was investigated. Under *in vitro* condition, embryos collected at 75 and 90 DAP have exhibited germination. Further, maximum germination percentage (86.96 %) of immature seed was evidenced in the MS medium supplemented with 3 mg BAP/L. Maximum shoot length (3.43 cm) and number of lateral shoot (3.20) were observed in MS medium containing 3 mg BAP/L+ 0.1mg of NAA. The maximum rooting percent (98.20) was recorded in MS medium supplemented with 0.7 IBA mg /L whereas, minimum in MS medium without IBA. ISSR analysis was carried out on 5 randomly selected individuals each cross-combination, which exhibited intermediate characteristics to confirm hybridity on the molecular level. *In vitro* immature seed culture will help the Nerium breeders for early development of new cultivars through hybridization.

Key words: *In vitro*, immature seed, *Nerium oleander*

GI/OP – 34

Characterization of yardlong bean germplasm (*Vigna unguiculata* var. *sesquipedalis*) for pod yield and attributing traits, and field tolerance to cowpea aphid borne virus disease

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ABSTRACT

Yardlong bean (*Vigna unguiculata* var. *sesquipedalis*) is an underutilized vegetable crop, tender pods are a very nutritious and rich source of protein, vitamins and minerals. Yardlong bean were primarily domesticated in India for vegetable purposes and India is considered as the primary centre of diversity and diverse germplasm mostly conserved by tribal population. We evaluated a total of 65 accessions of yardlong bean germplasm and two standards (Arka Mangala and Lola) during the summer season of 2021 to identify the better performing germplasm accessions for the summer season and field tolerant accessions for virus diseases. We characterized for DUS descriptors and a database was developed. Significant genetic variability was observed for pod yield and yield attributing traits. The moderate level of GCV and PCV was recorded for days to flowering and very high estimates of GCV, PCV, heritability and genetic advance for pod yield per plant, number of pods per plant, pod length, pod weight and field tolerance to virus diseases. Four accessions *viz.,*KV/TSA-28, TSA-79, TSA-84 and IIHR-7 recorded the higher pod yield as compared to the standard Arka Mangala. Eight accessions namely KVTSA-38B, TSA-73, KVTSA-37, KVTSA-28, KVTSA-32, TSA-3-2, TSA-24 and TSA-52 very high level of field tolerance to Cowpea aphid borne mosaic disease. The data generated through this experiment serve as preliminary resources for plant breeders for further investigation and further utilization in crop improvement.

Keywords: Yardlong bean, pod length, heritability, genetic advance, cowpea aphid borne mosaic virus disease

GI/OP – 35

The performance of sambar sauthe (*Cucumis melo* var. *conomon*) breeding lines for yield and quality traits

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ABSTRACT

The 'Sambar Sauthe' generally called as 'Oriental Pickling Melon' (*Cumis melo* ssp. *melo* var. *conomon*) worldwide, it is an ancient form of melon and cultivated in Asia, and it is neglected and underutilized crop for culinary uses. However, nowadays the focuses for underutilized crops are in eye sight for their nutrition importance, in this regard I evaluated and characterized the advanced germplasm lines yield and quality traits in replicated trial. The results revealed that the advanced germplasm line IIHR817-4 differed significantly for fruit weight (1243.33 g), fruit length (31.50 cm), fruit width (13.27 cm), flesh thickness (3.77 cm) and rind thickness (0.37 cm). The IIHR817-4 morphologically fruits are ovate in shape with pointed peduncle end and rounded blossom end, fruits exibits semi netting habit with yellow fruit skin colour, dark green fruit sutures, the fruit yielded white color flush for culinary use.

Keywords : Sambar sauthe, *conomon*, morphology, yield

GI/OP – 36

Optimization of cucumber haploid line production using *in-vitro* rescue of *in-vivo* induced parthenogenetic embryos

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ABSTRACT

The present study was undertaken to develop an efficient protocol in cucumber *(Cucumis sativus* L. 2n=2x=14) for the induction of a large number of haploids through *In-vitro* rescue of *In-vivo* induced parthenogenetic embryos using gamma-irradiated pollen. In plant breeding, haploid and doubled haploid plants play a key role because they shorten the time to produce pure inbred lines. In cucumber, it is well known that the conventional self-pollination process requires between 6-8 generations to create pure homozygous parental lines for hybrid breeding. This method will be most effective for shortening the breeding cycle and induction of pure haploids in a short period. The potential of double haploid production methods to expedite breeding programs for cultivar development is widely recognized. Among these techniques, parthenogenesis, involving the development of embryos from unfertilized egg cells, stands out as particularly efficient for advancing *Cucumis sativus* L. breeding programs. This investigation aimed to generate haploid cucumber plants by fertilizing female flowers with pollen that had been treated using gammaradiation. Various doses of gamma rays (0, 100.0, 200.0, 300.0, 400.0 and 500.0 Gray) were applied to the anthers. To assess pollen viability and pollen viability, TTC (2,3,5-triphenyl tetrazolium chloride) and germination tests, (solution containing 10% sucrose, 100g/l boric acid, 300g/l calcium nitrate, and 0.6% agar. The pH of the semisolid media was maintained at ph 5.8) were conducted respectively. Following radiation exposure, isolated female flowers were pollinated. The findings underscored that the most effective haploid offspring production occurred when pollen was exposed to a radiation dose of 500.0 Gy. Confirmation of regenerated plantlet ploidy levels was accomplished using phenotype study, root tip through cytology (Mitosis) and flow cytometry. Among the plants analysed, 23.37 % exhibited half the normal chromosome count (haploid), while 76.62 % displayed a mixture of normal and half-chromosome counts (mixoploid). The refined protocol for haploid and double haploid production holds significant promise for generating 100% homozygous lines, highly beneficial for integration into cucumber breeding programs.

Keywords : Cytology, flow cytometry, gamma-irradiation, haploid, homozygosity, inbreds, parthenocarpy

GI/OP – 37

Genetic diversity analysis of ajowan (*Trachyspermum ammi* L.) genotypes for growth and yield parameters

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ABSTRACT

Ajowan (*Trachyspermum ammi* L.) an herbaceous annual plant belonging to the family Apiaceae. It is a cross pollinated crop and an important minor seed spice with medicicinal value. Collection of ajowan germplasm in various region of India and to study the nature of genetic diversity would help in choosing right trait for further breeding programme. A Field study on Genetic diversity analysis of ajowan (*Trachyspermum ammi* L.) genotypes for growth and yield parameters was conducted at Horticultural College and Research Institute, TNAU, Periyakulam. The experimental materials include twenty ajowan genotypes collected from different parts of India. The experiment was laid out in Randomized Block Design (RBD) with three replication. All the twenty ajowan genotypes were sown by the spacing of 45 X 45cm in the bed size of 7 x1m. Totally 15 growth and yield parameters were observed from randomly selected 20 plants from each genotypes and the mean values were used for statistical analysis. The results of the present investigation showed that, the highest variation was found in plant height (cm), number of secondary branches per plant, number of umbel per plant, number of flower per umbel, number of seed per umbel seed yield per plant (g) and seed yield per ha (t). All the twenty ajowan genotypes of the present study were distributed to eight different clusters. In the cluster I (8 genotypes), cluster II, III, IV (each 2 genotypes), cluster V (1 genotype) and cluster VI, VII and VIII (each 1 genotype). On the basis of D^2 values the ajowan genotypes were selected and grouped into 8 clusters suggesting the existence of genetic diversity among the genotypes. From the results, inter cluster distance ranged from 23.62 to 457.3 and also larger than intra - cluster ranges from 5.262 to 21.38 suggested that presence of wide range of genetic diversity among the germplasm. The highest inter cluster distance (457.3) was observed between cluster IV &VIII. The seed yield per ha (47.40%) and number of flower per umbel (22.11%) are contributing high divergence among the characters. The cluster VIII is exhibit the highest D^2 value to produce desired traits for further breeding.

Keywords : Ajowan, diversity(D^2), inter & intra -cluster, *Trachyspermum ammi* L.

GI/OP – 38

Characterization and genetic divergence of pointed gourd clones of eastern and north eastern India

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ABSTRACT

Thirty-four pointed gourd (*Trichosanthes dioica* Roxb.) clones were characterized for 28 different qualitative traits and 27 quantitative traits over two consecutive years (2020-21 & 2021-22) as per DUS guidelines of PPV and FRA, GOI. Perusal of observation pertaining to the morphological descriptor and quantitative traits grouped the genotypes into different categories. The expression of studied characters remained consistent over two consecutive seasons indicating their uniformity. The genetic diversity was confirmed by a high Shannon-Wiener diversity score with an overall mean of 67.20%. Fruit shape, fruit apex shape at blossom end, leaf colour, petiole length, leaf blade length, vine length, fruit skin primary colour, and depth of leaf lobing were the main features that varied more widely between genotypes. Some potential pointed gourd genotypes, including BCPG-4, BCPG-5, BCPG-3, Kashi Suphal, Kashi Alankar, and BCPG-25, could be identified based on fruit production and other horticultural characteristics. Following thorough testing in West Bengal and a few other states in eastern and north eastern India, these promising genotypes might be commercialized, ensuring the mass supply of high-quality planting materials. Three traits namely, fruit weight, fruit length, and fruit number/plant should be considered as essential selection indices for yield improvement. Copper, manganese, total sugar, potassium, zinc concentrations of fruit, and leaf blade length were the top six traits that contributed most to genetic divergence. Seven diverse genotypes, BCPG-4, BCPG-5, BCPG-37, NP-260, Swarna Alaukik, BCPG-29, and BCPG-23, could be identified for use in a future breeding effort based on D^2 statistics, principal component analysis, and average performance for fruit yield/plant. Dioecism poses challenges for the development of genetics and breeding in pointed gourd. The sex alteration to induce hermaphrodite flowers in diverse female clones can therefore circumvent this challenge. Following the hybridization process, flowers of various sex types (male, female, and induced hermaphrodite) can be crossed in both homosexual and heterosexual ways. Desirable characters in hybrids as new varieties can be fixed indefinitely through clonal propagation within a short period of time.

Keywords : Pointed gourd, DUS characterization, genetic divergence analysis

GI/OP – 39

Mangalore melon – an underutilized potential vegetable for enhancing the shelf life of cantaloupe crops

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ABSTRACT

Mangalore melon (*Cucumis melo* subsp. *agrestis* var. a*cidulus*), popularly known as culinary melon, has been predominant in Karnataka's coastal and Malnad regions since ancient times. It belongs to the family Cucurbitaceae. However, its potential utilization and vegetable values remain largely untapped. This under-utilized vegetable crop is distributed across South Indian states and the Northeast region of India and is mainly sought after for its culinary applications. Mangalore melon is a short-duration vine, producing fruits that can maintain freshness for 8-10 months when stored. An evaluation of 52 selected accessions of South Indian Mangalore melon has revealed an extended shelf life of more than six months. In contrast, the cantaloupe crop (muskmelon) exhibits a poor shelf life of only 10-15 days. Through infraspecific hybridization with Mangalore melon, cantaloupe hybrids have been developed with an extended shelf life of up to 90 days, showcasing a balanced taste profile derived from both parent varieties. Identifying candidate genes responsible for the extended shelf life in Mangalore melon accessions, followed by their integration into muskmelon cultivars through advanced backcross QTL mapping, holds the potential to create new cantaloupe varieties with extended shelf life. This advancement is expected to enhance farmers' income by preserving fruits against fluctuating market prices and facilitating long-distance transportation.

Keywords : Underutilized vegetable, shelf life, mangalore melon, cantaloupe

GI/OP – 40

Genetic diversity studies of *Momordica cymbalaria*

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ABSTRACT

An experiment on genetic diversity studies of athalakkai (*Momordica cymbalaria*) was conducted at College orchard, Department of Horticulture, Agricultural College and Research Institute, Madurai, Tamil Nadu. The objective of the present study is to examine the genetic relatedness and genetic diversity among 23 athalakkai genotypes was aimed at. Significant differences were observed among 23 athalakkai genotypes with regard to different morphological characters. Twenty three athalakkai genotypes were grouped into eleven clusters by following Tocher's method of clustering analysis utilizing data on a set of sixteen traits related to growth, yield and quality traits. MC-2 and MC-5 (cluster XI) formed individual clusters and had the maximum genetic divergence. Whereas Cluster I had the maximum of four genotypes grouped together. The intra and inter cluster genetic distance values ranged from 885.403 (cluster XI) to 62.762 (cluster VI). The maximum inter cluster distance was observed between 29.756 (cluster XI) to 4.313 (cluster II). Cluster XI (289.500) showed the highest mean performance among twenty three athalakkai genotypes followed by cluster III. Contribution of individual characters towards divergence recorded that maximum contribution to total divergence recorded in yield per plant and Vitamin C; whereas the lowest contribution noticed in the traits such as days to sprout, vines per plant, fruit length and seeds per fruit. The highest frequency recorded on the traits *viz.,* yield per plant, leaf length, vine length and fruits per plant whereas the lowest frequency exhibited in vines per plant and days to sprout.

Keywords : *Momardica cymbalaria, Athalakkai,* Genotypes, D^2 analysis, genetic divergence

GI/OP – 41

Selective genotyping to identify markers linked to fruit bursting in Indian snapmelon

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ABSTRACT

In melon improvement, the snapmelon (*Cucumismelo* L.var *momordica*) of Indian origin has played an important role in providing disease-resistance genes for major diseases throughout the world. The very short post-harvest life due to fruit-bursting nature of snap melon hinders its large-scale cultivation. Snapmelon cultivars are endemic and restricted either to house hold or small areas. Inheritance of melon fruit bursting/ cracking is still not very clear and the limited literature available says it is due to complementary gene action. In the present work, we made an attempt to study the inheritance of fruit bursting and also to find out molecular marker associated with the same. F2 population was generated by crossing Snapmelon (IC632170) X Chandalak (Kashi Madhu) melon and evaluated for fruit bursting under polyhouse conditionat farmer's field in Tumkur district. Selective genotyping using SSR markers was performed only for the individuals exhibiting extreme phenotypic values. The calculated chisquare value (χ^2=0.041; P=0.838) was found to be significant and fitted with the expected Mendilian ratio of 3:1 (non-splitting: splitting) in the F_2 and depicted as single dominant gene governing the inheritance of fruit splitting. The back cross, BC_1 (P_1) (parent with non-splitting fruit type) exhibited 1:0 (50 non-splitting: 0 splitting). The BC_1 (P_2) (Parent having splitting fruit type) revealed 1:1 (41 non-splitting: 46 splitting) ratio (χ^2=0.287; P=0.591). Fruit cracking at maturity was found to be associated with the SSR marker CMCT505. The association was revealed by the significant-statistic value of 3.640 at p=0.05, with the allelic frequency of 0.73 for fruits with non-cracking nature and 0.26 for extreme cracking nature of the fruit. Melon (*Cucumis melo* L.) is a diverse species, with respect to fruit related traits such as shape, size, colour, texture, taste and composition and resistance to diseases and pest. The present study was undertaken to study the inheritance pattern of ovary pubescence, sex expression, fruit rind colour, fruit grooves, netting, flesh colour, flesh firmness, fruit suture, fruit shape in longitudinal section, fruit splitting and fruit shape at peduncle end using six generations (P_1, P_2, F_1, F_2, BC_1 (P_1) and BC_1 (P_2)). Monogenic incomplete dominance observed for ovary pubescence, flesh firmness and fruit shape in longitudinal section. Digenic control was observed for flesh colour, fruit suture and fruit shape at peduncle end.

Keywards : Snapmelon, fruit bursting, inheritance pattern

GI/OP – 42

Multivariate analysis for seed related traits in *Moringa* for diversified exploitation in food industry

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ABSTRACT

The consumption of plant-based milk substitutes has spread rapidly around the world due to its numerous positive health effects on the human body. Individuals with cow's milk allergy, lactose intolerance, and hypocholesterolemia prefer these beverages. Presently, several oil seed, nuts, rice, hemp and coconuts are preferred by people who suffer from an allergy to cow's milk. Plant-based milk substitutes have positive effects because of rich antioxidant activity and fatty acid, which reduce the risk of cardiovascular diseases, cancer, atherosclerosis, and diabetes. Alternately, plant-based milk substitute products also have various negative health effects including lack of protein content, low bioavailability of minerals and vitamins, and oral health problems. Both young and old consumers value plant-based milk substitutes as a result, consumption has recently risen 60–70%. Retail market sales of plant-based milk substitutes were estimated to be approximately $6 billion in 2017 and in the USA retail market is estimated to rise to $28 billion by 2021. Moringa is one such crop to be exploited as the fresh beans after roasting to taste like peanuts and rich in protein. Hence, 92 moringa accessions belonging both *M. oleifera* and *M. conconansis* characterized morphologically for 12 traits using multivariate analysis. The results showed the first five principal components had Eigen values with >1 by contributing 82.10% of the variability amongst accessions. Considering the major contributing PCs, characters with maximum values in PC_1 were 100 seed weight (0.490), 100 kernel weight (0.432) and seed girth (0.401), PC_2 comprised of seed length (0.472) and pod length (0.438), PC_3 constituted with kernel to seed ratio (0.633), PC_4 possessed with 100 seed kernel weight (0.388) and PC_5 had wing length (0.570). From this finding the superior performing accessions of *M. oleifera* (KS/RS-12, KS/RS-24, KS/RS-72, KS/RS-92) and *M. concanensis* (KS/RS-6) can be commercially exploited of seed related industry confirming their surface hydrophobicity and foaming properties.

Keywards : *Moringa oleifera, Moringa concanensis,* seed traits, Principal component analysis, food industry

GI/OP – 43

Breeding potential of taro (*colocasiaesculenta*l.) Genotypes using D^2 analysisunder hill zone of Karnataka

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ABSTRACT

Taro, is a widely distributed and important food crop in the humid tropics and subtropics. Relatively neglected by science, much knowledge of genetic diversity in taro is with farmers. The present study was conducted during the *Rabi* season of 2020–2021 at college of horticulture, mudigere and laid out in randomised complete block design with three replications.Genetic diversity among 20 genotypes of taro for 21 characters was evaluated in a breeding programme aimed at improving yield potential by using Mahalanobis D^2 statistics. The genotypes were grouped into five clusters suggesting considerable amount of genetic diversity in the material. The cluster I had maximum 8 genotypes followed by II and III having 7 and 3 genotypes, respectively. These clusters having maximum number of genotypes, reflecting narrow genetic diversity. Cluster II had the lowest intra-cluster distance and cluster III had the highest. The maximum inter-cluster distance was between clusters I and V, followed by II and V, which may serve as potential genotypes for a hybridization program. Maximum contribution towards the total divergence was exhibited by tuber yield per plant (60%) followed by leaf area at 120 DAP (21.58%) and corm yield per plant (14.21%). Noteworthy is that cluster V and III reflected high cluster means for plant height at 120 DAP, number of leaves per plant at 120 DAP, leaf breadth at 120 DAP, leaf area at 120 DAP, leaf area index at 120 DAP, tuber yield per plant, tuber yield per plot, estimated tuber yield and these clusters can be successfully utilized in hybridization programmes to get desirable transgressive segregants.

Keywords : Taro, *Colocasia esculenta*, genetic diversity, hill zone

GI/OP – 44

Multiple trait introgression through interspecific hybridization of sponge gourd (*Luffa cylindrica* L.) and underutilized satputia (*Luffa hermaphrodita*)

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ABSTRACT

Satputia is a locally cultivated bisexual and clustered *Luffa* species that provides prospectus for improvement of cultivated sponge gourd. The present investigation describes the important traits introgressed from Satputia to sponge gourd. Sponge gourd is mainly a monoecious vegetable and recently found compatible with *Satputia in* 2018. The successful interspecific hybridization between two species has proved a goldmine for crop improvement in sponge gourd. F_2 Population derived from this cross segregated into monoecious, andromonoecoius, gynoecious and bisexual plants. The gynoecious trait showed monogenic recessive inheritance in gynoecious ×monoecious cross. Clustered fruit bearing also unveiled a monogenic recessive inheritance. Initially developed andromonoecoius genotypes were maintained through self pollination. Gynoecious and clustered genotypes were initially backcrossed to sponge gourd genotypes and traits were selected in backcross F_2 along with the improvement in other agronomic traits. At present Gynoecious lines are being maintained through artificial male induction with the spray of sodium thiosulphate. Surprisingly, the progeny of BC1F5 generation also displayed the occurrence of male sterile plant in 2022. The male flowers of this plant did not carry pollen grains. The selected male sterile plant was crossed to fertile advanced breeding lines and trait segregated into 3:1 (fertile: sterile). Male sterile buds are small, mostly become yellow at high temperature and shed unopened. Few flowers opened during humid days and showed small, compact, and pale anthers. The heterozygous fertile vines carried less pollen density as compared to homozygous fertile plants. Heterozygous and male sterile vines were crossed to obtain 1:1 ratio of fertile and sterile vines in next generation. The gynoecious lines developed from interspecific hybridization and introgression were also screened for root knot nematode occurrence under field conditions. Simultaneously growing plants displayed sever galling and clear roots. In conclusion, all these traits will be helpful in crop improvement through heterosis breeding in sponge gourd.

Keywords : Sponge gourd, satputia, gynoecious, male sterile, clustered bearing, heterosis breeding

GI/OP – 45

Gyno-Cis hybridin sahyadri gourd

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ABSTRACT

An underutilized, seasonal, cucurbitaceous vegetable 'Sahyadri gourd (*Momordica sahyadrica*)' is endemic to the Western Ghats (Sahyadri mountain range) of India. Although it enjoys premium market price, its mainstreaming is constrained due to the dioecious nature, wherein Dioecious-Female plant bear only female flowers and on the other side the male flowers are born on separate Dioecious-Male plant. Thus the dioecious sex form serves as a barrier for classical breeding. 'Gyno-Cis' is composed of two words 'Gyno' and 'Cis'; the word 'Gyno' has its origin in a Greek language (gyné) meaning 'female'. 'Cis' conversely is a Latin word meaning 'on this side of' which is used to denote something 'on the same side'. Therefore, 'Gyno-Cis Hybrid' stands for a hybrid derived from two genetically female genotypes. Basically, the hermaphrodite flowers were induced using chemical-stimuli on *Momordicasahyadrica* Dioecious-Female genotypes. The pollen grains from such phenotypically hermaphrodite flowers were examined with Alexander's stain as well as with Hanging drop technique using 3% sucrose solution to ensure pollen viability and functionality respectively. Further, *Momordicasahyadrica*Dioecious-Female genotypes were successfully pollinated by pollen grains obtained from induced hermaphrodite but genetically Dioecious-Female genotypes of *Momordica sahyadrica*. Thereby the seeds of cross between two genetically female genotypes, which is otherwise unattainable naturally, were harvested during *Kharif* 2022. In the *Kharif* 2023 season, the 'Gyno-Cis Hybrid' developed were germinated and observed. In dioecious crops the Clonal selection has persistedas a keytechnique to utilize the naturally existing yield potential. The encouraging results concerning 'Gyno-Cis(GC) Hybrid' in Sahyadri gourd, however, unfold to be an approach beyond selection.

Keywords : Gyno-Cis hybrid, sahyadri gourd, *Momordica sahyadrica*, dioecious, sex regulation

GI/OP – 46

Genetic variability and character association studies in M_3 generation of *Momordica balsamina* L. and molecular characterization of putative mutant lines through bulk segregant analysis

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ABSTRACT

Momordica balsamina L. commonly known as the Balsam apple is an under-exploited cucurbit vegetable occurs wild type in nature which offers various dietary and nutraceutical properties. Since the crop occurs in wild forms, the diversity exists among the genotype is limited. For the improvement of plant characteristics in diverse crops, mutation breeding has been extensively applied. In the present study, treated population was evaluated to study the extent of genetic variability and character association on growth and yield parameters in M_3 generation of *Momordica balsamina* L. The results revealed that high heritability was exhibited by vine length at harvest, stem diameter, leaf area, number of fruits per plant, fruit length, fruit weight, lycopene content and β-carotene content. As per the correlation studies,fruit yield per plant showed highly significant and positive association with number of fruits per plant, fruit weight, fruit length and days to first flowering. Whereas, vine length at harvest, number of fruits per plant, days to 50 per cent flowering, fruit weight, fruit length and fruit girth recorded highest positive direct effect on fruit yield per plant. While, stem diameter, fruit thickness and days to 50 per cent flowering exerted negative direct effect on fruit yield per plant. Based on bulk segregant analysis followed by single marker analysis,the SRAP primer combinations namely, Em9/Me1, Em2/Me2 and Em4/Me5 and one SSR marker *viz*., MC01_4761 identified in the study were of high association with fruit yield, fruit length and fruit girth loci of *Momordica balsamina* L. and will be of high value for marker assisted breeding of *Momordica balsamina* L. to develop mutant lines with high fruit yield, fruit length and fruit girth.

Keywords : *Momordica balsamina* L., under-exploited, mutation, diversity, heritability, character association, primer, marker assisted breeding

GI/OP – 47

Germplasm evaluation for yield and biochemical/ nutritional quality in rat-tail radish (*Raphanus sativus* var *caudatus*) - an underutilized vegetable crop

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ABSTRACT

The growing demand from consumers in developing countries for diversity and novelty in foods creates new market for underutilized vegetables. Rat-Tail radish, *Raphanus sativus* var. c*audatus*, an edible podded radish (*Mougri*), is one of the neglected and underutilized vegetables originated from China and belonging to the family Brassicaceae. These do not produce bulbous, edible tap roots like radish and immature, tender, crisp green or purple pods are consumed as vegetable. Radish pods are storehouse of nutraceuticals lowering blood pressure, improving cardiovascular health, and preventing cancers. Despite their medicinal properties, there are no reports regarding yield or biochemical/ nutritional quality in Rat-tail radish. Hence, the present experiment was conducted to evaluate Rat-tail radish genotypes for yield and biochemical/nutritional quality as the germplasm available is also very less. Hence, the germplasm available at ICAR-IIHR, Bengaluru of eight accessions of *Raphanus sativus var caudatus* genotypes were evaluated for yield characters and ten biochemical/nutritional quality characters namely, total sugars, reducing sugars, non reducing sugars, protein content, acidity, TSS, dry matter content, Vitamin C, anthocyanin content and moisture content in a RCBD with 3 replications during the year 2019-2020. With regard to pod yield characters, highest number of pods/plant (356), highest pod length (40cm) and highest pod yield per plant (3.5kg/plant) was observed in IIHR 53 Highest protein content was also observed in IIHR 53 of 4.65mg/g in addition to highest TSS of 10.7 Brix The genotypes besides colour variation ranging from green to purple have the yield potential ranging from 12.8t/ha in IIHR74 to 89t/ha in IIHR 53 with highest vitamin C content of 23.75mg/100g in IIHR 69. To conclude, rat tail radish has excellent potential for cultivation/crop improvement as vegetable for nutrition while simultaneously providing additional source of income to farmers.

Keywords : Rat-tail radish, edible podded radish, *mougri*

GI/OP – 48

Evaluation of advance generation of interspecific BC_1F_{2-6} clone for yield, quality and root propagation efficiency in teasel gourd (*Momordica dioica* Roxb.)

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ABSTRACT

Teasel gourd (*Momordica dioica* Roxb.) belongs to the family cucurbitaceae and it is widely grown in Bangladesh, India and other Asian countries. It is generally grown by just few local farmers, mostly for their own consumption in homesteads and those which collected wildly from the forest and are sold in the market with premium price. It is great health food as it is rich in proteins and iron and is low on calorie. It contains only 17cal/100g. It's high in fiber and anti-oxidants and thus very useful for easy digestion. Currently, it is widely cultivated in West Bengal, Odisha and north eastern states. It sprouts by January-February and can give fruits for almost 6 months (April-August). Even though there is high demand for teasel gourd in Southern parts of India and Maharashtra. The teasel gourd is not picking up mainly due to lack of standard propagation technique for mass multiplication of roots. In ICAR- IIHR CHES, Chettalli teasel gourd improvement work was carried during last five years and identified and released a variety called "Arka Bhrath" It is very popular in Southern States and also Maharashtra. To overcome mass multiplication problem interspecific hybridization work was initiated, F_1 and back crossed progenies were selfed for further for increasing yield and improving root propagation efficiency. During 2021, total of six BC_1F_2 inter-specific hybrids developed between *M. s.* subsp. *renigera* × *M. sahyadrica* were evaluated for yield, nutritive quality and root propagation efficiency at ICAR-Central Horticultural Experiment Station, Chettahalli during Kharif 2021-22. Among them, BC_1F_2-6 clone recorded highest number of natural fruit set (82.72 %), found to be superior for fruit quality with maximum number of fruits per plant (225) and fruit yield of 6.69 kg/plant followed by BC_1F_2-4 (6.40 kg per plant). The high yielding clone 6, had fruit length of (8.01 cm), fruit weight (52g) fruits are oblong fruit shape, very attractive and lush green in colour. It has got total phenols (447.1 mg/ 100 g FW), FRAP Antioxidant activity (340.31mg/ 100), total Flavonoids 59.48 mg/100 g FW, Dietary fibre 3.26 g / 100 g EW, Ca (0.8%), Fe (325.5ppm) and Cu (62.9ppm). All the F_2 clones had root structure same like that of its female parent (*M. s.* subsp. *renigera)* the roots did not sprout like its female parent. During August 2022, different methods like, chip cutting, longitudinal root cutting and whole root along with root hormone IBA 1 % and control. Both male and female whole tuber planting without IBA treatment found promising and better germination.

Keywords : Clone, teasel gourd, interspecific hybrids, chip cutting, longitudinal root cutting and whole root

GI/OP – 49

Ex-situ conservation of curry leaf (*Murraya koenigii* (L.) Spreng): an insight into untapped genetic resources of underexploited native plants

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ABSTRACT

Curry leaf (CL) is a popular Indian leafy-spice. It is aninseparable component of Indian cuisine, a source of essential oils, and a storehouse of bioactive chemicals and minerals. It has long been used as a medicinal herb in Ayurvedic preparations. It is frequently grown in the backyards of every household, notably in southern and eastern India. It has recently attracted small and marginal farmers for high density commercial cultivation due to guaranteed long-term income, easy access to domestic markets, and inexpensive cultivation costs. Despite this, CL has remained an underutilized plant due to restricted area of cultivation and a lack of concerted research initiatives. In light of this, ICAR-IIHR Bengaluru has launched a dedicated CL research initiative to collect, conserve, and characterize vast genetic resources of CL, as well as identify and develop high yielding genotypes suitable for high density planting. Initially, germplasm rich zones were identified across the country and in total 6 such regions were targeted for germplasm exploration. An effective protocol for collection of rooted suckers from mother plants and establishing them in a field gene bank was standardized. A total of 250 germplasm accessions, including both cultivated and wild forms, were collected across India between 2018 and 2022 and conserved in the field gene bank established at the ICAR-IIHR, Bengaluru. Among a diversified group of accessions, genetic diversity for various morphological (qualitative and quantitative) and biochemical traits (essential oil yield and composition) was examined. It was discovered that there was significant variation in CL for all of the variables examined, both within and between the collection sites. In all, 3 morphotypes and 4 chemotypes were found in CL. A total of 20 elite lines were found suitable for high density planting and year-round production with high leaf yield and superior quality.

Keywords: Curry leaf, ex-situ conservation, germplasm, genetic-diversity

GI/OP – 50

Insights into ogura cytoplasmic male sterility system expediting breeding of exotic vegetables: case of *Brassica oleracea*

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ABSTRACT

Ogura-type cytoplasmic male sterility (Ogu-CMS) has been widely used in the hybrid breeding industry for cruciferous vegetables. CMS is a category of male-sterility resulted from a genomic conflict between the mitochondrial and nuclear genomes. Ogu-CMS was first discovered in Japanese radish and is now widely applied in the breeding of Brassicaceae crops including cabbage, cauliflower, kale, broccoli and knolkhol. Snowball cauliflower is an important member of vegetable Brassicas grown worldwide. It has been an important contributor in human diet. Mitochondrial markers can be used to differentiate diverse mitotypes as well as cytoplasms in angiosperms. In India, during the last three decades, a large number of CMS-based breeding lines/material have been generated in Indian cauliflowers by repeated backcrossing or somatic hybridization by exploiting various CMS sources. In this context, the present investigation highlighted the utility of organelle genome-based markers in distinguishing cytoplasm types in Indian cauliflowers. Further, the CMS and doubled haploid (DH) based hybrid were developed and evaluated for different phenotypic and yield related traits. The three CMS lines Ogu118-6A, Ogu33A, Ogu34-1A were identified as good general combiner for developing early maturity hybrids. Less than unity value of σ^2A/D coupled with σ^2gca/σ^2sca indicated the predominance of non-additive gene action in the expression of studied traits.The cytoplasmic effects on varying nuclear-genetic backgrounds rendered an array of floral abnormalities like reduction in flower size, fused flowers, splitted style with the exposed ovule, absence of nonfunctional stamens, and petaloid stamens. These floral malformations caused dysplasia of flower structure affecting female fertility with inefficient nectar production.The finding provides an important reference to ameliorate understanding of mechanism of cytonuclear interactions in floral organ development in Brassicas. The results pave the way for expediting hybrid breeding of exotic Brassica vegetables and strengthening indigenous hybrid industry.

Keywords: Exotic vegetables, cytoplasmic male sterility, doubled haploid, heterosis, mitochondrial DNA markers

Theme – 2
Genetic Improvement
Poster Presentations

GI/PP – 1

Evaluation of Annona genotypes under Northern dry zone of Karnataka

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ABSTRACT

Annonas are the most delicious fruits and are mostly used as table purpose besides they are used in ice creams and preserved as jam, jelly or other products on limited scale. Due to their wider adaptability and tolerance to the moisture stress condition, a study was being conducted at Horticultural Research and Extension Centre, Tidagundi (Vijayapur) to know the better adaptation to the region. The Annona varieties and hybrids *viz.*, Balanagar (*Annona squamosa*), Atemoya (*A. atemoya*), Chance seedling (*A. squamosa*), Red Sitaphal x Balanagar hybrid (*A. squamosa* x *A. squamosa*), Pink Mammoth (*A. atemoya*), Island Gem (*A. atemoya*), Red Sitaphal (*A squamosa*) and Arka Sahan (Island Gem x Mammoth**)** were planted in the research station during the year 2006**.** An experiment on evaluation of Annona genotypes under Northern-dry zone of Karnataka was undertaken during 2020-21. Annona genotypes were evaluated for growth, yield and quality attributes. Among different genotypes, Pink Mammoth recorded the maximum plant height (3.8 m) whereas Balanagar recorded the maximum number of branches/tree (14) and plant spread for North-South (3.22 m). Chance Seedling recorded the maximum tree girth (8.72 cm) and plant spread for East-west (3.14 m). With respect to yield and quality parameters, Balanagar recorded the maximum number of fruits (52.33) and yield (10.25 kg/tree), where as Arka Sahan recorded the maximum fruit weight (401.67 g), the minimum number of seeds/fruit (11.67), the lowest seed weight (7.75 gm) and the highest TSS (28.83^0 B). From this study under northern dry zone of Karnataka Annona varieties *viz*., Balanagar and Arka Sahan found superior for higher yield and quality fruits.

Keywords: Growth parameters, plant spread, fruit yield, fruit weight, TSS

GI/PP – 2

Evaluation of ber (*Ziziphus mauritiana*Lam.) genotypes under semi-arid conditions

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ABSTRACT

A study was conducted to evaluate nine genotypes of ber (*Ziziphus mauritiana*Lam.) under semi-arid conditions based on their plant growth, yield and fruit quality attributes. Plant height, spread NS, spread EW, and trunk girth varied from 1.84-4.12 m, 3.27-5.31 m, 3.18-5.43 m, and 21.45-39.62 cm, respectively. The genotype Kaithali was the most vigorous growth, and Narendra Ber Selection 2 was found with the least vigour among the genotypes. The Gola was early maturing; Kaithali, Chhuhara, Goma Kirti, Thar Sevika, Thar Bhubhraj, and Narendra Ber Selection 2 was mid-season maturing; and Umran and Narendra Ber Selection 2 was late season maturing under semi-arid conditions. The highest fruit yield (47.7 kg/ tree) was recorded in genotype Umran. The fruit of Narendra Ber Selection 2 had the highest fruit weight (30.4 g), fruit breadth (37.0 mm), and pulp weight (28.3 g). Fruit of the Kaithali genotype had the highest pulp: stone ratio. The TSS of fruit pulp varied from 15.5 to 21.0^{o}B in the genotypes Goma Kirti and Chhuhara, respectively. The fruit of genotype Umran had the lowest infestation of fruit flies and powdery mildew. The genotypes Chhuhara exhibited the maximum frost injury among the genotypes under semi-arid conditions.

Keywords: Growth, fruit quality parameters, productivity, stress tolerance

GI/PP – 3

Morphological characterization of dragon fruit (*Hylocereus* spp.) genotypes

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ABSTRACT

A rare fruit crop, dragon fruit is currently becoming more and more liked in India. Despite its popularity, there is little information now available on the reproductive biology and fruiting behaviour of dragon fruit. So the identification of an ideal genotype superior in yield and quality as well as suitable growing condition will be boon to the farming community. A scientific information on the flowering and fruiting behaviour is very vital for initiating crop improvement in this exotic fruit plant. The morphological characterization of dragon fruit was done as part of the study from July to August 2023 at the Kerala Agricultural University's College of Agriculture in Vellanikkara, Thrissur, Kerala. Five treatments T_1: Cambodian Red, T_2: Malaysian Red, T_3: Oregano Red, T_4: Srilankan Red, and T_5: Cambodian Red with five replications were tried. The results showed that Srilankan Red (T_4) and Cambodian White (T_5) had the highest and lowest branching habits, respectively. Oregano Red (T_3), Srilankan Red (T_4) and Cambodian Red (T_1) have flat margin ribs, while Malaysian Red, Cambodian White, and Oregano red have convex margin ribs. In terms of floral biology, Malaysian Red (T_2), Cambodian Red (T_1), Srilankan Red (T_4), Cambodian White (T_5), and Oregana Red (T_3) were the plants to flower first, second, third, and last. Oregano Red (T_3), Srilankan Red (T_3), and Cambodian White (T_5) all demonstrated 100% viability in relation to the pollen investigation. Oregano Red has larger fruit weight (621 g) than other treatments in terms of fruit features. Position of bract towards the peel is slightly held out in Malaysian Red (T_2), Cambodian White(T_5), and Cambodian Red (T_1), Oregano Red (T_3), and Srilankan Red (T_3) have bracts that are strongly held out from the peel.

Keywords: Morphology, fruit and floral biology, pollen viability

GI/PP – 4

Underutilized fruit crops of Indian arid and semi-arid regions: Importance, conservation and utilization strategies

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ABSTRACT

Currently, there is a high demand for nutrient-rich fruits to support metabolic and nutritional human health. In order to compensate for losses brought on by biotic and abiotic pressures, the production of commercial fruit crops is becoming substantially more reliant on inputs. Most underutilized crops are grown, commercialized, and consumed locally rather than being widely traded or commercially cultivated. Compared to the main commercially farmed crops, these underutilized fruits have significant advantages in terms of ease of growth, hardiness, and resilience to climate fluctuations. They also have therapeutic use and are extraordinarily rich in significant compounds. Therefore, consuming them may assist rural populations including those in vulnerable arid and semi-arid regions of the world meet their nutritional demands. The nutritional and therapeutic benefits of these crops are also widely known to the locals. In order to expand the future food supply and improve its functional and nutritional qualities, focus must be placed on the thorough investigation of the conservation and nutritional characterization of significant, underutilized fruit crops of arid and semi-arid regions (Indian jujube, Indian gooseberry, Lasora, Bael, Kair *etc*).

Keywords: Indian jujube, Indian gooseberry, lasora, bael, conservation

GI/PP – 5

Evaluation of elite plant material of jamun

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ABSTRACT

A study was carried out to evaluate the elite planting material of jamun. The purpose of this study was to evaluate the collected germplasm of jamun top worked on 12 years old seedling rootstocks. The successful scions were collected from 18 different locations and budded on old jamun trees by top working during the year 2018-22. The different sites of scion collection were Yamunanagar, Kurukshetra, Hisar, Rohtak and Saharanpur (U.P) districts. The results of the study revealed significant increase in growth, yield and quality of jamun. However, the value ranged for plant height (5.6 - 7.6 m), stem girth (21 - 26.4 cm), yield (3.5 - 18.4 kg/plant), fruit weight (5 - 9.2 g), stone weight (1.0 - 2.5), TSS (10.0 - 14.0 ^{0}Brix) and acidity (1.00 - 1.25 %). Thus, it can be concluded that different scions collected from different sites increases the growth, yield and quality of jamun.

Keywords: Scion, top working, yield, stone weight

GI/PP – 6

Floral traits and pollen morphology in self-fruitful and unfruitful progenies of Arka Sahan Annona hybrid

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ABSTRACT

The reproductive biology of Annona is varied and intricate, involving diverse floral types, pollination modes, and fruit formation, but its reproductive outcomes can be inconsistent. The study compared the floral features and pollen morphology of self-fruitful and unfruitful progenies within the Arka Sahan custard apple hybrid. The flowering season for both groups lasted from March to July. Self-fruitful progenies had different peduncle lengths (1.0 to 3.1 cm), while unfruitful progenies had slightly shorter peduncles (1.0 to 2.7 cm). Petal opening angles in self-fruitful were larger (initial: 10° to 30°, final: 10° to 15°) than in unfruitful progenies (initial: 35° to 80°, final: 20° to 50°). The number of flowers per 10 cm shoot was higher in self-fruitful progenies (1 to 10 flowers) than in sterile offspring (1 to 4 flowers). Anthesis and anther dehiscence times varied, mainly occurring in the early morning and afternoon to evening, respectively. Stigma cone diameter was uniform (2.0 to 4.5 mm) and stigma receptivity reaching its peak on the day of anthesis and decreasing over two days. Pollen morphology analysis showed consistent shapes, including elliptic monads with one or two furrows on the proximal face and boat-shaped monads. Dyads and triads had no specific shapes, while tetrads had isobilateral, decussate, or tetrahedral forms. Self-fruitful progenies had a wider range of pollen types (monads, dyads, and tetrads) than unfruitful progenies, which had a narrower range. However, a notable difference was that self-fruitful progenies had higher pollen germination rates and longer pollen tube lengths than unfruitful progenies. Pollen length and width also differed in both groups.

Keywords: Annona, flower, pollen, self fruitful, progenies

GI/PP – 7

Biochemical analysis of *Litsea cubeba* (Lour.) fruits from Arunachal Pradesh

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ABSTRACT

"May Chang" or "Chinese pepper" (*Litsea cubeba* Lour., 2n= 24) is an evergreen, fast growing, and a rare deciduous tree or shrub of 3 to 10 m height. It belongs to family Lauraceae which consists of more than 400 species. It is predominant in tropical and subtropical regions of India, Southeast Asia, southern China, Taiwan and Japan. The tree is spontaneously distributed in the eastern Himalayas up to an altitude of 2700 m from mean sea level. The fruits are used by the natives either in fresh or dry form as spice or pickled. The plant is used in traditional medicine system for curing cold, diabetes, edema, arthritis, asthma, gastro-intestinal ailments, traumatic injury and is considered to possess many biological properties such as anti-bacterial, anti-cancer, anti-oxidant, neuropharmacological, insecticidal, fungicidal, acaricidal and nematicidal properties. Keeping in mind the importance of this plant, biochemical analysis of the fruits collected from 17 different location of Arunachal Pradesh was carried out and it was found that the genotype LC15 had highest amounts of total phenols (691.21 mg/100g dw) and total flavonoids (740.15 mg/100g dw) followed by LC16 (668.88 mg/100g dw and 300.17 mg/100g dw, respectively). Lowest amount of total phenol and total flavonoids was reported in genotype LC5 with 336.87 mg/100g dwand 139.06 mg/100g dw, respectively. Total profiling of phenols and flavonoids were also carried out to find out the predominant phenols and flavonoids present in the *Litsea cubeba* fruits.

Keywords: *Litsea cubeba*, traditional medicine, phenol, flavonoids

GI/PP – 8

Variations in morphological and biochemical traits in diverse jackfruit fruit types across growth and development Stages

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ABSTRACT

Jackfruit (*Artocarpus heterophyllus* L.) belongs to the family *Moraceae* and became popular due to its multifunctionality and great nutritional benefit. The fruit is a good source of energy, vitamins, minerals, flavonoids and has a wide range of variability in terms of morphological and biochemical parameters. The present investigation was carried out with three distinct accessions with respect to flake colour *viz*., Tubugere red for coppery red flakes, Panrutti for yellow flakes and NAH-5 for creamy white flakes. Results indicated that the highest days to fruit set and fruit maturity was recorded in Tubugere red. At the mature stage of fruit, higher fruit weight, length, diameter, total number of visible flakes, flake weight and seed weight were noticed in Panrutti. Results in fruit physico-chemical attributes indicated highest in Vitamin C content in Panrutti at mature stage, and it also had higher dietary fibre at an immature stage. In totality, Tubugere red accession is better in terms of nutritive value for total carotenoid, FRAP antioxidants content, water- and fat-soluble vitamins. However, starch and total phenol contents were better in NAH-5. Highest variation in sensory quality attributes viz., TSS, acidity, total sugars, reducing sugars and non-reducing sugars from immature to mature stage was reported in Panrutti. Further, mature stage fruits were reported to have high Iron and Zinc content in the accession Panrutti. Whereas, Calcium and Magnesium content was highest in Tubugere red and NAH-5 respectively.

Keywords: Accessions, biochemical parameters, quality attributes, nutrients

GI/PP – 9

Morpho-physicochemical characterization and germination studies in surinam cherry (*Eugenia uniflora*)

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ABSTRACT

Surinam cherry is an exotic underutilized fruit species belonging to the family *Myrtaceae*. It grows as a shrub and bears attractive ribbed fruits which change colour from green to pale yellow, orange and red with advancement in maturity. Comparative morphological characterization of fruits from firm ripe and soft ripe stages revealed significant variations in fruit length, fruit width, fruit weight and weight of edible portion per fruit. RHS colour values were also recorded in the fruits of studied stages. Though TSS, pH and titratable acidity exhibited significant variations, ascorbic acid content in fruits from both the stages was statistically similar. Effect of substrates *viz*. soil, vermicompost and coir pith compost on seed germination was also studied for two seasons in the species. Germination pattern varied widely among the treatments. Significantly highest germination percentage was recorded when coir pith compost was used as a substrate than in soil or vermicompost. Seedling growth parameters *viz*. shoot length, number of leaves, leaf length and width, collar thickness, number of primary roots and root thickness also exhibited significant variations among the treatments, while root length was statistically similar in all the treatments. Considering the performance of the species under island conditions, it could be popularized in humid tropical regions of the country.

Keywords: Ascorbic acid, exotic fruit, seedling vigour, substrate

GI/PP – 10

Collection, evaluation and selection of elite karonda: a potential future fruit crop

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ABSTRACT

Karonda *(Carissa carandas L.)*, a future fruit crop of dryland which is a widely grown as indigenous shrub in India and is able to flourish in marginal and wasteland where other crops of commercial importance are unsuitable. Considering the nutritive and medicinal value of Karonda fruits, a study was undertaken on collection, evaluation and selection of elite plants for commercial utilization of Karonda fruits for different purposes. The various selections of Karonda from different areas of Western Ghats of Karnataka and Maharashtra state such as plateau, low altitude, mid altitude and high altitude areas were collected and evaluated for different parameters such as vegetative growth and yield parameters and fruit quality parameters at Regional Horticultural Research and Extension Center, Dharwad from 2014 to 2023. The study indicated that among the several selections, KAR1 recorded highest plant height (210.40cm), plant girth (59.50mm), number primary branches (4.03) and number of secondary branches (14.70) as vegetative growth parameters as compared to standard check, Konkan bold. Similarly, among fruit characters, KAR-1 selection recorded highest fruit weight (5.95g), pulp weight (5.29g), seed weight (0.67g), pulp to seed ratio (8.16), number of seeds per fruit (2.92) and TSS (11.14%) as compared to Konkan bold variety as standard check. Further, among yield parameters, significantly maximum number of fruits per plant (112.80), yield per plant (0.63kg) and yield per hectare (1620kg) was registered in KAR1 selection as compared to Konkan bold variety (785kg). The size and fruit shape of KAR1 selection is round as compared to Konkan Bold which is big and oval in shape. Further, KAR1 selection was recorded least mealy bug population during vegetative stage and fruit fly incidence at maturity as compared to other Karonda selections. It can be concluded that overall performance of KAR1 selection is found to be promising and significantly superior in recording highest yield as compared to Konkan Bold variety.

Keywords: Growth characters, fruit yield, biotic stress

GI/PP – 11

Transcriptomic analysis of cocoa (*Theobroma cacao* L.) genotypes for drought tolerance

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ABSTRACT

The transcriptome analysis for highly drought tolerant exotic genotype (T85/799) and highly drought sensitive variety CCRP 5 was analysed using mRNA sequencing under both control (100% FC) and drought stress condition (40% FC). A total of 131.79 million reads from tolerant (HRC vs HRT) and 120.44 million reads from sensitive libraries (HSC vs HST) were produced and mapped onto the Theobroma cacao genome sequence and assembled into 20,774 and 20,773 unigenes.Analysis of transcripts derived from the leaves of stressed and control T85/799exotic genotype revealed that 1540 transcripts are significantly upregulated and 1148 are significantly down regulated whereas in CCRP 5 a significant 1502 transcripts were upregulated and 1250 down regulated. PCA was performed using gene level log2 FPKM values of the data. The PCA scatter plot showed that replicates of the control samples of tolerant genotype and susceptible check formed distinct groups highlighting the differences between the two genotypes. Most of the Transcription Factors (TFs) identified families were enriched in, B3, bHLH, WRKY, ARF, ARR B, FAR, LBD, MADS and ERF that could be grouped into 10 families. RNA-Seq analysis showed that highly drought tolerant exotic genotype (T85/799) activated more number of drought responsive genes than drought sensitive check variety CCRP 5. Several drought-responsive genes were upregulated in the tolerant genotype such as those encoding TFs, cytochrome 450, and membrane transporters, and those associated with carbohydrate metabolism and flavonoid biosynthesis. These genes might confer drought tolerance in this cocoa genotype at the molecular level. Identified drought- responsive genes and metabolic pathways are targets for future studies in order to understand the molecular mechanism of drought tolerance in cocoa. The transcriptome data would pave way for developing climate-smart cocoa crop.

Keywords: mRNA sequencing, carbohydrate metabolism, flavonoid biosynthesis

GI/PP – 12

Diversity of Indian hog plum (*Spondias pinnata* L.) under South Gujarat

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ABSTRACT

An exploration has been conducted to assess the diversity of Indian hog plum (*Spondias pinnata* L.) under Valsad and Navsari district of South Gujarat during year 2021-22. Survey revealed that vast variation in terms of size, shape and colour of fruits, leaf shape, maturity period, etc. exists among the trees of Indian hog plum belongs to atleast two species. A hot-spot village is found where large number of trees seen as backyard tree. There is need to encourage the farmers for conservation of this under-utilized fruit treeat farmers field conditions and simultaneously need to collect the existing variations for further evaluation.

Key words: Indian hog plum, spondias, diversity, South Gujarat

GI/PP – 13

Biochemical characterization and sensory evaluation of pummelo (*Citrus grandis* L.): An insight into flavour components

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ABSTRACT

Pummelo (*Citrus grandis*L.) is the largest *citrus* fruit under the genus *Citrus* and belongs to the Rutaceae family. Devanahalli pummelo is well known for its uniqueness as its carpels are pinkish, juicy to fairly dry and the segments are easily skinned of and have a distinct blend of sweet and sour flavours. The rising popularity of pummelo is mainly attributed to its numerous health benefits. To delve into the biochemical composition of this exceptional fruit, the research is framed to "Survey, selection and propagation of elite genotypes of pummelo (*Citrus grandis* L.)" in Devanahalli and Bengaluru Rural regions of Karnataka during the year 2021-22. The research results indicated that genotype DSP-8 exhibited the highest ascorbic acid content of 60.00 mg/100g, genotype RHREC-7 had the highest titratable acidity at 2.07 percent and DSP-17 showed the highest TSS of 11.07ºB. Additionally, DAK-1 had the highest total sugar content of 7.64 percent, RHREC-1 recorded the maximum reducing sugar of 3.93 percent, whereas HSR-2 contained the highest non-reducing sugar of 5.60 percent. DSP-16 had the highest total phenolic content of 166.17 mg/100g, DSP-12 exhibited the highest total antioxidants at 7.06 mg AAE/100g and DSP-6 contained the highest total flavonoid content of 137.78 mg/100g.The maximum colourimetric *a** value was recorded in DSP-4 (12.60) and the *b**valuein BAN-1 (16.00) for pulp.Organoleptic evaluation of pulp shown that, DNR-1 garnered the highest sensory score for texture of 8.47. The highest scores for colour appearance were achieved by genotype DNR-1 of 8.37. DVP-1 recorded an impressive score of 8.30 for flavour, while DVP-4 outshone all other genotypes with the highest score for taste. Remarkably, when considering the overall acceptability, DNR-1 (8.37) secured the top spot closely followed by DVP-4 (8.34) among the panel members.

Keywords: Reducing sugar, flavonoid content, phenol, DNR-1

GI/PP – 14

Evaluation of elite tamarind genotypes (*Tamarindus indica* L.) for yield and quality attributes for Southern dry zone of Karnataka, India

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ABSTRACT

Tamarind (*Tamarindus indica* L.) is one of the most important multipurpose tree species, It is considered as one of the minor tree spice crop in India. In this view, twenty Tamarind genotypes were evaluated at HREC, Arsikere, India. Analysis of variance of 5 years mean data indicated that, there was a significant difference observed in vegetative and yield characters. Among the genotypes studied, highest pod yield per plant was recorded in tree number 10 (110 kg/tree) followed bytree no. 151 (105 kg/tree) compared to other genotypes. However, the lowest pod yield was recorded in tree no.28(70kg/tree). The maximum pulp yield was recorded in tree number 10 (50.95 kg/tree) followed by tree number 51 (36.24 kg/tree) and tree no.14 (33.98 kg/tree). The TSS was highest in tree number 10 (18^0B) followed by tree 51(17.5^0B) compared to other genotypes. Significant variation was observed among the genotypes with respect to yield, podcharacters, and tartaric acid content. Among the tamarind genotypes, tree number 10 has recorded the highest pod yield per plant (110kg), pulp yield per tree (50.948kg), pulp weight per pod (10.15g) and TSS (18˚B) and hence it was recommended to releases as variety ATS-1 (Arsikere Tamarind selection -1) for southern dry zone of Karnataka, India and these attributes could be effectively used in tamarind improvement programme for selecting genotypes.

Keywords; Tamarind, Genotypes, pod yield, pulp yield, TSS

GI/PP – 15

Evaluation of Barbados cherry (*Malpighia emarginata* DC.) for physiochemical characteristics at three fruit maturity stages

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ABSTRACT

The fruit of Barbados cherry or West-Indian cherry (*Malpighia emarginata* DC.), has been known uniquely concentrated source of vitamin C (ascorbic acid) and it is being used for fortifying the antioxidant activity values in other fruit juices. Considering the important of this fruit crop for growers, the current study aimed at evaluating changes in physical and biochemical characteristics in three maturation stages (immature, intermediate and mature or green, yellow and red) of three genetic sources were used during the monsoon in open field at ICAR-Indian Institute of Horticultural Research, Bengaluru during 2023. The experimental design was a completely randomized block with factorial scheme 3 x 3 (plant source x fruit maturation stage) and three replicates. The samples were analyzed for parameters like plant height (3.63 m), canopy diameter (4 m), leaf and flower characters, bearing habit, fruit weight (5.23-10.1 cm), fruit length (0.9-2.43 cm), fruit width (1.1-2.75 cm), pulp recovery (86-91%), seed number per fruit (3), seed weight (0.06-0.22 g), seed length (0.5-1.2 cm), seed width (0.4-0.9 cm), etc. along with different biochemical indicators such as vitamin C (1434-1925 mg), titrable acidity (16.5-32.8 ml), pH (3.65), moisture (90-93%), ash (0.5 g), protein (0.8-1.2 g), total soluble solids (6.4-8.7), non-reducing sugar (0-0.9 g) and total sugars (4.5-5.1 g), where titrable acidity, total soluble solids and total sugars increased and vitamin C, protein and non-reducing sugar decreased with progress of maturation. All three genetic sources performed best fruit quality in most of the characteristics evaluated.

Keywords: Fruit maturity stage, biochemical content, barbados cherry, west-Indian cherry

GI/PP – 16

Morphological characterization of off-season bearing jackfruit (*Artocarpus heterophyllus* Lam.)

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ABSTRACT

Jackfruit (*Artocarpus heterophyllus* Lam.), is an important tropical fruit crop, grown in the homesteads of India. Due to the cross, pollinated nature of jackfruit, there exists a rich genetic diversity. Many variations was observed in this crop in traits such as growth habit, canopy structure, fruit shape, size, colour, flesh type, sweetness, flavour and taste. An unusual yet important characteristic observed in jackfruit is its off-season-bearing nature. It occurs from August to September, with fruits accessible from October/ November to January. In order to exploit the rich variability of off-season types and selection of superior lines, a research work was conducted at College of Agriculture, Vellayani during 2022 and survey was carried out in five districts (Kasaragod, Kannur, Kozhikode, Malappuram and Thrissur) of Kerala. The study revealed that maximum number of trees had a rough trunk surface, semi-erect growth habit and medium branching density. The maximum leaf length(22.1cm) and leaf width (17.3cm) were observed in KNR4. The fruit-bearing habit was regular in most of the accessions studied. Fruit weight was recorded as maximum in MPM1(16.1kg) while minimum in MPM12 (3kg). The weight of flakes per kg fruit was noted as high in KZK5(729g) and as low in MPM10 (270g). The highest seed length was recorded in KZK16 (4.5cm) and the lowest in KZK1(2cm). Seed width was highest in KZK7 (3.4cm) and lowest in KZK10 (1.1cm). Hence the study revealed that there exists a wide variation in the morphological characters and these variations can be potentially used in future crop improvement programmes.

Keywords: Jackfruit, survey, characterization, accessions, variability

GI/PP – 17

Variability in jackfruit types (*Artocarpus heterophyllus*) for fruit quality under Konkan agro-climatic conditions of Maharashtra

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ABSTRACT

Jack fruit (*Artocarpus heterophyllus*) belongs to *Moraceae* family and bears the largest known edible fruit. Jackfruit contains more protein, calcium, iron, vitamins and other essential nutrients when compared to the common fruits. The jackfruit is a multi-purpose species providing food, timber, fuel, fodder, and medicinal and industrial products. In spite, the jackfruit is considered as "an underutilized crop" in the tropical-to-subtropical climate. Due to its nutritive value and capacity to replace the food grains under drought condition under changing climatic conditions, the jackfruit is gaining importance on national and international levels. Hence now a day's it's high time to evaluate the genetic diversity in jackfruit types available with farmers in Sindhudurg district of Konkan region of Maharashtra. The experiment was conducted at Regional Fruit Research Station Vengurla. The ten promising jackfruit types form farmers homestead were collected and planted at Regional Fruit Research Station farm for further morpho-physical evaluation & conservation. The data revealed that the average fruit length varied from 28.87 cm (JK-9) to 61.33 cm (JK-10) while the average fruit circumference varied from 38.37 cm (JK-8) to 78.03 cm (JK-1). The average number of fruits per tree was found to be the maximum (17.00) in JK-10 followed by JK-7 (15.50). The highest value for average fruit yield per tree was recorded in JK-10 (190.62 kg) while the lowest value was found in JK-6 (24.40 kg). The average weight of flake with seed was found to be in between 12.20 g (JK-7) to 42.20 g (JK-1) whereas the average weight of flake without seed was observed in between 5.60 g (JK-5) to 30.80 g (JK-1). The maximum TSS content was observed in JK-7 and JK-2 (21.20B) followed by JK-1 (20.4 0B) and JK-10 (19.80B). The recovery of the edible portion was found to be in the range of 23% (JK-2 & JK-6) to 30% (JK-1).

Keywords: Jackfruit types, fruit variability, flake characters, Konkan agro-climatic condition

GI/PP – 18

Morphological characterization of charoli (*Buchanannia lanzan* Spreng) tree for growth and yield attributes

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ABSTRACT

A survey was conducted in North Eastern transitional zone of Karnataka for growth and yield attributing characters. The survey of 50 seedling progenies revealed that maximum tree height was recorded in KCS-10 (6.90 m) with coefficient of variation of 17.13 per cent, The genotype KCS-40 (72.70 m^3) recorded maximum tree canopy with greater coefficient of variation (42.09%). The greater variation was also recorded for leaf shapes *viz*. leaf apex and leaf base, various genotypes registered round shape leaf apex and rounded base. Among reproductive and fruit parameters studied, maximum number of branchlets were observed in KCS-1 (12.67) with coefficient of variation of 34.16 per cent. Variation for panicle shape was also registered, majority of the panicles have shown erect type of panicle (56%) and semi-erect shape (17%), while others shown pendulous (10%) type of panicle The maximum number of fruits per panicle (47) was observed in KCS-14 with coefficient of variation of 27.59 per cent. Similarly, with respect to bearing majority of trees are of early bearing in nature. Growth habit of charoli trees also registered variations for growth habit of trees like semi-spreading (56 %), upright (42 %) and spreading (2%) types. Fruit and seed shape studies indicated that, 64 per cent of seedling populations showed 'bold' and 36 per cent of with 'flat' fruit and seed shape. KCS-43 genotype recorded maximum fruit yield per tree (6.39 kg/tree) with coefficient of variation of 43.39 per cent. The differential response to gall midge and mealy bug pest infestation was also recorded for genotypes KCS-3, KCS-11, KCS-16, KCS-17, KCS-22, KCS-26, KCS-28, KCS-29, KCS-34, KCS-35 and KCS-48 have shown infestation of gall midge and KCS-49 has shown mealy bug infestation.

Keywords: Leaf characters, fruit parameters, gall midge, mealy bug

GI/PP – 19

Variability studies for fruit and quality characters of charoli (*Buchanannia lanzan* Spreng) under North Eastern transitional zone Of Karnataka.

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ABSTRACT

A survey work was carried out to assess the variation exerted by the seedling progenies under transitional zone of Karnataka for superior fruit and quality characteristics. The study revealed that, the maximum fruit weight was found in KCS-22 (1.48 g) with coefficient of variation of 14.49 per cent and it ranged from 0.76 to 1.48 g, fruit length (13.15 mm) and fruit breadth (12.98 mm) was found in KCS-50 and KCS-22 with coefficient of variation of 5.91 and 5.47 per cent respectively. Maximum pulp weight was found in KCS-22 (1.10 g) with coefficient of variation of 18.68 per cent and it ranged from 0.43 to 1.10g, while pulp per cent was found in KCS-4 (75.90 %) with coefficient of variation of 6.25 per cent and it ranged from 56.61 to 75.90 per cent. Fruit and seeds studied shape, both parameters had shown 64 per cent 'Bold' and 36 per cent 'flat' shape. KCS-46 (0.45 g) found maximum seed weight with coefficient of variation of 12.61 per cent, while nut length was found in KCS-50 (10.69 mm) with coefficient of variation of 4.73 per cent and nut breadth was found in KCS-32 (10.54 mm) with coefficient of variation of 4.99 per cent. shelling percentage of nuts was found in KCS-34 (34.87 %). Among quality parameters studied, genotype KCS-16) recorded maximum TSS (24.00 ^{0}Brix) with coefficient of variation of 9.39 per cent, total sugars was recorded in KCS-46 (15.6 %) with coefficient of variation of 6.14 per cent, lowest titrable acidity was recorded in KCS-15 (0.6 %) with coefficient of variation of 22.16 per cent, protein content of kernels was recorded in KCS-27 (20.69 %) with coefficient of variation of 10.12 per cent and it ranged from 13.36 to 20.69 per cent. KCS-7 genotype recorded maximum kernel fat content was recorded in (40.69 g) with coefficient of variation of 15.28 per cent and it ranged from 19.43 to 40.60 g.

Keywords: Fruit quality, pulp content, nut length, total sugars

GI/PP – 20

Bio-conservation of superior wood apple genotypes across Karnataka through soft wood grafting

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ABSTRACT

In-situ survey and evaluation of superior genotypes around different places of Karnataka was carried out during 2021-2023. Based on the preliminary evaluation by using DUS guidelines of bael fruit crop, fruit physical parameters and fruit biochemical parameters has been analyzed. The ten best genotypes have been identified and *In-situ* conservation of the genotypes was carried out by using soft wood grafting. The wood apple syns. *Feronia elephantum* Correa; *Limonia acidissima* L.; *Schinus limonia* L.) is the only species of its genus, in the family Rutaceae with 2n=18 chromosomes. Wood apple is native and common in the wild dry plains of India and Ceylon and cultivated along roads and edges of fields and occasionally in orchards. The soft wood grafting done in the month of January showed that germination percentage of range (86.6-100%), number of sprouts in the range of (14.533-26.933), graft height (11.727-19.4 cm), scion girth (6.801-8.411 mm), rootstock girth (7.714-9.076 mm), leaf length (3.873-5.605 cm), leaf width (1.85-2.313 cm) and number of leaves (111.2- 170.8). Genotypes 3, 4, 7 and 10 showed 100 per cent germination, genotype 3 showed maximum number of sprouts per plant (26.933), graft height and leaf length (19.4 and 5.605 cm respectively) were recorded in genotype 7, scion girth and rootstock girth was highest in genotypes (8.411 and 9.076 mm respectively), while the leaf width was highest in genotype 10 (2.313 cm) and number of leaves recorded maximum in genotype 3 (170.8) after 3 months of grafting. Further the grafts are planted and maintained in the field.

Keywords: Grafting success, graft growth, scion growth

GI/PP – 21

Identification of elite wood apple (*Feronia limonia* L.) genotypes from Karnataka region.

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ABSTRACT

Wood apple belongs to the family *Rutaceae* and is botanically known as *Feronia limonia* L. The fruit possess great potential for its commercial cultivation, due to its hardy nature, long shelf life of fruit and abundant nutritional value. Information regarding the area of wood apple in India is not available, because it is seldom found in the form of an orchards and generally large number of trees with great diversity is found in wild, roadside, in homestead garden and it is still under unexploited condition because of lack of awareness regarding its significance with respect to their nutritional and therapeutical values. A study was conducted during 2021-2023, to identify the elite wood apple genotypes among its natural population from different locations of Karnataka. Wood apple trees in 5 different locations were initially screened for their morphological parameters, fruit quality characters and fruit bio-chemical properties. The different elite class germplasm was evaluated for characters like fruit weight, fruit volume, fruit length, fruit diameter, seeds per fruit, pulp weight, rind weight, TSS and titratable acidity. Fruit weight range (86.33-264.33gm), fruit length (45.5-91.77mm), fruit diameter (44.86-82.63mm), fruit volume (92-264.33cm^3), rind weight (43-159.66gm), pulp weight (40-93.33gm), number of seeds (95-460), tss (7.96-19.33^o brix), acidity (0.94-4.58%) and Vitamin C (10-27mg/100g) was recorded. Genotypes 7, 8, 11, 12, 14, 18,20, 23, 36, 44 and 46 showed some promising genotypes among 46 genotypes studied.

Keywords: Wood apple, morphological parameters, fruit quality, pulp weight, TSS

GI/PP – 22

Characterization and evaluation of pummelo (*Citrus grandis*L.) hybrid population for economic traits

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ABSTRACT

Pummelo, the largest fruit in the citrus family, is usually covered with a thick rind and depending on the genotype, the fruit possess its own flavour and other biochemical characteristics. Unlike the other citrus fruits (orange and mandarins) that have a loose skin and a mild to sweet taste, pummelo fruits own a thick rind with varying flavour (due to bitter principle). Hence, the consumer preference mostly tends towards the fruits with, very thin rind for easy separation of segments coupled with zero to negligible amount of bitterness. The present study was carried out in hybrids of pummelo planted during August 2016 at ICAR-IIHR, Bengaluru. Morphological and biochemical characterization of 102 pummelo hybridswas conducted with special emphasis on economic traits (Less bitter/sweetness and thin rind). Among the two hybrid combinations the fruit ranged from 0.72 kg to 2.62 kg in Acc.12 X Acc.19 with rind thickness ranging from 0.92 to 3.16 cm while, the significant other cross *viz.*, Acc. 3X Acc.19 recorded fruit weight ranging from 0.61 kg to 2.41 kg withrind thickness ranging from 1.08 cm to 2.88 cm. The mean TSS was found to be 8.80^{o} B for the former and 9.02^{o} Bin later hybrids of the cross combinations respectively. An average titrable acidity of 1.35, 1.38 and the flavonoid content of 13.71, 11.44 were recorded in the hybrids respectively. Based on biochemical attributes and sensory evaluation, H17-3, H17-5 and H17-9 from first cross and from second cross, H23-4 and H23-11 were selected as elite progenies with low bitterness, high TSS which could be exploited as a breeding stock/ new hybrids for commercial cultivation

Key words: Pummelo, bitterness, sweetness, rind thickness, hybrids

GI/PP – 23

Morphological characterization of seedling progenies of marking nut (*Semecarpus anacardium* L.) for growth and yield Attributes.

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ABSTRACT

The studies on 'Morphological characterization of seedling progenies of marking nut (*Semecarpus anacardium* L.) for fruit and quality attributes' was recorded through survey approach in north eastern transitional zone of Karnataka during the year 2018-19. The studies pertaining to growth parameters revealed that the leaf area registered great variation which ranged from 74.54-496.76 cm^2 and A-22 registered maximum leaf area with having 496.73 cm^2 with a coefficient of variation of 40.09 per cent. Similarly, fruit weight and nut weight indicated the variation and it ranged from 1.53-7.80g and 1.40 -9.37 g, respectively. Fruit yield parameters such as number of panicles per plant, number of fruits per panicles and fruit yield per plant also showed lot of variation and which ranged from 15.00 to 172.00, 4.00-28.00 and 0.80 – 11.36 kg per plant, respectively. The greater coefficient of variation for marking nut apple weight and kernel weight was 31.23 and 36.29 per cent and its values ranged from 1.53 to 7.80 and 1.40 to 9.37, respectively. Number of panicles per plant, number of fruits per panicles and fruit yield per plant also showed greater degree of variability of 69.99 per cent, 53.53 per cent and 73.44 per cent, respectively. Similarly the marking nut apple registered 19.28 per cent of coefficient of variation and it ranged from 6.44 to 13.13^o Brix. The protein content of kernel also recorded, the extent of variation with respect to coefficient of variation was 7.27 per cent and it ranged from 2.88 to 3.71 per cent. A-19 registered maximum apple weight (7.80 g) followed A-49(7.07 g). A-49 also registered maximum nut weight of 9.37 g. A-29 registered maximum TSS (13.12^o Brix), while A-27, A-36 and A-50 registered maximum kernel protein content of 3.71 per cent. A-44(9.49 kg) and A-30(9.07 kg) registered maximum fruit yield per plant.

Keywords: Leaf area, apple weight, kernel content, fruit yield

GI/PP – 24

Domestication of native wild fruits for diversification in Melghat region of Maharashtra state of India

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ABSTRACT

Wild edible plants (WEPs) are the species that are neither cultivated nor domesticated but growing wild and are however edible. Different wild edible plants have played a significant role in all geographical regions of the world throughout human history. Poor communities throughout the world are dependent on these wild plants for their food, nutrition and subsistence needs and improving rural livelihoods as well. The role of WEPs in ensuring food and nutritional security to rural or indigenous communities is now widely recognized. The data available on their identification, composition or nutritional properties, use and management or user's preferences is scanty or less documented. Maharashtra is one of the rich states in terms of floristic and ethnic diversity in India. About 120 wild food plants from Maharashtra and Goa out of which the six wild edible plants from Maharashtra i.e. *Diospyros peregrina, Grewewia tillifolia, Optunia elatior, Capparis zeylanica, Flacourtia indica, Elaeagnus conferta* found potential for commercial exploitation. These wild edible plants are rich in nutrients, vitamins and fibers. These plants may become the supplementary source of food for common people if brought under cultivation. Such edible plants and wild relatives of the established crop plants are reservoirs of important desirable genes for resistance against fungal, bacterial and especially viral pathogens. They also harbor resistant genes for adverse climatic conditions such as drought, frost, water lodging etc. Such resources could be used to broaden the gene pool of crop plants. Domestication of wild relative plants can broaden genetic diversity which will help to fight against pests, diseases and climate change. Wild edible plants are hardy and can grow in adverse conditions with minimum inputs. Need to aware farmers consumers about the importance and potentiality of wild edible plants.

Keywords: Wild edible fruits, nutrients, vitamins, stress tolerance

GI/PP – 25

Evaluation of morphological characters of lasoda (*Cordia myxa L.*)

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ABSTRACT

Lasoda (*Cordia myxa L.*) is also known as Indian cherry, glue berry, Assyrian plum, Gonda or Lehusabelongs to the family Boraginaceae. It is indigenous to India and found growing all over the country expect higher altitudes. The pulp of lasoda is sweet in taste and full of gum. Fruits have anthelmintic, diuretic, demulcent and expectorant properties. It is used in treating dry cough, asthma, catarrh, chronic bronchitis, syphilis, influenza etc. Along with fruits, leaves and barks also have medicinal properties. The kernel of fruit is used in external application for ringworm. In light of the above, the present investigation was carried out at ICAR-IIHR, Bengaluru on the morphological characteristics of lasoda. It is a medium-sized tree with a plant girth of 93.51 cm, a trunk girth near the first branching of 116.25 cm, a height from the ground to the first branch of 58.25 cm, and a canopy that extends 8.75 metres east to west and 7.82 metres north to south. The leaf is alternate, entire to slightly dentate and glabrous, elliptic- lanceolate to broad ovate shape. The leaf measurements included leaf length (11.55 cm), leaf width (9.21 cm), petiole length (4.38 cm) and petiole diameter (36mm). Fruitin lasoda is a drupe having thicker epicarp, mucilaginous mesocarp and hardy and stony endocarp.Fruit is small to medium size weighing 3.40 g, fruit length (1.72 cm), fruit width (1.62 cm), pulp weight (1.91 g) and peel weight (1.14 g).Average seed values of lasoda were 0.36 g seed weight, 1.32 cm seed length, and1.22 cm seed width. The pulp recovery of lasoda was found to be about >80%. The fruit pulp has TSS of about 13.5^{o}B and 0.08%. acidity. The drought hardiness, nutritional and therapeutic properties of lasoda make it excellent for crop diversification programmes to address climate change in India.

Keywords: Lasoda, fruit, morphology, biochemical parameters

GI/PP – 26

Estimates of genetic variability, heritability, cluster analysis, principal component analysis and correlation coefficients for fruit quality and yield in tamarind (*Tamarindus indica* L.)

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ABSTRACT

The study was conducted to assess the extent of genetic variability, heritability, cluster analysis, principal component analysis and correlation coefficients among 25 tamarind (*Tamarindus indica* L.) genotypes from college of agriculture, Dhule, Maharashtra, evaluated for fruit quality and yield parmeters during 2021-22. Being a highly cross-pollinated, a wide range of variation, the narrow difference between the genotypic coefficient of variation (GCV) and the respective phenotypic coefficient of variation (PCV) indicated that all the characters were least affected by the environment. High heritability coupled with high genetic advance as per cent of mean were recorded for pod yield, pulp per cent, pod weight, pod length, shell weight, pulp weight, fibre weight, number of seeds per pod, shell percentage, fibre percentage, TSS, acidity and non-reducing sugar indicated that, these characters governed by additive gene action hence, direct selection would be effective for genetic improvement of these characters. Cluster analysis grouped genotypes into seven clusters with a maximum inter-clusrer distance between cluster 3 and 5. Pod yield contributed maximum to genetic divergence followed by circumference. First two principal components cumulatively explained 91.92% variation, includes pod yield. Correlation analysis revealed that pod yield was significantly and positively correlated with pod length (cm), pod weight (g), pulp weight (g), seed weight (g), shell weight (g), number of seeds per pod, fibre weight (g) and pod width (cm) indicated that, these traits contributed to a large extent to pod yield per tree. Hence, these characters could be effectively used in tamarind improvement programme for selecting genotypes with higher yield as they show positive and significant association.

Keywords: Pod yield, pod quality, pulp content, fibre

Collection and evaluation of local custard apple (*Annona squamosa* L.) genotypes from Dhadgoan tehsil of Nandurbar district

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ABSTRACT

The custard apple (*Annona squamosa* L.) is widely grown and diverse in Maharashtra as potential economic and nutritional resource. The present study was conducted to survey, collection and evaluation of local custard apple genotypes from Dhadgoan tehsil in Satpuda hills known for rich biodiversity area of custard apple was undertaken to explore and evaluate on the basis of morphological, physical and quality characters during April-November 2022. These selected twenty five genotypes revealed wide variability in morphological characters *viz*., growth habit, compactness of branching, leaf morphology, matured leaf colour, stem colour, fruiting habit, flowering, fruiting and also in fruit shape. In physical characters *viz*., fruit weight (157.9 to 412 g), pulp weight (42.7 to 226 g), pulp percentage (24.73 to 69.33%), seed weight (4.7 to 23 g), seed percentage (2.5 to 8.66%), pulp: seed ratio (4.52 to 17.5), seed: pulp ratio (0.05 to 0.22) while in qualitative characters *viz*., average TSS (22.2 to 32.4°Brix), acidity percentage (0.16 to 0.35%) and TSS: acidity ratio (72.9 to 180). The study showed a significant correlation between various physical and quality traits, which gives basic idea about fruit nutritional flows during fruit growth and development. By considering morphological, physical and qualitative characters DCA-3 was recorded overall good performance in all respects. From overall performance among these 25 custard apple genotypes, in respect of earliness, higher fruit weight, pulp weight, pulp percent, TSS and TSS: acidity ratio, seven custard apple genotypes *viz*, DCA-3, DCA-9, DCA-4, DCA-1, DCA-2, DCA-10 and DCA-22 were identified as promising genotypes.

Keywords: Growth habit, fruit weight, pulp, fruit quality

GI/PP – 28

Phenotypic characterization of *Tamarindus indica* L. using multivariate analysis

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ABSTRACT

Tamarindus indica L. is a multipurpose monotypic agroforestry species, possessing numerous domestic and industrial applications. It grows naturally in subtropical and semi-arid tropical regions of the world. Sixteen quantitative traits of *T. indica* were used to unravel the phenotypic diversity on a large scale (422 accessions sourced from 12 districts of 8 Indian states) using multivariate analysis. Significant differences between the provenances were recorded for all the traits ($P < 0.01$). In terms of total pod weight, shell weight, fiber weight, pulp weight, real pulp value, and seed weight, Karnataka outperformed the other states. There were strong positive associations between real value of pulp (RVP) and all pod size traits ranging from 0.37 to 0.93. Titratable acidity was found to have a significant positive relationship with pod size and pulp recovery (r= 0.513-0.742); sugar/acid ratio with seed percent (r= 0.718) and shell percent (r=0.537). According to the principal component analysis (PCA), the first five principal components accumulated 98.61% of the variation. Pulp quality related characters were most important in differentiating the accessions. Morphological cluster analysis revealed four distinct clusters with high diversity. A unique accession from Karnataka was selected by participatory breeding, enabling the farmer to establish a successful nursery and conserve the valuable genotype. Our study provides valuable information about phenotypic diversity, in situ evaluation, selection indices for plus trees and conservation of tamarind genetic resources in India.

Keywords: Pod size, pulp recovery, pulp quality

GI/PP – 29

Evaluation of native ornamentals for mitigating air pollution and landscaping

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ABSTRACT

Sustainable landscaping is a modern way of landscaping that give emphasis to the environment, with minimal use of non-renewable resources. One of the important features of sustainable landscaping is the use of native flora. Now a days there is a lot of demand for the native flora elsewhere globally. Use of native flora for landscaping is getting popularity in the country too. Towards the promotion of native flora for commercial purposes, research programmes have been initiated by ICAR-DFR through coordinated research programmes. Kerala is an abode of a wide variety of flora and fauna. The Western Ghats which is one of the hotspots of biodiversity has great reserves of the under exploited floral wealth of India. Studies on the growth and flowering habits of the under exploited native ornamental species throw light into the suitability of native ornamentals for use in landscaping which are not at all explored. The increasing environmental pollution has emphasized the need for screening shrubs with tolerance to environmental pollution. Screening and selection of shrubs with high pollution tolerance will help in assessing their suitability to be grown as hedges and edges in urban landscapes for mitigating air pollution. The present study was undertaken to evaluate the suitability of native flora in landscaping and to assess their air pollution tolerance index. The selected native ornamental species were *Murraya paniculata, Barleria mysorensis, Rauwolfia tetraphylla, Barleria strigose, Clerodendron inermi, Carmona retusa, Melastoma malabathricum, Ecbolium viride, Eranthemum capensis* and *Pogostemon quadrifolius.*Selected plants were raised in 8 inch pots.The vegetative and flower characters were observed at flower initiation**.**The air pollution tolerance index parameters such as ascorbic acid content(mg/g), total chlorophyll content(mg g-1 FW), pH of leaf extract, relative water content of leaves (%) were recorded and the air pollution tolerance index was computed from the values of the above observations.The highest air pollution tolerance index was calculated for *Carmona retusa* and lowest for*Pogostemon quadrifolius.*

Keywords: Native ornamentals, air pollution mitigation, landscaping

GI/PP – 30

Habitat characteristics and abundance of threatened and endangered potential ornamentals of lateritic hillocks of Kerala

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ABSTRACT

Hillocks of Kerala are rich abodes of wide variety of flowering plants including grasses, herbaceous perennials, shrubs and trees. Many of these plants which were utilized in traditional medicine are either endangered or critically vulnerable due to human interventions. Most of the hillocks of Kerala are subjected to exploitation for soil excavation, laterite mining, quarrying etc. The habitat destruction is extremely fast and loss of nearly 50% has been observed during last decade. So, protection of this ecosystem is of prime importance. Mapping the identified geographical locations and predicting potential distribution of a species out of that is known is useful in identifying critical regions that may need conservation action. The study was undertaken to evaluate the species diversity of potential ornamentals of hillocks of Kerala. The selected endangered and threatened potential ornamentals were *Pogostemon quadrifolius, Naregamia alata, Exacum bicolour, Sesamum lacinatum, Habenaria diphylla, Habenaria marginata, Habenaria longicorniculata, Lepidogathis keralensis, Syzigium caryophyllatum* and *Jasminum malabaricum.*The study was conducted in four districts of Kerala namely, Kasargod, Kannur, Malappuram and Thrissur. Bioclimatic variables with 30 seconds spatial resolution, were taken. Latitude and Longitude of the locations were recorded and the quadrat method was followed to know the species diversity in a specificed locations of Kerala. Frequency, Density and Abundance of selected plant species are calculated. Study has shown that there is high abundance of *Naregamia alata, H. diphylla, Syzigium caryophyllatum, Jasminum malabaricum, Exacum bicolor, Pogostemon quadrifolius and Lepidogathis keralensis* in specified locations of hillocks in Kasargod. With respect to the Kannur district there is high abundance of *Jasminum malabaricum*, *Pogostemon quadrifolius*, *Syzigium caryophyllatum* and *Habenaria diphylla*. But in Thrissur, *H marginata, Exacum bicolor, Naregamia alata, H. diphylla and Sesamum lacinatum* were found to be threatened and limited only to some specific locations.

Keywords: Habitat characteristics, bioclimatic variables, threatened and endangered, potential ornamentals of hillocks, frequency, density

GI/PP – 31

Evaluation of *Hibiscus rosa-sinensis* genotypes for their morphological characters and anthocyanin content

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ABSTRACT

Hibiscus rosa-sinensis is a shrub which belongs to the family Malvaceae, widely known for its therapeutical and nutraceutical values and the pigment content. Hibiscus is popular as an ornamental plant because of its attractive flowers used for landscaping and also for loose flower purpose. Hibiscus flowers are rich sources of anthocyanin pigments. Screening of hibiscus genotypes for variability in their plant and flower morphological characters and pigment content will help in identifying promising genotypes for further breeding programme. The present study was thus conducted to identify the promising hibiscus genotypes for morphological characters and pigment content. Fifteen genotypes were collected from different locations in Kerala. The cuttings were raised in the nursery and the established cuttings were planted in the main field. The genotypes were characterized based on their plant characters such as plant growth habit, plant height, plant branching and the leaf characters such as leaf length, leaf width, leaf shape, leaf colour and incision of leaf, etc. They were also characterized for some flower characters such as the flower colour, flower diameter, petal length, petal width, and also their dry weight and fresh weight. Hibiscus genotypes collected from different locations in Kerala showed wide variation in their morphological characters as well as their anthocyanin content (ranging from 83.67mg/g to 127.35mg/g).

Keywords: *Hibiscus rosa-sinensis*, genotypes, morphological characters, anthocyanin content

GI/PP – 32

Varietal evaluation of chrysanthemum for pot mums under Raipur region of Chhattisgarh plains

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ABSTRACT

This research on the varietal evaluation of chrysanthemum for pot mums under Raipur region of Chhattisgarh plains. The research was conducted at IGKV Raipur using a Completely Randomized Design (CRD) with nine chrysanthemum varieties (Aub pink, Aub burgundy, Tourmalet, Mount Kenya, Aub purple, Mount Pleasant, Aub apricot, Mount Juno, Savita). The main objective of the research was to evaluate the performance of these varieties for their suitability as pot mums in the Raipur region. The research covered different parameters such as growth parameters and flower yield. The research revealed that Aub Pink and Mount Juno were the best performers in terms of growth, yield, and quality of flowers, while Savita was found to be the least performing variety. The study concludes that the use of Aub Pink and Mount Juno varieties can be recommended for commercial pot mum cultivation in the Raipur region. This research provides valuable insights for the floriculture industry, especially for growers and breeders of chrysanthemum, in the selection of suitable varieties for pot mum cultivation in the region.

Keywords: Pot mums, varietal evaluation, growth parameters, flower yield

GI/PP – 33

Estimation of genetic variability in buckwheat (*Fagopyrum esculentum* Moench.) genotypes under northern dry zone of Karnataka

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ABSTRACT

An experiment was carried out on Estimation of genetic variability in buckwheat (*Fagopyrum esculentum* Moench.) genotypes under northern dry zone of Karnataka during Jan-April 2021-2022 at the department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Bagalkot. The experiment was laid out in Randomized complete block design (RCBD) with two replications. Fifteen genotypes of buckwheat were assessed for genetic variability for 15 characters with pooled data of three environments *i.e,* full dose of recommended fertilizer (RDF), 3/4th dose of RDF and 1/2nd dose of RDF. The genotypic and phenotypic coefficient of variation varied from 2.71 to 19.51 and 3.3 to 22.37 respectively. The GCV and PCV were moderate for plant height at 15 DAS, number of branches at 30 DAS, number of cymes per plant, seed yield per plant, seed yield per plot and seed yield per hectare and low for other estimated parameters. The range of genetic advance over mean was from 4.57 per cent to 35.05 per cent, which is low to high. Heritability ranged from 43.09 per cent to 97.23 per cent which is moderate to high. The characters like number of branches at 30 days after sowing, number of cymes per plant, number of cluster per cyme, seed yield per plant, seed yield per plot and seed yield per hectare had higher heritability with higher genetic advance over mean.

Keywords: Buckwheat, GCV, PCV, GAM and Heritability

GI/PP – 34

Exploiting the wealth of underexploited flora of Wayanad district of Kerala for ornamental and landscape uses

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ABSTRACT

Wayanad, the North East district of Kerala is a rich spot of biodiversity and a home to variety of endemic flora and fauna. A study was conducted at the Department of Floriculture and Landscaping, College of Agriculture, Vellanikkara, Thrissur, Kerala to explore the wealth of underexploited ornamentals of Wayanad for various ornamental and landscape uses. As a part of the study, extensive survey was conducted in various regions of Wayanad*viz;*Vythiri, Muttil, Vazhavatta, Karappuzha, Maniyankode, Meenangadi, Beenachi, Pazhuppathur, Meppadi, Nenmeni, Vaduvanchal, Ambalavayal, Choothupara, Muthanga, Manavayal and Ottathekku and different ornamental species were collected. Collected ornamentals were grown in the Department of Floriculture and Landscaping, College of Agriculture, Vellanikkara to test the adaptability. The plant species survived under Vellanikkara condition were multiplied and tested the suitability to various landscape uses. Plant species such as *Thunbergiaerecta*, *Megaskepasma erythrochlamys*, *Hibiscus schizopetalum, Hibiscus multiflorum, Flemingia strobilifera, Clerodendrum fragrans* and*Rhinacanthusnasutus*were found suitable for shruberry.Promising species suitable for making hedges were *Barleriacristata, Barleria prionitis* and *Hypoestesphyllo stachya.* Plant species such as *Ruellia elegans* and *Gloxiniaperrenis* were found ideal for pot plant purpose and *Solanumcrispum*was suitable for arches.Suitability of the flowers and leaves of these plants for making value added products was studied. None of the plant species were suitable for fresh flower arrangements as their vase life was very short however dried flower stalks of *Flemingia strobilifera* and *Barleria cristata* were found suitable for dry flower arrangements.Propagation techniques for selected ornamentals with commercial valuewas also standardised. Propagation by cutting was found to be suitable for all collected plant species. Terminal cutting was suitable for *Gloxinia perrenis* whereas more survival percentage was observed in semi hardwood cuttings in other plant species. A conservation garden was set in the department to showcase the potential ornamentals which are found promising for landscaping and plants were labelled with their names and QR code which provides all details of the plant species.

Keywords: Underexploited flora, Wayanad district,propagation techniques,ornamental, landscape

GI/PP – 35

Morphological characterization of garden rose genotypes for landscape use in Kerala

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ABSTRACT

Rose (*Rosa* x hybrida L.) which is universally acclaimed as the 'Queen of flowers' occupies a prime position among the flower crops because of its beauty and elegance. Besides it's versatile landscape uses, rose is commercially grown for cut flower as well as loose flower purposes and preparation of several value added products. It is important to collect, conserve and evaluate the diversity of these rose species as characterization of germplasm provides precise information about the extent of diversity present among the cultivars. It also helps in cultivar identification, variety improvement and genetic diversity conservation. Morphological markers are the phenotypic markers used to describe the observable characters of the plant. They are best for visualization, reproducibility and serve as reality check for molecular studies. Thus this study was under taken to characterize rose using morphological markers for various commercial and landscape uses. In the present study, 30 garden rose genotypes were collected from different SAUs as well as from various parts of Kerala and the observations on vegetative and floral characters were recorded. KAU R – 2 and KAU R – 4 were found to have maximum plant height. KAU R- 11 and KAU R – 12 were devoid of prickles and anthocyanin colouration was found absent. KAU R-10, KAU R – 11 and KAU R – 12 took least number of days from initiation to opening of flower. KAU R-11 showed highest number of flowering laterals and number of flowers per plant. KAU R – 4 produced maximum numbers of flowers per bunch. Flower persistence was found highest in Arka Sinchana. Based on nature of growth, KAU R – 5 and KAU R – 8 as well as KAU R – 13 can be recommended as ground covers and bedding purpose respectively. KAU R – 11 can be recommended as garden rose for landscaping as it is thorn less and produce large number of flowers. Thus the study reveals the diversity present in various garden roses which can be utilized for crop improvement and genetic conservation studies.

Keywords: Garden rose, morphological characterization, genotypes, landscaping

GI/PP – 36

Underutilized flower crops of Mizoram

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ABSTRACT

Mizoram is one of the richest reservoirs of genetic variability and diversity of different ornamental crops, which exist in plant types, morphological and physiological variations, reactions to diseases and pests, adaptability and distribution.The under-utilized flower crops such as copper leaf, fire cracker flower, rain of gold, brazil button flower, fire ball, white caladium, cigar plant, cockscomb, and ground orchid etc. are mainly grown under traditional farming systems by diverse ethnic communities.Increased focus to document indigenous knowledge is required such as through ethno-botanical studies. Such emphasis will help tap value additions as much of native diversity is put to multipurpose uses. Many of the marketable underutilized flowers also provide potential good market value due to limited supply and great demand. Commercial exploitation of these local flowers with proper management under a system for their sustainable use can help in generating income for the indigenous people. Henceforth, an elaborative exploration programme is further needed to document the potential local flowers in the state of Mizoram.

Keywords: underutilized, local flower, Mizoram

GI/PP – 37

Evaluation of yield and post harvest traits of chrysanthemum (*Dendranthema* x *grandiflora* Tzvelev) genotypes under the plains of Kerala

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ABSTRACT

Chrysanthemum (*Dendranthemagrandiflora*Tzvelev) is a herbaceous perennial flowering crop that holds great potential for commercial cultivation. Fifteen chrysanthemum genotypes were studied at the Department of Floriculture and Landscaping, College of Agriculture, Vellanikkara, Kerala Agricultural University, Thrissur with an objective to evaluate the yield and post harvest performance to select suitable cultivars for commercial cultivation in the plains of Kerala. Significant variations for various yield and post harvest parameters were recorded among the genotypes.Significantly highest flower weight was recorded in the genotype 'Karnool Pink' (8.07 g).The genotype 'KAU C-4' recorded more number of flowers per plant and highest flower yield per plant (96.95 and 0.31 kg) which was on par with 'KAU C-1' (79.55 and 0.27 kg) and 'KAU C-6' (70.45 and 0.25 kg) respectively. Longest shelf life and vase life was recorded in the genotype 'KAU C-7' (4.89 days) and 'KAU C-3' (14.48 days) respectively. Estimation of genetic parameters revealed the high range of heritability (>90 %) and high genetic advance (>20%) for all the traits, indicating additive gene effect and ample scope for selection and improvement. Correlation and path coefficient analysis indicated that the parameters such as number of flowers per plant and flower weight were having positive and significant correlation with flower yield per plant with a direct effect. The genotypes 'KAU C-4' and 'KAU C-6' can be recommended for both cut and loose flower purpose whereas the genotypes'Karnool Pink', 'KAU C-1', 'KAU C-7', 'KAU C-3', 'KAU C-8' and 'KAU C-2' are best preferred for loose flower purpose and the genotype 'Pink Cloud' was found ideal for both garden type and loose flower production.

Keywords: Chrysanthemum, yield, post harvest performance, garden type and loose flower

GI/PP – 38

Pollen germination and stigma receptivity in China aster (*Callistephus chinensis* Nees.)

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ABSTRACT

China aster is botanically called as *Callistephus chinensis* Nees, It is native to China and belongs to family Asteraceae. It is a half hardy annual ornamental flower crop grown for its flowers.In china aster, stamens and pistils do not mature simultaneously in the individual flower. The stigma of the individual flower unfolds after the pollen is discharged from the flower., In present study, a simple and reliable pollen germination medium was developed asmodifiedBrewbaker and Kwack (BK) medium. Different pollen germination media as BK modified media with PEG and sucrose in different combinations was used. Modified BK media + 15% sucrose + 30% PEG 6000 recorded maximum pollen germination in Arka Kamini (70%) followed by Arka Archana(80%) and Arka Aadya (46.83%), whereas BK media 5% Sucrose + 15% PEG6000 recorded maximum pollen germination in variety Arka Shashank(45%). However, pollen germination was not observed in Arka Poornima in lab condition. Stigma receptivity was recorded by H_2O_2effervescence method. It was lowest in Arka Kamini in 1st stage (bud stage) increased up to 5thstage of anthesis, Arka Archana and Arka Aadya was highest on 5thand 6thstageof anthesis. While in variety Arka Shashank it was constantly increases up till 5th stage then decreases. The variety Arka Poornima showed maximum stigma receptivity on 5th and 6th stage of flower anthesis. This study is important for breeders to help in developing new varieties in China Aster.

Keywords: China aster, pollen, stigma receptivity, germination

GI/PP – 39

Collection, evaluation and aroma profiling of scented field roses (*Rosa* spp.)

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ABSTRACT

The present study, 'Collection, evaluation and aroma profiling of scented field roses' conducted at the Department of Floriculture and Landscape Architecture, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, during the year 2022-23. This study provides valuable insights for cultivatorsand industries seeking to harness the potential of scented field roses. The varieties evaluated include Arka Sukanya, Arka Parimala, Bourbon rose type 1, Bourbon rose type 2, Pusa Alpana, Rose Sherbet, Damask rose type 1, Damask rose type 2, and Andhra Red. Results indicated that the variety Bourbon rose type 1 (V_3) was superior in terms of parameters like maximum plant height, number of shoots per plant, and chlorophyll content. Additionally, it demonstrated the shortest duration for bud to bloom and yielded the highest weight for 100 flowers. Scent Pink (V_7) showcased the maximum plant spread in both the N-S and E-W directions. Furthermore, it exhibited the longest shelf life at room temperature and in cold storage at 5 ºC. Bourbon rose type 2 (V_4) displayed the maximum leaf length, individual leaf area and the highest number of flowers per plant. Arka Parimala (V_2) exhibited the maximum petal length and petal width. Gas Chromatography-Mass Spectrometry (GC-MS) analysis revealed the presence of key compounds contributing to the characteristic rose fragrance, such as phenyl ethyl alcohol, citronellol, and geraniol.

Keywords: Rose, fragrance, collection and evaluation

GI/PP – 40

Crossability studies in chrysanthemum (*Dendranthema* x *grandiflora*)

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ABSTRACT

To achieve compatible successful crosses, twenty chrysanthemum genotypes were used as parents for crossing, at ICAR-Indian Institute of Horticultural Research, Bengaluru, during 2016-18.The different concentration media such as sucrose, PEG4000 and in combination were used before pollination on receptive stigma to achieve successful cross. In order to achieve the compatible crosses, we investigated days to seed set, per cent seed set and seed germination. The results indicated that seeds collected from only one successful cross IIHR6-41 x MP recorded 25.68% (15% sucrose) to 40.74% (10% sucrose) seed setting and cross IIHR6-41 x MP recorded 26.74% (15% sucrose) to 54.12% (control) seed germination. Among PEG4000 concentrations, the seed setting was ranged from 1.57% (Ajay x MP) to 31.35% (IIHR6-41 x MP). The seed germination in one successful cross IIHR6-41 x MP recorded 54.48% germination. Among sucrose and PEG4000 concentrations, seed setting was observed in five crosses *i.e.* Ajay x MP, Arka Chandrika x MP, Arka Kirti x MP, Lal Pari x MP and IIHR6-41 x MP. Seed setting was ranged from 1.69% (Ajay x MP) to 39.32% (IIHR6-41 x MP). Seed germination was recorded in four crosses i.e. Arka Chandrika x MP, Arka Kirti x MP, Lal Pari x MP and IIHR6-41 x MP, however, significant seed germination ranged from 3.27% (Arka Chandrika x MP) to 49.02% (IIHR6-41 x MP).Among crosses and sucrose + PEG concentrations, 10% sucrose + 15% PEG with crosses Arka Chandrika x MP and IIHR6-41 x MP recorded seed set ranged from 3.44% to 52.65%, respectively. Among crosses and sucrose + PEG concentrations, cross IIHR6-41 x MP (10% sucrose + 15% PEG) recorded highest seed germination (60.50%).

Keywords: Chrysanthemum, emasculation, half-sib progenies, mixed pollen, pollination

GI/PP – 41

Genetic variability studies in ornamental sunflower (*Helianthus annuus* L.)

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ABSTRACT

Field experiment was conducted to study the "Genetic Variability Studies in Ornamental Sunflower (*Helianthus annuus* L.)" was conducted during 2021-2022 at the Department of Floriculture and Landscape Architecture, College of Horticulture, Mysore. Twenty three genotypes of Ornamental Sunflowers were evaluated using Randomized Complete Block Design with three replications, the study revealed significant variation for vegetative, floral and flower yield parameters. The longest crop duration was recorded in genotype RGM-49 (80.33 days) followed by R-630 (73.40 days) and R127-1 (68.73 days), whereas, shortest was in Tobias (48.20 days). Maximum number of flower heads per plant was observed in RCR-97 (29.67) followed by R-630 (28.93) and Sunflower Sungold (23.40). In terms of vase life, improved vase life was recorded in Vincent (13.01 days) followed by R-630 (12.53 days), RCR-97 (11.73 days) and R-127-1 (10.47 days). High phenotypic and genotypic co-efficient of variability (>20%) was recorded by parameters *viz*., plant height at 60 days after sowing, leaf area at 60 days after sowing, flower stalk girth, flower stalk length, total flower heads per plant and vase life signifying the presence of good amount of variability in the genotypes. For flower stalk girth, leaf area at 60 days after sowing, plant height at 60 days after sowing, total flower heads per plant, vase life and flower stalk length, the expected genetic advance was high (>20%). Flower yield was positively and significantly correlated with the number of branches (0.258), plant spread in E-W (0.257), and plant spread in N-S (0.249) at genotypic level. Genotypic path coefficint study indicated that the traits, crop duration (0.593), plant height (0.407), number of ray florets (0.367) and number of leaves per plant (0.334) had positive and direct effects on flower yield per plant. Phenotypic path analysis resulted in high positive and direct effect of plant height (0.287), stalk length (0.284), number of ray florets (0.252) and number of branches (0.203) on flower yield. High heritability (>60%) along with high genetic advance as percentage of mean (>20%) for above characters suggested the role of additive gene action. Hence, simple selection based on phenotypic performance of these traits would be more effective. In the current investigation, the genotypes RCR-97 and R-360 have emerged as promising genotypes with respect to flower yield and quality and Vincent is best suitable for cut flower purpose.

Keywords: Ornamental sunflower, cut flower, genetic variability, yield

GI/PP – 42

Effect of intervarietal crosses on seed setting of gladiolus (*Gladiolus hybrida* L.) under southern Rajasthan

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ABSTRACT

Thirty- five intervarietal crosses of gladiolus were tested separately in RBD, each with 3 replications in the ACRIP Floriculture, Department of Horticulture, RCA, Horticulture farm Udaipur from 2019-20. The objective of the study was to find the potentially of seed set in different crosses. Under intervarietal crosses, high capsule set per spike resulted in 'H11 - GS-2 × Arka Amar (5.42), H12 - GS-2 × Priscella (5.35), H1 - Anglia × Priscella (5.16), H13 - GS-2 × Punjab Beauty (5.14), H9 - Chandani × Punjab Beauty (5.10), H24 - Pusa Gunjan × Arka Kesar (5.10) and H25 - Pusa Gunjan × Arka Pratham (5.00) per spike., but 'H3 - Arka Amar × Arka Kesar (1.34), H18 - Punjab Beauty × GS-2 (1.40) and H33 - Pusa Subham × Nathan Red (1.50) produced the lowest capsule set per spike. 'H13 - GS-2 × Punjab Beauty' resulted the highest weight of capsule per spike (70.22 g) followed by 'H11 - GS-2 × Arka Amar' (61.75g). While the lowest in cross 'H3 - Chandani × Arka Amar' (13.91 g). 'H25 Pusa Gunjan × Arka Pratham' produced maximum number of seed per capsule (55.00) followed by 'H11 - GS-2 × Arka Amar' (54.00). While 'H3 - Arka Amar × Arka Kesar' the poor seed setting (9.00). The maximum number of seed set per spike in 'H11 - GS-2 × Arka Amar' (298.10) followed by the cross H24 - Pusa Gunjan × Arka Kesar (239.70), whereas lowest number of seed set per spike in 'H3 - Arka Amar × Arka Kesar' (12.06). 'H25 - Pusa Gunjan × Arka Pratham' gave highest seed weight per capsule (2.10 g), while lowest in 'H30 Pusa Kiran × Punjab Beauty (0.30)'. 'H25 - Pusa Gunjan × Arka Pratham' produced highest seed weight per spike (10.6 g) followed by 'H11 - GS-2 × Arka Amar' (8.8 g) and 'H18 - Punjab Beauty × GS-2' produced lowest seed weight per spike (0.9 g)

Keywords: Capsule, seed, spike, intervarietal hybrid

GI/PP – 43

Morphological evaluation of lotus hybrids for container gardening

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ABSTRACT

Sacred lotus (*Nelumbo nucifera* Gaertn.) is the national flower of India and one of the mostspectacular plants in the aquatic garden collections. Lotus occupies a unique position in the art andmythology of ancient India and has been an auspicious symbol of Indian culture since timeimmemorial. Besides it's functional and landscape uses, lotus plant has several economic,aesthetic, spiritual and medicinal uses. In India, sacred lotus occurs throughout the country exhibitingenormous morphological and genetic diversity with a large number of variants in different shapes,sizes and shades of pink and white, suitable for various commercial and landscape uses. The hybrids resultedfrom crossing temperate and tropical lotus haveunique properties for growing in containers and its introduction from China and Thailand, have bloomedthe lotus farming industry in Kerala. However manyof the hybrids are shy to flower in the tropicalconditions. Hence, the study was under taken to select the best hybrids for container gardening. In the present study, ten popular lotus hybrids were evaluated based on vegetative and floral characters. Green Apple and Buchawere found to have maximum leaf length, width and number of leaves. Lowest petiole length was recorded in Liangly. Early flowering was observed in Green Apple and Pink Cloud. Lowest flowerstalk length was recorded in Liangly and Ameri Camellia. Green Apple showedshowed highest number of petals and flower diameter. Maximum flower production was observed in Ameri Camellia and Liangly. Pink cloud and Green Apple were found to have maximum field life. Based on the vegetative and floral characters, Green Apple, Pink Cloud, Bucha and Ameri Camellia can be recommended for container gardening. Liangly can be recommended for growing in bowls as it produces small leaves with short petiole and more number of flowers with short flower stalk. Thus the study reveals the diversity present in various lotus hybrids which can be utilized for further crop improvement studies.

Keywords: Sacred lotus, hybrids, vegetative growth, floral parameters

GI/PP – 44

Genetic analysis on economic parameters of aloe (*Aloe barbadensis* Mill.)

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ABSTRACT

Aloe barbadensis Mill. (*Aloe vera*) is a succulent plant and well known for its medicinal properties. There is a gaining importance of gel in the cosmetic industry and aloin content in pharmaceutical industry. Yet, there is little information available about genetic variability and selection of characters for getting economic benefits from aloe accessions. A study was conducted in ICAR-DMAPR from 2019-2021 to investigate the variability analysis and character association of aloin contentand leaf yield in 26 accessions in two replications. ANOVA has revealed a significant variation among the studied accessions. Aloe accessions superior in terms of leaf yield, gel yield and aloin yield with high aloin content were identified. Pearson correlation and path analysis were used to determine the effect of characters on genotypesselection. The results revealed the importance of certain characters to improve that characters *viz.,* exudates yield per plant (r_g = 0.684**, r_p = 0.634**) and leaf thickness (r_g = 0.454*, r_p = 0.433**) recorded significant and positive correlation with aloin content. The characters *viz.,* leaf weight (r_g = 0.925**, r_p = 0.897**), exudates yield per plant (r_g = 0.745**, r_p = 0.694**), leaves per plant (r_g = 0.732**, r_p = 0.701**), leaf breadth (r_g = 0.595**, r_p = 0.576**) were positively associated with the leaf yield. Path analysis revealed that exudates yield per plant, followed by leaf thickness for aloin content and leaf length for leaf yield exhibited significant positive association and high positive direct effect. As aloe is used as an efficient herbal drug and natural cosmetic agent, selection of these characters will be more rewarding.

Keywords: Aloe, genetic variability, selection, character association, aloin content

GI/PP – 45

Interpreting the magnitudes of correlation coefficients in lupine (*Lupinus perennis* L.) under hill zone of Karnataka

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ABSTRACT

A study on the association of various morphological traits through correlation analysis in lupine (*Lupinus perennis* L.) under hill zone of Karnataka was carried out in the open field at the experimental farm of the Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere. The experiment was laid out in Randomized Block Design (RBD) having ten treatments and three replications. In the present study, the correlation coefficients between yield and various other components and interrelationship among the traits were computed and they are presented. The result revealed that, flower yield had highly significant and positive phenotypic correlation with plant height, number of leaves per plant, leaf area, chlorophyll content, number of branches per plant, dry weight of plant, flower duration, diameter of flower, stalk length, number of stalks per plant. Whereas, days taken for flower stalk emergence and blooming from days after planting exhibited highly significant and negative correlation with flower yield. Seed yield possessed highly significant and positive phenotypic correlation with weight of seeds per flower, test weight, number of branches per plant, number of stalks per plant, number of florets per stalk, diameter of flower, dry weight of plant, flower yield per plot, seed yield per plant. The associations of these characters with flower and seed yield are in desirable direction. Hence, these characters may be considered as selection indices in lupine breeding programme.

Keywords: *Lupinus perennis L.,* correlation-coefficients, flower, seed yield

GI/PP – 46

Exploring genetic variability and yield-contributing traits in purslane (*Portulaca oleracea* L.) for crop improvement

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ABSTRACT

This study is dedicated to exploring the underutilized potential of purslane (*Portulaca oleracea* L.), a commonly recognized weed crop that possesses significant attributes as a green leafy vegetable. Despite being often overlooked, purslane is abundant in minerals, fatty acids, proteins, phenols, flavonoids, vitamins, and a spectrum of nutrients, showcasing versatile properties including neuroprotection, antimicrobial efficacy, antidiabetic effects, antioxidative benefits, and more. It is also a notable source of omega-3 and omega-6 fatty acids and holds traditional importance in healthcare systems. However, despite its remarkable potential, purslane's genetic resources have remained underexplored, prompting the initiation of this investigation. The research encompassed the study of 15 distinct purslane accessions from various regions of Tamil Nadu, during the summer of 2022. Through an analysis of genetic variability, heritability, and genetic advancement across multiple traits, this study aimed to uncover hidden attributes. The correlation analysis unveiled connections between various traits and their influence on overall yield. Furthermore, the path coefficient analysis unveiled the direct and indirect implications of different traits on yield. The results offer compelling evidence of substantial genetic diversity within purslane traits. Notably, traits such as plant height, leaf area, chlorophyll content, carotenoid content, and yield per plant exhibited elevated heritability and genetic advancement, suggesting their potential for deliberate selection and improvement. A positive correlation emerged between yield and diverse traits, as corroborated by the path coefficient analysis that identified carotenoid content as having a prominent positive direct impact on yield. To conclude, this research illuminates the latent potential of purslane as a valuable crop, accentuating the urgency of its genetic enhancement to amplify both yield and nutritional quality. These insights into the intricate relationships among distinct traits and their collective contributions to purslane's overall yield hold significant promise for guiding future breeding endeavors and informed agricultural practices.

Keywords : Common purslane, genetic diversity, traditional healthcare, trait selection,omega-3 and omega-6 fatty acids

GI/PP – 47

Speed breeding: An innovative approach to accelerate vegetable research and breeding

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ABSTRACT

Global food security is a major worry due to the expanding human population and shifting environmental circumstances as well as the fact that the current growth rates of numerous vital crops are insufficient to satisfy projected demand. The adoption of speed breeding technology which shortens the breeding cycle and speeds up agricultural research through rapid generation progress is an alternative strategy to overcome this obstacle. Speed breeding is indeed an innovative technique that has been developed to accelerate the research and breeding of various crops, including vegetables. Speed breeding is a technique which involves extending photoperiod and controlled growing conditions, enabling rapid generation advancement by shortening the breeding cycle. Speed breeding technology use as a means to improve the breeding cycle and accelerate crop research in vegetable crops. The technology involves manipulating the growth conditions of plants, such as extending daily exposure to light, to reduce the generation time. Speed breeding can achieve up to six generations per year allowing for faster variety development to meet the increasing demands of a growing population and changing environmental conditions. Speed breeding is also integration with other breeding techniques such as marker-assisted backcrossing and genome editing, to further enhance the rate of genetic gain and improve crop traits. While speed breeding offers many benefits, there are challenges to consider, such as the cost of setting up the necessary infrastructure and the potential for physiological and toxicity symptoms in plants. Nonetheless, speed breeding has the potential to revolutionize crop breeding and improve food security.

Keyword : Speed breeding, vegetable breeding, accelerate crop research, marker-assisted backcrossing

GI/PP – 48

Genetic analysis of qualitative traits in snake gourd (*Trichosanthes cucumerina* L) germplasm

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ABSTRACT

Trichosanthes cucumerina which is known as snake gourd, viper gourd, snake tomato or long tomato. The fruit is usually consumed as a vegetable due to its good nutritional value. The plant is rich in flavonoids, carotenoids and phenolic compounds. It has a promising place in the Ayurvedic and Siddha system of medicine due to its various medicinal values like antidiabetic, hepatoprotective, cytotoxic, anti inflammatory, larvicidal effects.In the present study, a total of 122 Snakegourd accessions were evaluated using thirteen qualitative traits in a Completely Randomized Design .The distribution of genotypes categorized under the selected traits and their states were computed for all the genotypes .Principal component analysis identified four components accounts for 58.78 variability in the snakegourd germplasm with PC1 Contributing 20.42% and PC2 Contributing 13 .60% .The results of the eigen vector of nine qualitative traits indicated the traits namely Plant growth habitat Tendril, Tendril type, Tendril branching, Leaf Margin, Leaf Shape, Leaf size, Biotic stress susceptibility, Leaf Apex, Stem Pubescence density, Stem Shape, Leaf Pubescence density, Leaf Pattern could serve as a distinguishable morphological markers for the characterization of *Tcucumerina* genotypes. Correlation studies that significant positive association among the traits under this study. PCA Biplot showing that Dimension 1 variability 20.4% and Dimension 2 variability 13.6%. representing their diverse nature among the genotypes. The clustering analysis separated 122 *T. cucumerina* accessions into five major clusters. Among all the cluster third cluster consist of 24 Genotypes these are promising genotypes with highest degree of divergence used for future breeding programme.

Keywords : Snakegourd, correlation, PCA, cluster

GI/PP – 49

Superiority of F1 hybrids over parents for fruit yield and its component traits in okra (*Abelmoschus esculentus* (L.) Moench)

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ABSTRACT

The present investigation was conducted on heterosis for earliness related traits and fruit yield per plant in okra. Thirty-six F_1 hybrids were generated by half diallel (excluding reciprocals) mating design. These F_1 hybrids along with nine parents were evaluated in randomized block design with three replications during three seasons *viz*., *Early kharif* 2021 (E_1), *Kharif* 2021 (E_2) and *Late kharif* 2021 (E_3) at Instructional farm, Junagadh Agricultural University, Junagadh (Gujarat). The observations were recorded on five randomly selected plants from each plot for growth and fruit yield parameters *viz*., days to first flowering, days to first picking, days to last picking, number of pickings and fruit yield per plant (g). The highest standard heterosis was observed in AOL-12-59 x GO-2 in E_1, EC 169513 x GO-2 in $E_2$and AOL-12-59 x VRO-6 in $E_3$for days to first flowering; HRB-55 x GO-2 in E_1, EC 169513 x GO-2 in E_2; and HRB 108-2 x GO-2 in E_3 for days to first picking; IC 90107 x VRO-6 in E_1, IC 90107 x EC 169513 in E_2 and E_3 for days to last picking; HRB 108-2 x JOL-11-1 and EC 169513 x AOL-12-59 in E_1, IC 90107 x EC 169513 and IC 90107 x GO-2 in E_2 and IC 90107 x JOL-11-1 in E_3 for number of pickings and EC 169513 x GO-2 in E_1, HRB 108-2 x AOL-12-59 in E_2 for fruit yield per plant. The top five heterotic cross combinations *viz.*, HRB 108-2 x AOL-12-59, HRB 108-2 x HRB-55, EC 169513 x GO-2, IC 90107 x EC169513 and HRB 108-2 x EC 169513 were identified as desirable heterosis for fruit yield and other earliness related traits in one or another environment in okra.

Keywords : Okra, half diallel, heterosis for earliness

GI/PP – 50

Performance of selected exotic chilli genotypes in Maharashtra

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ABSTRACT

Chilli has diverse uses as spice, condimentand culinary supplement, medicine, vegetable and ornamental plant. It is one of the most important spice crops grown in India having great export potential. India is the largest consumers of chilli and chilli contributes to 42% of the total spice export from India. Evaluation and characterization of germplasm is the first step for utilizing the available plant diversity for crop improvement and breeding programme. Twelve exotic chilli genotypes procured from AVRDC, Taiwan through NBPGR, New Delhi and evaluated in pots at Pune condition with Kashi Anmol as a standard check. Genotypes varied considerably with respect to plant growth, flower and fruit characters. The genotypes also showed wide variations in the plant height (50.85-96.46cm), days to first flowering (30.47-50.00), days to first harvest (58.71-75.26), fruits/plant (6.51-25.60), fruit length (4-13.67cm), fruit diameter (0.52-1.44cm), fruit weight (1.97-7.85g), seeds/fruit (31.33-173.20), 100 seed weight (0.17-0.56g) and TSS (3.20-7.75°Brix). Highest yield/plant of 136.88 g obtained in the line EC777201which was nearly the double than standard check Kashi Anmol (76.82g). Line EC777196 (107.4 g) and EC777199 (89.9 g) also showed higher yield/plant compared to Kashi Anmol. Line EC777204 yielded on par with standard check while yield in all other lines was significantly less and were in the range of 28 - 67.6 g. Vitamin C content of 169.12, 167.07, 165.42, 163.23, 158.95 mg/100gm FW observed respectively, in lines EC783760,EC777197, EC777200, EC777201 andEC777196 was significantly higher compared to Kashi Anmol (147.12 mg/100gm). Lowest population of thrips (thrips number/ sample) was observed in EC777197 (2.1) followed by EC777199 (2.8), while the Kashi Anmol recorded 4.9 thrips/ sample. Among the genotypes tested, the lines EC777201, EC777196 and EC777199 found promising in Pune-Maharashtra region as these lines performed better than check Kashi Anmol in terms of yield and quality. While EC777199 also showed low thrips population in addition to better yield and quality. The observed results needs verification under field condition and under different agro climatic regions before utilising them for cultivation or in future breeding programmes.

Keywords : Chilli, diversity, characterization, genotypes, breeding

GI/PP – 51

Evaluation of genetic variability, heritability and genetic advance among the characters of sponge gourd [*Luffa cylindrica* L. (Roem)]

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ABSTRACT

The present investigation was conducted during spring-summer (March-June) and rainy (July to October) seasons of 2019 at vegetable Research Farm of College of Horticulture, Banda University of Agriculture and Technology, Banda (Uttar Pradesh) to determine genetic variability, heritability and genetic advance of sixteen sponge gourd germplasm which was laid out in Randomized Block design (RBD) with three replications. Study result reveled that phenotypic coefficient of variance(PCV) was higher than genotypic coefficient of variance(GCV) for all the traits studied *viz*., days to 50% germination, days to first male flower emergence days to first female flower emergence, node number of first male flower, node number of first female flower, intermodal length (cm), number of leaves per plant, leaf area cm^2), number of branches, male/female ratio, days to first picking)fruit length (cm), fruit diameter (cm), specific gravity of fruits (g/cm^3), total soluble solids (^{0}Brix), dry matter content (%), fruit weight (g), number of fruits per plant and fruit yield per plant (kg). It indicated that the apparent variation is not only genetic but also influenced by the growing environment in the expression of the characters. High GCV & PCV, heritability and genetic advance as percentage of mean was estimated for number of branches, fruit diameter, number of fruits per plant and fruit yield per plant across the spring summer and rainy season.

Keywords : Sponge gourd, genetic variability, heritability and genetic advance

GI/PP – 52

Genetic analysis in vegetable cowpea (*Vigna unguiculata*)

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ABSTRACT

A field study on genetic analysis in vegetable cowpea (*Vigna unguiculata*) was conducted during 2020-2023. The experimental materials includes seven vegetable cowpea varieties viz., Arka Garima, PKM 1, Arka Samruti, Pusa Komal, Gomati, Kashi Kanchan and Kashi Nidhi were evaluated for yield and yield attributing traits *viz*., number of branches per plant, days to 1st flowering, days to 50% flowering, pod length (cm), pod girth (cm), number of pods per plant, pod weight (g), pod yield per plant (g) and yield per hectare (q). The experiment was laid out in a randomized block design and replicated thrice. The results revealed that the variety Arka Garima and Arka Samruti produced higher number of branches per plant. It was followed by PKM – 1, Pusa Komal and Kashi Nidhi. Among the seven varieties evaluated for earliness, the variety PKM – 1 bloomed earlier and took minimum number of days for days to Ist flowering and days to 50% flowering. It was followed by Gomti and Kashi Nidhi. Higher pod length and pod girth was recorded by PKM -1 and it was followed by Kashi Kanchan and Kashi Nidhi. Higher number of pods per plant was noticed in Pusa Komal, Gomati, Arka Garima and Arka Samruti. Maximum pod weight was observed in PKM – 1, Kashi Kanchan and Arka Garima. The highest yield per plant and yield per hectare was noticed in Arka Garima (21.35 q), PKM – 1 (20.88 q), Arka Samruti and Kashi Kanchan (20.47 q). Analysis of variance of the present study indicated the significant differences among the varieties for all the studied traits suggested that the existence of variability and offered opportunities for the improvement of yield and yield attributing traits through selection. Higher PCV and GCV values were observed for the traits *viz*., pod length, number of pods per plant, pod weight, yield per plant and yield per hectare. High PCV and moderate GCV value was recorded by the trait pod girth. Low estimate of PCV and GCV values were recorded for the traits number of branches per plant, days to Ist flowering and days to 50% flowering. Estimates of high heritability and GA were recorded for the traits pod length, number of pods per plant, pod weight, yield per plant and yield per hectare. Whereas the trait pod girth recorded high heritability estimate and moderate GA estimate. The other traits, number of branches per plant, days to Ist flowering and days to 50% flowering registered low estimate of heritability and genetic advance.

Keywords : Vegetable cowpea, *Vigna unguiculata,* variability, heritability, GA

GI/PP – 53

Evaluation of yard long bean (*Vigna unguiculata ssp. sesquipedalis*) genotypes for yield and quality traits

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ABSTRACT

A field study on Evaluation of yard long bean (*Vigna unguiculata ssp. sesquipedalis*) genotypes for yield and quality traits was carried out during 2022-2023 at Grapes Research Station, Anaimalayanpatty, Theni district. The study was undertaken with fourty two genotypes of yard long bean (*Vigna unguiculata L. var. sesquipedalis*) for yield and quality attributes using a Randomised Block Design (RBD) with three replications. The mean performance, genetic parameters *viz*., genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV), genetic advance (GA) and heritability (h^2) were detected for days taken for germination, days taken for first flowering, days taken for fifty per cent flowering, number days taken for pod formation, vine length, number flowers cluster^{-1}, number of pods cluster^{-1}, pod setting per cent, pod length, pod girth, individual pod weight, 100 pod weight, number of pods plant^{-1}, pod yield plant^{-1}, pod yield hectare^{-1}, number of seeds pod^{-1}, 100 seed weight, protein, crude fibre, carbohydrate, vitamin A, micronutrients (Fe, Mn, Zn, Cu), dry matter production, sucking pest (Aphids), pod borer, powdery mildew, anthracnose and viral disease (Bean mosaic virus). The results revealed that higher vine length values were recorded by EC-769236, IC-471938, EC-769248 and EC-769229. Regarding earliness the genotypes EC-769241. EC-769229 and EC-769231 took less number of days for days to Ist flowering and days to 50% flowering. The genotypes EC-769251, IC-471949 and EC-769247 were recorded higher number of pods per plant. Higher yield per hectare was noticed with EC-769247, EC-769240 and IC-471951. The results of analysis of variance showed that highly significant difference among the genotypes indicated that the presence of appreciable amount of variability among the genotypes that offers good scope for selection of genotypes with desirable traits. From the study it was noticed that the phenotypic coefficient of variance values were higher than genotypic coefficient of variance for all the traits. Higher PCV and GCV values were registered by the traits pod length, individual pod weight, 100 pod weight, pod weight per plant, pod yield per hectare, protein content, sucking pest, pod borer, powdery mildew, anthracnose and viral disease. High estimate of heritability and genetic advance was noticed with days taken for germination, plant height, number of flowers per cluster, number of pods per cluster, pod setting percentage, pod length, pod width, individual pod weight, number of pods per plant, 100 pod weight, pod yield per plant, pod yield per hectare, number of seed per pod, 100 seed weight, protein, crude fibre, carbohydrate, manganese, copper, zinc, sucking pest, pod borer, powdery mildew, anthracnose and viral disease.

Keywords : Yard long bean, genetic advance, GCV, PCV, h^2 , GA

GI/PP – 54

Exploration of wide diversity and evaluation of underexploited local cultivars of cucumbers *Cucumis melo sub species agrestis* in comparision with *Cucumis sativus*

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ABSTRACT

Cucumber belongs to the family Cucuritaceae and the genus Cucumis is having two species *Cucumissativus*and *Cucumismelo*. Of the two species *C. melo*is a having a wide diversity for fruit characters which is classified into many botanical groups. One of botanical group (Unknown/ New) which is not fully exploited belongs to sub species *agrestis*. Local cultivars of *C. melo* sub species *Agrestis* (unknown group) with many desirable economic traits being cultivated as commercial crop in few districts of Karnataka are least exploited in crop improvement programmes. These local cultivars in regional language are known as Cucumbers as most of the fruit traits are similar to *sativus* types. In the present investigation to understand the variability within and between the species of *melo* and *sativus* 150 genotypes in which 116 are melo and 34 are *sativus* types were evaluated in *Kharif*2019 for growth, yield and fruit quality traits. Three checks including one local cultivar of *melo* were considered for evaluation. Results revealed the significant differences for all the traits among the treatments and among the checks and few traits showed no significant differences among the treatments verses checks. High PCV and GCV was reported high for vine length, node number of first female flower and number of female flowers. High heritability for sex ratio, days to fifty percent flowering and high GAM for all the traits except days to first female flower, days to first fruit set and sex ratio. For fruit quality traits wide diversity reported for fruit colour,fruit length and shape. Results indicated the high amount of variability existing in *melo*compared to *sativus* types and most of the traits are highly heritable in nature that can be exploited for efficient selection to develop improved varieties.

Keywords : Exploration, *Cucumis melo*, cucuritaceae

GI/PP – 55

Genetic variability, correlation and path analysis of *Momordica cymbalaria*

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ABSTRACT

Athalakkai (*Momordica cymbalaria*) is a perennial herbaceous climber, belongs to the family cucurbitaceae. It is a plant more or less similar to bitter gourd. It is commonly known as Karchikai (Kannada) or Athalakkai (Tamil) or Kasarakayee (Andhra Pradesh) and Kakrol (Hindi). Athalakkai comes under underutilized vegetable and it is widely distributed in the tropical regions of Africa and India. In Tamil Nadu, it is found in Virudhunagar, Madurai, Theni, Dindigul, Tuticorin and Ramanathapuram districts and vegetables are available in the market during November to January. Athalakkai is used as a vegetable by the rural people of South Tamil Nadu, India. However it is not very popular because of its bitter taste, a lack of understanding of its nutrient content and non availability of standard recipes. Many athalakkai types are grown as wild and it is available in Southern parts of Tamil Nadu. There is no named variety available in India and it has occurrence of wide variability is common. With this background, the present study, significant variations in the mean performance of 23 athalakkai genotypes for 16 traits were observed which revealed that the germplasm collections being maintained have high breeding value. The high estimates of PCV for the number of fruits per vine (38.39 %), number of seeds (38.63 %) and moderate PCV and GCV observed for the most of the traits which indicated the presence of adequate genetic variation among the genotypes. High heritability estimates coupled with high genetic advance for the number of fruits per vine, vine length, yield per plant and number of fruits per plant confirmed that these traits are under control of additive gene action. Yield per plant had significantly and positive correlation with vine length, number of seeds, number of fruits per plant, number of fruits per vine, fruit weight, fruit stalk length. Number of fruits per plant had significant and positive correlation with vine length, fruit length and number of fruits per vine and negative correlation with days to first flowering, fruit girth and days to sprouting.

Keywords : *Athalakkai*, PCV, GCV, heritability, correlation, path analysis, yield

GI/PP – 56

Evaluation of underutilized vegetable *Momordica cymbalaria* genotypes for growth and yield characters

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ABSTRACTS

The evaluation of twenty three athalakkai (*Momordica cymbalaria*) for growth, yield and quality characters" was carried out at College Orchard, Department of Horticulture, Agricultural College and Research Institute, Madurai during 2020 - 2021 with the aim to identifying high yielding athalakkai accessions suitable for commercial cultivation of southern Tamil Nadu. A field survey was conducted at Virudhunagar, Dindigul, Madurai and Theni districts and collected twenty two accessions of athalakkai. The collected tubers were planted during Rabi season with the bed size is 3 x 3 m. The present field experiment was laid out in a Randomized Block Design (RBD) with twenty three treatments and replicated thrice. Observations such as growth, yield and quality characters were recorded and analysed statistically. Analysis of variance for 16 characters of athalakkai genotypes results revealed that mean squares due to genotypes were highly significant for all traits, thereby suggesting existence of great amount of variation among the genotypes. The results revealed that among the twenty three accessions, MC-2 (Pudupatti local) recorded the highest values in growth and yield characters such as days taken for flowering (18.50 days), vine length (140.67 cm), number of vines per plant (8.67), number of fruits per vine (12.30), number of fruits per plant (71.67), fruit length (4.91 cm), fruit girth (3.76 cm), fruit weight (0.93 g), leaf petiole length (4.01 cm), fruit stalk length (1.81 cm), number of seeds per fruit (3.68) and yield (57.10 g/plant) followed by MC – 14 (Chittur local), whereas MC–12 (Kovilangulam local) registered the lowest values in all the traits. MC–12 (Kovilangulam local) recorded the highest days (6.67 days) taken for sprouting, whereas the MC – 2 (Pudupatti local) found the least days taken for sprouting (5. 67 days). Regarding quality characters, MC-12 registered the highest in vitamin C (289.00 mg/100 g), Crude fibre content (6.40 g), protein (2.15 mg/100 g), whereas MC-12 registered the lowest content of quality characters (284.12 mg/100 g; 6.30 g; 2.15 mg/100 g). The present study it was concluded that MC-2 (Pudupatti local) performed well under Madurai condition and need for further evaluation.

Keywords: *Athalakkai, Momardica cymbalaria,* genotypes, evaluation, yield, quality

GI/PP – 57

Studies on path coefficient analysis in mithipagal (*Momordica charantia* var. *muricata*) genotypes

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ABSTRACT

The current investigation was conducted at Tamilnadu Agricultural University, Coimbatore, with the aim of exploring "Path coefficient analysis in various genotypes of Mithipagal *(Momordica charantia* var *muricata*)." Various observations were made, including measurements of vine length, days to male flower inflorescence, days to female flower inflorescence, node of first male flower appearance, node of first female flower appearance, sex ratio, number of fruits per vine, fruit weight, fruit length, fruit girth, number of seeds per fruit, yield per vine, ascorbic acid, protein content, iron content and total soluble solids. The study involved an examination of path coefficient analysis among different genotypes. The findings revealed that, among the 16 traits under investigation, individual fruit weight and the number of fruits per vine demonstrated a strong and positive direct influence, while fruit length and the days to first female flower inflorescence exhibited a positive and moderate direct effect. Vine length, on the other hand, showed a positive but relatively weaker direct effect. Understanding these statistical factors can help identify genotypes with greater yield potential, contributing to the enhancement of Mithipagal genotypes.

Keywords: Mithipagal, yield, path coefficient analysis.

GI/PP – 58

Studies on per se performance of under utilized green leafy vegetables in salt affected soils

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ABSTRACT

Increasing urbanization and population has resulted in use of marginal lands for crop cultivation. Among identified biotic and abiotic stresses, salinity is one of the key factors responsible for yield reduction. Green leafy vegetables are good source of vitamins, minerals and fibre. Greens are good supplements for iron, since it is present in its most metabolically active form than in any other vegetables. Hence, an experiment was conducted at Horticultural College and Research Institute for Women, Trichy in soil with pH of 8.5 and the EC 1.5ds/m, to investigate the effect of salinity on per se performance green leafy vegetables under open field conditions. The experiment was designed to identify suitable green leafy vegetables for salt affected soils. Six different amaranthus varieties of six different species *Amaranthus dubius, A tricolor, A tristis, A hypochodriacus, A blitum, A polygonoides* and palak *Beta vulgaris* var *bengalensis* were chosen for the experiment. All the seven green leafy vegetables were replicated thrice in randomized block design and data were recorded. All the species under salt stressed condition showed delayed germination and lesser surviving rate irrespective of the variety. The results clearly indicated that among different Amaranthus species, *Amaranthus dubius* showed increased yield followed by *Amaranthus tristis* and *Beta vulgaris var bengalensis*. Germination percentage (90%), shoot length (18.50 cm), leaf area (2115 cm^2), total dry matter production (155.2g), relative water content (93.7%), chlorophyll stability index (88.10 mg/g) and proline content (0.527µg g^{-1}) were highest in palak which might be the reason for increased yield (612g) of palak. Results revealed that salt affected soil decreased germination, growth and yield in most of green leafy vegetables and palak was found to be comparatively suitable.

Keywords : Underutilized green leafy vegetables, salt affected soil, per se performance

GI/PP – 59

Speed breeding: A promising tool to accelerate crop production

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ABSTRACT

Global human population growth amounts to around 83 million annually and it is estimated this will grow till 9.8 billion by mid-2050. Providing global food security to this growing human population makes the pressure high on researcher and the changing climatic scenario makes the crop improvement much back breaking. The conventional breeding methods have given lot of high yielding verities but these methods are taking longer time to accelerate the crop improvement so the faster crop improvement rate can be achieved by the method called 'speed breeding' for improving crops genotypically as well as phenotypically. Speed Breeding greatly shortens generation time and accelerates breeding and research program. Speed breeding is likely to reduce generation time for crop like tomato, potato, amaranthus (can be produce eight generations per year instead two in the field), pepper (early flowering and fruiting under continuos light), onion and potato (early senescence), sugarbeet and one of the most exciting research is done that the level of nitrate and other oxalate can be modified in leafy vegetables under different light intensity. This accelerated research can be achieved by providing crops 24 hours of artificial lights and optimum relative humidity and temperature in controlled environment like glasshouse. The use of supplemental lighting in a glasshouse environment allows rapid generation cycling through single seed descent (SSD). Crops are harvested to earliest germination of seed condition from the date of sowing to increase generations per year. Speed breeding as a platform can be combined with several other technologies such as marker assisted selection, genomic selection, CRISPR gene editing, etc. to get to the end result faster.

Keywords : Speed breeding, accelerated research, single seed descent, genomic selection

GI/PP – 60

Collection evaluation and development of improved variety in clutter bean (*Cyamopsistetragonoloba (L) Taub*)

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ABSTRACT

Guar or cluster bean (*Cyamopsistetragonoloba* (L) Taub) 2n=14, is drought tolerant annual multipurpose legume. In Tamil Nadu, the total area of cultivation of cluster bean is 1000 ha (as per status) since it is are latively tolerant to salt, water stress, high yield under adverse conditions and needs less fertilization, it is suitable for small and marginal farmers and also suitable to cultivate problematic soil condition. In Tamil Nadu there is no specific variety available and farmers are used to cultivating the local landraces and Pusanaubahar. Hence, identification of a suitable genotype with better yield and quality by utilizing the genetic variability is need for an hour. Totally seventy-three genotypes were collected from different parts of India. Out of 73 genotypes were evaluated narrow down to 27 genotypes based on yield performance. Six superior-yielding genotypes isolated based on yield and other desirable characters were evaluated for three different seasons. Considering the yield potential over seasons, quality parameters *viz.,* crude fibre, colour, texture, taste, overall acceptability and resistance to powdery mildew, the ACC.IC432117 is suitable for cultivation in southern districts of Tamil Nadu.

Keywords : Clutter bean, drought tolerant, legume

GI/PP – 61

Genetic variability studies for yield and yield attribute traits in spine gourd (*Momordica dioica Roxb.*)

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ABSTRACT

Spine gourd (*Momordica dioica* Roxb.) belongs to the Cucurbitaceae family, which cultivated in semi-domestic and wild forms in local pockets. It is a nutritionally rich, dioecious and perennial cucurbit with a wide range of suitability distributed throughout India and many other countries. Twelve distinct spine gourd genotypes were evaluated for variability and heritability of essential agronomic traits and their associations with fruit yield per vine revealed a substantial genetic diversity among the spine gourd genotypes, with significant differences observed across all the traits studied. Notably, traits such as 100 seed weight, average fruit weight, fruit length, fruit diameter, and yield per vine exhibited wide variability, coupled with high GCV and PCV. High estimates of heritability and genetic advance over the mean (GAM) were identified for multiple characters, including vine length, number of branches, number of fruits per plant, days to first harvest, days to the opening of the first female flower, fruit size (weight, length, and diameter), yield per vine, seed weight per fruit, 100 seed weight, protein content, total antioxidants, and Vitamin C content indicating that these traits are predominantly governed by additive genetic components, highlighting the efficacy of direct selection for their improvement. Correlation and path analysis revealed that fruit yield per vine exhibited significant positive associations with several traits, including fruit weight, fruit diameter, fruit length, seed cavity length, 100 seed weight, days to the opening of the first female flower, days to first harvest, vine length, number of branches, and internodal length. These traits were identified as key determinants of fruit yield per vine, emphasizing their importance in breeding programs for enhancing spine gourd genotypes.

Keywords : Genetic variability, spine gourd, fruit yield

GI/PP – 62

Genetic diversity analysis of ajowan (*Trachyspermum ammi* L.) genotypes for yield and physiological parameters

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ABSTRACT

Ajowan (*Trachyspermum ammi* L.) is a herbaceous annual plant belonging to the family Apiaceae. Collection of ajowan germplasm in various region of India was done to study the nature of genetic diversity which would help in choosing the right trait specific genotypes for further breeding programme. Field study and laboratory experiment was conducted at HC&RI, TNAU, Periyakulam. Totally 15 physiological parameters were studied by randomly selected plants from each genotype and the results were used for statistical analysis. In the present investigation results showed that, the highest variation was found in chlorophyll content 'a', 'b' and total chlorophyll at vegetative stage, flowering stage and fruit setting stage. The other physiological parameters *viz.,* CSl and RWC also exhibited higher variation at vegetative stage, flowering stage and fruit setting stage. The distribution of characters among the genotypes were formed five different clusters., Cluster I included the highest number of genotypes (16 genotypes) and cluster II, III, IV& V includes each 1 genotype. On the basis of D^2 values of selected ajowan genotypes were grouped into 5 clusters suggesting the existence of genetic diversity among the genotypes. From the results, it was noticed that inter cluster distance ranged from 55.01 to 99.38 also larger than intra - cluster ranges from 68.07 to 98.38 indicating wide range of genetic diversity among the germplasm. The highest inter cluster distance (99.38) was observed between cluster III& IV. The CSI at fruit setting stage (26.84%), seed yield/ha (22.11%), CSI at vegetative stage (13.16%), chlorophyll 'b' at flowering stage (11.58%), chlorophyll 'a' at flowering stage (6.84%) and chlorophyll 'b' at vegetative stage (6.32%) is contributing of high divergence among the characters. The cluster V (Acc. No.3) is exhibit the highest D^2 to produce desired traits for further breeding programme.

Keywords: Ajowan, cluster, chlorophyll, CSI, diversity (D^2) and RWC

GI/PP – 63

Evaluating F_1 hybrid snake gourd (*Trichosanthes anguina* L.) varieties: A comprehensive study on heterosis, combining ability, yield, quality traits and genetic profiling with microsatellite markers

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ABSTRACT

A comprehensive study aimed at improving snake gourd (*Trichosanthesanguina* L.) productivity involved crossing six elite parental linesPKM-1, Manusree, Kaumudi, IC 347377, CO-2, and IC 212513 in a half-diallel fashion, yielding 15 F_1 hybrids. In the *Rabi* of 2022-23, these hybrids, parent lines, and commercial checks underwent a thorough evaluation for 18 critical biometric traits, including flowering times, fruit characteristics, and nutritional content. Promising F1 hybrids emerged, with Manusree x CO-2, PKM-1 x CO-2, CO-2 x IC 212513, and PKM-1 x IC 347377 exhibiting superior fruit yield per vine and desirable traits compared to commercial checks, demonstrating significant standard heterosis. The study revealed substantial genetic diversity within the material, with non-additive gene action prevailing for all examined traits. PKM-1, Manusree, and CO-2 were identified as strong general combiners for fruit yield and related characteristics based on their general combining ability effects. Specific combining ability effects pinpointed Manusree x CO-2, CO-2 x IC 212513, PKM-1 x CO-2, and PKM-1 x IC 347377 as hybrids with remarkable potential for fruit yield per vine and average fruit weight. These hybrids consistently displayed desirable per se performance, significant specific combining ability effects, and heterosis for essential traits. To validate heterozygosity of the F_1 hybrids, DNA analysis used EST-SSR markers. Nine Expressed Sequence Tags Simple Sequence Repeat markers assessed genetic diversity and heterozygosity among the 15 hybrids and their parental lines. Four polymorphic SSR markers effectively confirmed the heterozygous nature of the hybrids, distinguishing them from their parents. In summary, this study identifies Manusree x CO-2, PKM-1 x CO-2, CO-2 x IC 212513, and PKM-1 x IC 347377 as promising F_1 hybrids for snake gourd cultivation, emphasizing improved yield and desirable traits. Molecular markers successfully confirmed heterozygosity, enhancing our understanding of the hybrids' genetic basis for more efficient breeding strategies in the future.

Keywords : Snake gourd, heterosis, combining ability, molecular markers

GI/PP – 64

Performance of arrowroot (*Maranta arundinacea* L.) genotypes for rhizome yield and quality

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ABSTRACT

Arrowroot *Maranta arundinacea L*, is a perennial plant in family Marantaceae with chromosome number 2n=48. Being a warm and humid climate crop it grows well in drained soil. It is highly valued for its starchy rhizomes used to extract a fine, powdery starch known as arrowroot starch. Arrowroot starch is a valuable ingredient in the food industry, serving as a gluten-free substitute for wheat flour with excellent thickening properties and is often used in soups, sauces, puddings, and baked goods. The starch is easily digestible and well-tolerated by individuals with dietary restrictions or sensitive digestive systems and suitable for infant foods. Arrowroot has been used in traditional medicine for its potential health benefits. There is a huge scope in understanding its nature, biochemical properties and its post-harvest utilization. Hence, collection of arrowroot accessions is vital for evolving superior genotype. An attempt has been made to collect different accessions for creation of new varieties and study of biochemical characters in rhizome, starch quality and its suitability for food industries. The current study was conducted at HC&RI, Orchard, TNAU, Coimbatore during 2022-23 with ten accessions in randomized block design with two replications. TAr18-01, TAr18-02, TAr18-04, TAr18-05, TAr18-10, TAr18-11, TAr18-12, TAr18-13, TAr18-14 and Local were evaluated for their *per se* performance for growth, yield and quality parameters. Maximum values were recorded in TAr18-14 for plant height (132.01 cm), number of tillers (8.45) biggest rhizome weight (198.81g) whereas, TAr18-10 had more number of leaves (109.33). The yield traits like rhizome length (25.49 cm), diameter (9.46cm) and number of rhizome per plant (30.00), rhizome yield per plant (1.49kg) were maximum in TAr18-10. The quality parameters *viz*., dry matter (%) was highest in TAr18-10 (56.76%),TSS in TAr18-12 (27.83%), ash contents in TAr18-10 (3.88%). Among various accessions TAr18-04 recorded the highest starch (54.62%) and amylopectin (33.06 %) and TAr18-14 recorded highest protein content (6.194%). Amylose content (21.88 %) was maximum in TAr18-01. Among the growth, yield parameters, variation components like PCV ranges from 20.76 to 37.93 per cent and GCV from 17.17 to 34.79 per cent respectively. Whereas, for the biochemical traits variation ranges is 4.62 to 18.56 % (PCV) and 3.37 to 18.07 % (GCV). The current study revealed existence of variation in morphological, yield and quality traits among arrowroot accessions.

Keywords: *Per se* performance, GCV, PCV, rhizome yield, starch

GI/PP – 65

Study on extent of genetic variability and character association in mutagen treated population ($M_1$and M_2generation) of *Momordica balsamina* L.

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ABSTRACT

Momordica balsamina L. commonly known as the Balsam apple is an under-exploited cucurbit vegetable occurs wild type in nature which offers various dietary and nutraceutical properties. It is an annual to perennial, tendril-bearing herb, native to tropical regions of Africa. Since the crop occurs in wild forms, the variation exists among the genotype is limited.For the improvement of plant characteristics in diverse crops, mutation breeding has been extensively applied.In the present study, treated population was evaluated to study the extent of genetic variability and character association on growth and yield parameters in M_1 and M_2 generation of *Momordica balsamina*L. The results revealed that high heritability was exhibited by vine length at harvest, number of branches per plant at harvest, stem diameter, leaf area, number of fruits per plant, fruit girth, lycopene content, β-carotene content and ascorbic acid content. As per the character association studies, fruit yield per plant showed highly significant and positive association with number of fruits per plant, fruit weight, fruit length and days to first flowering. Whereas, highly significant but negative association was revealed by number of branches per plant at harvest, stem diameter and days to 50 per cent flowering among mutant population. Whereas, vine length at harvest, number of fruits per plant, fruit weight, fruit length and fruit girth recorded highest positive direct effect on fruit yield per plant. While, number of branches per plant at harvest, stem diameter and days to 50 per cent flowering exerted negative direct effect on fruit yield per plant.

Keywords: *Momordica balsamina* L., under-exploited, mutation, variability, heritability, character association

GI/PP – 66

Recent approaches in lettuce breeding

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ABSTRACT

Lettuce (*Lactuca sativa*.) is an annual and self-pollinating crop that belongs to the Asteraceae (Compositae) family. It is one of the most globally essential commercial vegetable crops, used in salads and sandwiches. it is rich in fiber, antioxidants, antiproliferative compounds (vitamins C, E, polyphenols and carotenoids) and phytochemicals like (anthocyanins and chlorophylls. According to traditional culture, it is used in the treatment of a variety of health disorders, including insomnia, neuropathy, dry cough, rheumatic pain and anxiety. Like other crops, lettuce production is hindered by biotic and abiotic stress. Traditional approaches like selection and hybridization were used to develop resistant varieties, but these methods have their own limitations because of sticky pollens, difficulty in producing hybrid seed without selfed seed and the small number of seeds are produced from each pollination. There are many recent approaches which would help to overcome these difficulties such as, Haploidization can produce pure lines; Molecular marker-assisted breeding can help to construct the genetic map and to identify the QTL's for biotic and abiotic stress; Biochemical markers can distinguish between lettuce and wild lettuce genotypes; Bioinformatics shows the number of protein genes and RNAs in lettuce; Using advances in molecular techniques and genome sequencing, genetic engineering provides tools to improve lettuce yield and quantity. Injection with the *ipt* gene, slows down the senescence of mature leaves. CRISPR/Cas9 system helps in the precise genome editing; Mutants were also used to develop new lettuce products including miniature and herbicide-tolerant cultivars. Mutagenesis combined with genomic technology like TILLING may provide powerful tools for the discovery of novel gene alleles.

Keywords: Lettuce, haploidization, molecular marker, CRISPR/Cas9, mutagenesis

GI/PP – 67

Evaluation of morphological traits in cowpea [*Vigna unguiculata* (L.) Walp.] genotypes cultivated in north-east India

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ABSTRACT

A study was conducted during the kharif season 2022 at the Vegetable Research Farm, located within the College of Horticulture and Forestry at Central Agricultural University in Pasighat, East Siang, Arunachal Pradesh, India to investigate "Evaluation of Morphological Traits in Cowpea [*Vigna unguiculata* (L.) Walp.] Genotypes Cultivated in North-East India". These morphological traits demonstrated significant variation among the twenty locally accessible genotypes. Qualitative traits such as growth habit, twining habit, foliage colour, leaflet shape, flower colour, pod shape, pod colour, seed shape, seed colour were recorded. Quantitative characters such as days to 50% flowering, plant height (cm), leaf area (cm²), number of clusters per plant, number of pods per cluster, number of pods per plant, pod length (cm), pod width (cm), days to harvest, number of seeds per pod, 100 seed weight (g) and pod yield per plant (g) were studied. The mean performance revealed that CHF CP-12 gave highest pod yield per plant (589.19 g), highest 100 seed weight in CHF CP-12 (24.67 g), longest pod length in CHF CP-5 (32.77 cm), longest pod width in CHF CP-10 (1.07 cm), maximum number of clusters per plant was recorded in CHF CP-12 (14.16), maximum number of pods per plant in CHF CP-17 (11.80) and maximum leaf area was recorded in CHF CP-6 (229.30 cm²). The minimum number days taken for 50% flowering was found in genotypes CHF CP-9 (45.67).

Keywords: Cowpea, genetic diversity, landraces, variation, genotype

GI/PP – 68

Assessment of genetic variability in segregating generation of *Lagenaria siceraria* (Mol.)

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ABSTRACT

Presence of genotypic and phenotypic variability is a prerequisite to develop varieties according to the requirements. However, the variability discovered in bottle gourd has attracted less attention in crop improvement. The study conducted in five progenies from each F_3 and F_4 generations of the bottle gourd cross GH-29×NDBG-15 at Vegetable Research Farm of CCS HAU, Hisar during spring-summer and rainy seasons of 2021–22 confirmed variability in various yield and yield contributing traits. Fruit yield per hectare showed high GCV (20.96%) in F_4 generation and high PCV (25.80% and 26.74%), moderate heritability (56.14% and 61.44%) and high genetic advance (29.84% and 33.84%) in F_3 and F_4 generations, respectively. The number of primary branches showed moderate values of GCV (10.71% and 13.34%) and PCV (11.20% and 13.71%), with high heritability (91.49% and 94.70%) and high genetic advance (21.10% and 26.74%) in F_3 and F_4 generations, respectively. Fruit length recorded high PCV (23.88%) in F_3 and high estimates of GCV (24.70% and 21.92%), heritability (93.47% and 80.87%) and genetic advance (47.56% and 36.52%) F_3 and F_4 generations, respectively. Number of fruits per vine showed moderate values of GCV (11.92% and 13.74%), PCV (16.76% and 17.52%) and heritability (50.61% and 61.45%) F_3 and F_4 generations, respectively Swith moderate genetic advance (17.47%) in F_3 and high genetic advance (22.18%) in F_4 generation. Progeny 3 and 5 outperformed in terms of yield contributing traits. Greater values of GCV than PCV indicated negligible effect of environment on the expression of trait. Heterozygosity resulted in fluctuations in genetic variability values across generations, which maybe fixed once homozygosity is achieved in subsequent generations.

Keywords : Bottle gourd, variability, generation, heritability, progenies

GI/PP – 69

Assessment of genetic variability for growth and yield parameters in smooth gourd (*Luffa cylindrica* (L.) Roem.)

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ABSTRACT

Smooth gourd [*Luffa cylindrica* (L.) Roem.] is one of the minor cucurbitaceous vegetable crop grown extensively throughout the tropical and sub-tropical regions of the world. Genetic variability, heritability and genetic advance study was conducted in 40 sponge gourd genotypes with two replications in a RCBD design at the Department of Vegetable Science, College of Horticulture, Bagalkot during the year 2020-21. High (> 20%) genotypic coefficient of variation (GCV) and phenotypic coefficient variation (PCV) were observed for vine length at 45 DAS, number of branches at 45 DAS, fruit yield per vine, fruit yield per plot, fruit yield per hectare and number of seeds per fruit indicated existence of broad genetic base for these characters, which would be amenable for further crop improvement. High estimates of heritability (> 60 %) coupled with high genetic advance as per cent of mean (> 20 %) were recorded for vine length at 45 DAS, number of branches at 45 and 90 DAS, node at first male and female flower, fruit length, average fruit weight, number of fruits per vine, fruit yield per vine, fruit yield per plot, fruit yield per hectare, number of seeds per fruit and sponge yield assured that there is a prepondence of additive gene action and selection for the these traits is reliable for development of high yielding cultivar of smooth gourd.

Keywords : Smooth gourd, variability, heritability, genetic advance

GI/PP – 70

Characterization and genetic variability of snap melon (*Cucumis melo* var. *momordica*) genotypes for yield and quality.

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ABSTRACT

An experiment was carried out in the Department of Vegetable Science, University of Horticultural Sciences, Bagalkot, during *Rabi* 2020. Twenty-eight accessions were collected from different parts of India were grown in randomized block design with two replications and were evaluated for the genetic variability and its morphology. In each treatment or genotype, five plants were randomly selected for recording the observations on various parameters. The traits like hairiness on stem, tendril type, tendril branching, leaf margin, flower colour, sex type, fruit skin 1^0 and 2^0 colour, design produced by 2^0 skin colour, fruit shape, fruit cracking habit and other quantitative traits were studied and grouped into different categories based on their morphological character.Analysis of variance revealed that there is a considerable variability exists among the genotypes for all the characters studied. High estimates of genotypic and phenotypic coefficient of variation and high heritability coupled with high genetic advance as per cent mean were recorded for vine length, node to first male flower, average fruit weight, fruit yield per vine, length of fruit cavity, pulp placenta ratio, number of seeds per fruit, 100 seed weight, protein, vitamin C, total ash, calcium, fat and phosphorus, suggesting better scope for improvement of these traits by effective selection of genotypes.

Keywords : Snap melon, fruits characters, genetic variability, *Cucumis melo*

GI/PP – 71

Conservation and utilization of underutilized floating lace plant (*Aponogeton natans* L.): challenges and opportunities

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ABSTRACT

Aponogeton natans L. is also known as floating lace plant belonging to Aponogetonaceae family, its one of the underutilized vegetable crop naturally found in submerged and aquatic ecosystem. Floating lace plant also called as Kotti kizhanku in Tamil, Neeru balli in Kannada, Nanna puvvumokka in Telugu and Paruakizhangu in Malayalam. Origin of this species is India to Myanmar and extent upto Sri Lanka. In the conservation of this plant is mostly found in submerged floated areas and its used as a aquarium in the western countries. Whereas, the utilization of this floating lace plants are, tuber is ground with water and the paste is applied topically, heat reliever and paste used as wound healing. The tuber are directly boiled with water and its used for culinary purpose for humun consumption. Tuber is economic part, its showed oblong and globose in nature. Leaves are lanceolate, cuneate, apex are obtuse and long leaf petiole. Flowers are borne in dense, narrow spikes. *Aponogeton natans* is a crop for in future, nutri-rich vegetable and also new potential crop for plant breeder, which have great potential to be used in main-steam of agriculture.

Keywords : Aquarium, *Aponogeton natans* L., floating lace, kotti kizhanku, tuber

GI/PP – 72

Smart vegetable breeding driven by artificial intelligence

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ABSTRACT

There is need for more efficient farming techniques to feed the growing population through available / modified technologies. For this, Artificial intelligence serves as an important tool fulfilling the needs of the breeders, farmers, agricultural industries and consumers. AI, combining computer science and robust datasets, enables problem-solving, it uses computers and technology to simulate the human mind's problem-solving and decision-making skills. It also encompasses sub-fields of machine learning and deep learning. In the field of agriculture, it is applied for weather, price prediction, robotics in quality check, harvesting, grading, disease diagnosis, decision making etc. It has emerged as a revolutionary field, providing a great opportunity in shaping modern crop breeding, and is extensively used in indoors for plant science. Advances in crop phenomics, enviromics, together with the other "omics" approaches are paving ways for elucidating the detailed complex biological mechanisms. In the breeding program, recording, administration and transcription of data are the key steps requiring large human force, time and may affect analysis and selection decision if any small mistakes occur. Recent interventions in data management using computer-based breeding databases, informatics applications and tools have made the breeder's life easier. Especially in vegetable crop production and breeding, which demands more labor force, AI will serve as an alternative tool in disease diagnosing (in all the vegetables), thinning (lettuce), precision spraying, proper stage of harvesting the crop etc. through the usage of robots, reducing losses to farmers. Expert system/ Knowledge-Based System (KBS), is a computer program designed to mimic the problem-solving behavior of an expert in a discipline. Examples include, Cuptex, Tomatex, expert systems for cucumber and tomato production respectively. Even though AI finds opportunities for application in horticulture, there exists lack of awareness on farms. One will be able to feed the data into cloud-based AI applications via portable devices, drones, and agriculture-equipment platforms making AI applications more widely accessible.

Keywards : Artificial intelligence, Knowledge-Based System, machine learning, smart vegetable breeding

GI/PP – 73

Agathi (*Sesbania grandiflora*): A potential underutilized nutritious vegetable

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ABSTRACT

Sesbania grandiflora commonly known as Agati, is a widely available plant. It is belongs to family Fabaceae. Approximately 60 global species are found which are a member of the genus Sesbania, they are generally found in Australia, Africa, and Asia. Although agathi trees are mostly distributed in India, it is not so popular among the people. It is cultivated in states like Assam, Bengal, Punjab, Andhra Pradesh and Tamil Nadu (Samja and Aparna, 2013). It is native to Asian countries such as India, Malaysia, Indonesia and the Philippines. Most sesbania species can be described as soft, semi or slightly woody, 1-4m tall perennial nitrogen fixing trees. Sesbania grandiflora has large red, light yellow or white flowers, up to 10 cm in diameters. The plant has an outstanding feature is its extremely fast growth rate, especially during the first 3 or 4 years after planting. It is an open branching tree tall up to 15m and 39cm in diameter. Agathi are often classified in to 4 distinct groups, which are sita has white colored flower strain, peeta has yellow colored flower strain, neela which is blue colored flower strain, lohita is rich red colored flower strain. Red and white groups are used as vegetables, while blue and yellow are used in the drugs. Red group is highly nutritious than white which contains higher phenolic compound. White flowers are preferred to red ones as they're less bitter than the red ones Leaves, seeds, pods and flowers of S. grandiflora are edible. Unopened flowers are the most widely used as vegetable. The flowers are also bitter and astringent. It's possible to reduce the bitterness by removing the stamen. The flower's texture is mildly crunchy and fibrous. Young leaves are also eaten, usually chopped fine and steamed, cooked or fried. Agathi leaves taste bitter, sour, and mildly tart. As per the book on "Nutritive Value of Indian Foods," 100g agathi leaves contain 93kcal energy, 73g moisture, 8g protein, 1g fat, 3g minerals, 2g fibre, 12g carbohydrate, 1130 mg calcium, 80 mg phosphorus and 4 mg Iron. Certainly, the leaves are an excellent source of calcium and iron. The plenty of these nutrients is one reason for its reputation as a bone strengthener. The Sesbania grandiflora is used in folk medicine for various diseases and infections like tuberculosis, anemia, microbial infections, etc. The S. grandiflora is also used as a potent anticancer, diuretic, purgative, anthelmintic, and hepatoprotective agent as traditional medicine. Agathi can be considered as a potential ingredient for food products. It can be used to improve the nutritional status of the child as well as to overcome nutritional deficiencies and non-communicable diseases.

Keywords: *Sesbania grandiflora*, underutilized vegetable, flower colour, nutritive value

GI/PP – 74

Characterization and evaluation of pummelo (*Citrus grandis* L.) half-sibs for economically essential traits

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ABSTRACT

Pummelo *(Citrus grandis* L. Osbeck) often known as shaddock, or jabong is a natural, non-hybrid, mono-embryonic citrus species that originated in the Malayan and East Indian archipelago, belonging to the family Rutaceae. Pummelo though being nutritionally comparable to mandarins, lacks commercialisation, owing to its large size and thick rind hence, an investigation entitled "Characterization and evaluation of pummelo (*Citrus grandis* L.) half-sibs for economically essential traits"was carried to identify ideal individuals. The study was conducted from 2020 to 2023 on the well-established 92 half sib progenies of Accession.18, Accession. 6 and Accession.12 maintained at ICAR-Indian Institute of Horticultural Research, Bengaluru which were planted during August 2016.On the basis of their precocity and regularity of bearing together with the yield under consideration, 92 half-sibs were selected out of 245 for further studies. The results on physico-chemical attributes revealed that the fruit weight, fruit diameter, fruit length, and rind thickness were varied from 0.49-2.42 kg,9.96-20.54 cm,9.68-17.90 cm and 0.98-3.20 cm, respectively. Among the biochemical attributes, TSS, acidity, ascorbic acid and phenol content were ranged from 6.46 to 11.48ºB, 0.57-3.56 %, 20.40 to 63.30 mg100 $ml^{-1}$and 32.20 to 181.44 mg $100ml^{-1}$ GAE, respectively.The progeny HS46-13 and HS48-12 were found to be superior in terms of economic traits among the evaluated half-sib population of pummelo.

Keywords: Biochemical traits, bitterness, fruit quality, physical, sweetness, rind thickness

GI/PP – 75

Characterization of tamarind germplasm of Eastern India for fruit quality attributes

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ABSTRACT

Tamarind (*Tamarindus indica* L.) having a wide geographical distribution in the tropics, semi-arid tropics, and subtropics of the world is an evergreen diploid tree species (2n=2x=26) of family Fabaceae. It is an excellent tree for social forestry, agroforestry and development of wasteland and dryland. Virtually every component of the tree (fruit pulp, seeds, flowers, leaves, wood, bark) has its specific applications, ranging from human and animal consumption to fuel wood, traditional medicine, construction, trading, and industrial processing. Tamarind plantation in India is diverse as it is mostly self-sown or sown with the seeds of unknown parentage. The wide range of variability within the population is a boon for crop improvement programmes. Since, characterization of germplasm ensures identification of desirable traits and its utilization in breeding programme, an *in-situ* evaluation study of tamarind germplasm was carried out by Central Horticultural Experiment Station (ICAR-IIHR) in different Districts of West Bengal (Hooghly and South 24 Pargana) and Odisha (Koraput, Rayagada, Cuttack, and Boudh) during 2019-22 to assess the variability and to identify the superior genotype from eastern India. A total of 122 numbers of germplasm were evaluated for their physical and biochemical parameters of fruit quality. A great extent of variability was observed with respect to pod length (7.48-17.68cm), fruit weight (6.40-23.19g), pulp content (36.9-53.68%), moisture content (10.78-18.39%), total soluble solids (66.32-81.1°B), acidity (6.10-18.75%), and total sugar (23.92-41.67%). The concentrations of total phenols and total flavonoids per 100g fresh weight were 97.21-195.11mg GAE, and 31.50-283.04mg QE, respectively. Anti-oxidant capacity measured in terms of FRAP and DPPH varied between 10.62-19.37mM $Fe_{(II)/}$ 100g fresh weight and 54.85-83.98%, respectively. Based on the *in-situ* evaluation, 23 accessions with desirable traits have been collected and are currently being maintained at the Research Farm of CHES, Bhubaneswar for the selection of the elite type.

Keywords: *In-situ* evaluation, fruit quality, germplasm, tamarind

GI/PP – 76

Performance of exotic and indigenous coconut varieties for growth, fruit yield, fruit and nut characters under Assam condition of North East India

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ABSTRACT

Coconut is an important plantation crop grown in India. Considering the value of this crop that provides food, drink, medicine shelter & a variety of raw materials, and also sustains the livelihood of many small and marginal farmers of North Eastern part of the country, it is essential to improve the productivity of coconut in this region to ensure higher income and profitability to growers. A lot of research effort has been carried out for improvement of coconut in many of the major coconut growing states of India. However, systematic work on coconut improvement in North East region has been limited. A few varieties are grown in North East India, especially Assam but not much study on suitability of different coconut varieties has been undertaken. Therefore, the present study was undertaken to evaluate four exotic, five hybrid and six indigenous coconut genotypes for their growth, nut yield and fruit characters under Assam condition. The data on growth characters were recorded for five years, from 2015 to 2019, and nut yield was recorded for seven years (2016 to 2022) while studies on, fruit component characters was undertaken for four years from 2017 to 2020 and the mean data was used for analysis. Significant differences were observed between the treatments for most of the characters recorded. Nut yield varied from 35.34 (Malayan Yellow Dwarf) to 106.12 (Kera Sankara). The hybrid variety Kera Sankara recorded higher nut yield (106.12) as compared to other varieties. Fruit weight among the varieties varied from 605.04 g to 1173.47 g. Variety Kamrupa recorded higher fruit weight (1173.47 g), husk fruit weight (832.04 g) and endosperm weight (379.50 g). Maximum husk thickness (2.87 cm) and husk to fruit percentage was observed in Fiji tall variety (45.97 %) Considering the nut yield, hybrid Kera Sankara may be recommended for cultivation in North East region of India. The present study therefore indicates the importance of characterization and evaluation of coconut germplasm suited for North East region of India

Keywords: Coconut varieties, endosperm, husk thickness

GI/PP – 77

Screening of indigenous and exotic mango genotypes for fruit fly resistance

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ABSTRACT

The Oriental fruit fly, *Bactrocera dorsalis* (Hendel) (Diptera: Tephritidae), which causes significant yield loss and issues in the export of fresh fruits from several mango-producing countries, is one of the most significant pests of mangoes (*Mangifera indica* L.). The present study aimed at screening of genotypes for fruit fly resistance based on the percent fruit infestation and the average number of larvae per damaged fruit (2020-2021 &2021-2022)under field and lab conditions. Additionally, thephysico-biochemical characterization of these popular mango genotypes concerning their reaction to *B. dorsalis*infestation were done.Under both field and laboratory assessments,the extent of fruit damage and infestation rates was found higher in the exotic genotype 'Tommy Atkins' and lowest in indigenous genotype 'Langra'. Among the various physico-biochemical parameters, the physical parameters such as peel thickness ($r = -0.77^{**}$), sap volume ($r = -0.65^{*}$) and fruit firmness ($r = -0.60^{*}$), and bio/ allele-chemical traits such as total phenols ($r = -0.68^{**}$), total flavonoids ($r = -0.72^{**}$), ascorbic acid ($r = -0.82^{**}$), and total tannins ($r = -0.75^{**}$) displayed significant negative correlations with the intensity of fruit infestation. Additionally, uponfruit fly infestation there was significant upregulation of enzyme activity (Glutathione peroxidase, super oxide dismutase, and polyphenol oxidase) compared to healthy tissue, except for catalase, which was found to be higher in healthy tissue. The upregulation was found higher in immune genotype 'Langra' compared to Tommy Atkins, which could explain its greater resistance to fruit fly infestation. Genotypes 'Totapuri' and 'PusaManohari' had moderate infestation.

Keywords: Artificial screening, biochemical screening, fruit fly infestation, natural screening

GI/PP – 78

Exploring cutting-edge techniques in horticultural crop breeding: a comprehensive review

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ABSTRACT

The breeding of horticultural crops has witnessed a transformative paradigm shift with the emergence of novel technologies and innovative strategies that have opened up new dimensions in the field. This review paper delves into the advancements that have redefined the landscape of horticultural crop breeding. Traditional breeding approaches are being complemented but in some cases these are being replaced by cutting-edge methodologies such as molecular breeding, genome editing and precision phenotyping. Molecular breeding techniques, including marker-assisted selection and genomic selection have expedited the process of developing improved cultivars with desired traits. Furthermore, the revolutionary CRISPR-Cas9 genome editing system has revolutionized crop improvement by enabling precise and targeted modifications of specific genes, unlocking a realm of possibilities for creating novel traits and enhancing crop resilience. The integration of omics technologies such as genomics, transcriptomics, proteomics and metabolomics has provided a comprehensive understanding of the genetic makeup and regulatory mechanisms underlying desirable traits.In addition to genetic advancements, innovative phenotyping technologies have enabled non-invasive, high-throughput and accurate trait assessments, contributing to a more efficient selection process. However, the marriage of remote sensing, drones and sensor technologies with advanced data analytics has facilitated real-time monitoring and decision-making in breeding programs.The evolving field of synthetic biology has introduced the concept of designing biological systems to create tailor-made plants with enhanced attributes. Through synthetic biology, it is possible to engineer metabolic pathways, nutrient profiles and even stress responses to address emerging challenges in horticulture.In summary, the breeding of horticultural crops has ventured into a new era, embracing multidisciplinary collaborations and leveraging technologies that were once deemed futuristic. As we navigate this uncharted territory, it is imperative to maintain a holistic perspective that integrates scientific prowess with ethical mindfulness, ultimately shaping the future of sustainable and resilient horticulture.

Keywords: Cutting-edge techniques, horticultural crop, crop breeding

GI/PP-79

Comparative transcriptome analysis provides novel insights into molecular response of salt-tolerant and sensitive polyembryonic mango genotypes to salinity stress at seedling stage

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ABSTRACT

Increased soil salinity in the recent years has adversely affected the productivity of mango globally. Extending the cultivation of mango in salt affected regions warrants the use of salinity tolerant/resistant rootstocks. However, the lack of sufficient genomic and transcriptomic information impedes comprehensive research at the molecular level. We employed RNA sequence based transcriptome analysis to gain insight into molecular response to salt stress by using two polyembryonic mango genotypes with contrasting response to salt stress viz., salt tolerant Turpentine and salt susceptible Mylepelian. RNA sequencing by Novaseq6000 platform resulted in a total of 2795088, 17535948, 7813704 and 5544894 clean reads in Mylepelian treated (MT), Mylepelian control (MC), Turpentine treated (TT) and Turpentine control (TC) respectively. In total, 7169 unigenes annotated against all the five public databases, including NR, NT, PFAM, KOG, Swissport, KEGG and GO. Further, maximum number of differentially expressed genes were found between MT and MC (2106) followed by MT vs TT (1158) and TT and TC (587). The differentially expressed genes under different treatment levels included transcription factors (bZIP, NAC, bhLh), genes involved in signal transduction (CDPK), ABA biosynthesis, Photosynthesis etc. Expression of few of these genes was experimentally validated through quantitative real-time PCR (qRT-PCR) and contrasting expression pattern of ARF2, LEA and CDPK genes were observed between Turpentine and Mylepelian. The results of this study will be useful in understanding the molecular mechanism underlying salt tolerance in mango which can serve as valuable baseline information to generate new targets in mango breeding for salt tolerance.

Key words: Mango; Polyembryony; Rootstock; Transcriptome; Salinity stress; RNA-Seq; SOS Pathway

GI /PP-80

Characterization of selected appemidi mangoes of Western Ghats region

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ABSTRACT

Appemiditype of mango (*Mangifera indica* L.) found in the specific region of Western Ghats of India.Karnataka state has unique position for its tender mango fruits, which is used for pickling known as "Appemidi". "Appe midi" (midi means tender mango in Kannada) is the king of all tender mangoes as far as its use in pickle industry is concerned. The appemidi is not just an ordinary mango its fragrance is so strong that adding just a few midis to an ordinary pickle can change its taste and smell. Among the hundreds of varieties of mango pickles, appemidi pickles are the most sought after, as they remain fresh for years. Hence, present study was formulated to study the quality characterization of pickle of appemidi mangoes. In this study, five different varieties*viz*., Kashimidi, Holekoppoda Appe, Arunagowda Appe, Sasive Appe and Isgoore Appe were used with two (brine and salt) treatments of preservative. The results showed that, among two treatments; brine treatment is good with respect to all quality parameters compare to salt treatment while among all varieties 'Kashimidi' variety found superior in total organoleptic score in color, texture, crispiness, flavor/ aroma and taste followed by Arunagowda Appe and Holekoppoda Appe after 12 months of storage at ambient temperature. The 'Kashimidi'Appemidi variety could be used for commercial pickling on large scale.

Theme – 3
Production Management
Oral Presentations

PM/OP – 1

Enhancing efficiency of propagation in pitaya (*Hylocereus undatus* (Haworth) Britton & Rose) involving growing media, IBA and stem cuttings

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ABSTRACT

Dragon fruit is an exotic super fruit introduced in India, belongs to the family Cactaceae. The fruit is getting popularity in Indian market due to its nutraceutical properties, antioxidants, vitamins and minerals. Water scarcity in coming years is not uncommon and dragon fruit could be a best to cultivate as its water use efficiency is highly good. The study focused on the influence of different media, size of shoot cuttings, IBA and their interaction on root induction, growth and shoot parameters in dragon fruit. The first experiment involving various rooting media was carried out with design CRD. It revealed that vermicompost was found the best media for the propagation of cutting which recorded early sprouting (13.2 days), highest sprout length, number of sprouts per cutting, length of the longest root, number of primary roots, fresh weight, dry weight (15.19cm, 3.20, 15.08 cm, 9.60, 82.00g, 34.60g respectively at 90 DAP), and survival percentage (84 %). The second experiment involving different sizes of stem cuttings, various levels of IBA and their interaction was carried out using factorial CRD, in which there was a synergetic effect of both size of the cutting and IBA treatment on root induction and sprouting. The maximum responses in early sprouting (10.33 days), number of sprouts per cutting (3.33) and length of the sprout (42.33cm), length of the root (23.80 cm), fresh weight (157.73g), dry weight (45g), and survival percentage (100%) were found in the treatment combination of five node cutting and 500 ppm IBA at 90 days after planting. We have tried single node cuttings with an intention of producing more cuttings or planting material per shoot and interestingly, single-node cutting also responded well, but to a higher concentration of IBA at 400 ppm and more which is good for production of more planting material per shoot.

Keywords: Dragon fruit, media, root growth, survival percent

PM/OP – 2

An insight to dragon fruit cultivation in Kerala

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ABSTRACT

Commercial cultivation of dragon fruit in Kerala is dominated by the dark pink/purple fleshed dragon fruit (*Hylocereus costaricensis*). The variability within this species cultivated in ten different orchards spread over four districts was analysed using statistical techniques like factor analysis and cluster analysis. The maximum variability observed in stem and flower characters was 59.38% and that in quality attributes was 62.74%. Stem, flower, fruit, yield and quality attributes of fruit were found to vary widely among the different genotypes. Stem characters recorded were stem segment length (33-210cm), stem segment width (1.80-6.60cm), distance between areoles (2.00-5.50 cm), arch height (1.00-4.20 cm), stem waxiness (strong/weak), stem sturdiness (high/low), margin of rib(convex/flat), number of spines per areole (3-5), spine colour (medium brown/dark brown), height of the pole (6.5-8 ft with 1-2 ft buried underground), number of branches (numerous) and number of stem segments per branch (1-6). Variations were also observed for flower characters such as bud shape (ovate and elliptic), shape of bud apex(acute/rounded), secondary colour pattern of sepal (slightly red edged/red edged), intensity of red colour on bracts (weak/ medium/strong), length of style (23.50-31.00 cm) and number of stigma lobes (26-36). Fruit characters studied were fruit weight (84-896g), length of fruit (4.60-10.40cm), width of fruit (4.40-10.40cm), length/ width ratio of fruit (1.00-1.21), number of bracts (18-50), length of apical bracts (3.00-6.30cm), width of base of the bracts (1.40-5.70 cm), position of bracts towards the peel (adpressed, slightly held out and strongly held out), fruit weight without peel (52-592 g), fruit shape (oval/spherical), colour of peel (medium pink/dark pink), flesh colour (dark pink/purple) and yield per post (5-20 kg year^{-1} based on age of the plants). Values ranged from 11-18 °B with respect to TSS of the fruits whereas titrable acidity was found to be 0.12% in all the fruits.

Keywords: Dragon fruit, stem characters, flower characters, fruit characters

PM/OP – 3

Effect of different grafting methods on dragon fruit (*Hylocereus* spp.)

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ABSTRACT

Dragon fruit (*Hylocereus* spp.) is an exotic fruit crop with excellent nutritional and economic potential in national and international markets. With rising consumer demand, the supply of high-quality planting materials becomes a concern. Since dragon fruit is commonly propagated by stem cuttings, there might be an issue with that particular variety being prone to various stresses, pests, and diseases. So by developing a suitable grafting method, we can overcome all the problems with the use of resistant genotypes in the near future. As a first step, the effect of different grafting methods on dragon fruit was carried out in the College of Agriculture, Kerala Agricultural University, Vellanikkara, Thrissur, Kerala, during the months of February to May, 2023. The experiment consists of six treatments (T_1: horizontal grafting; T_2: L grafting; T_3: shoot grafting; T_4: bone grafting; T_5: V-cut bud grafting; T_6: seedling grafting) with six replicates, and two varieties (Mexican Red and Malaysian Red) were grafted in an inter- and intra-varietal manner. Observations were taken at 15-day intervals for three months. The results showed that horizontal grafting (T_1) had superior values in terms of length of segments (115.47 cm), length of scion (131.3 cm), and graft height (165.1 cm) when Malaysian Red was used as rootstock. Shoot grafting (T_3) had superior values in terms of girth of scion (135.2 mm and 148.5 mm), survival (100%), initial success (100%), and graft establishment (100%) when both Mexican Red and Malaysian Red were used as rootstock. Also, shoot grafting (T_3) had superior values in length of scion (117.4 cm) and graft height (158.4 cm) when Mexican Red was used as rootstock. V-cut bud grafting (T_5) was the inferior method of grafting, with zero percent success.

Keywords: Dragon fruit, grafting methods, propagation

PM/OP – 4

Top working in kodampuli (*Garcinia gummigutta* (L.) ROBS.)

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ABSTRACT

One of the major problems in the cultivation of *Garcinia gummigutta* is the segregation among the seedling progenies into male and female in the ratio of 1:1. Seedlings continue to be a propagating material in addition to vegetatively propagated plants. The sex of the tree can be identified only after 7-8 years of planting. Removal of male trees at that stage causes considerable loss in terms of time and resources to the grower. Studies have revealed that the unproductive males can be converted to productive females by top working. The technique is simple and ensures cent percent success. Techniques tried for top working in *Garcinia* included bark grafting, flush/ cleft grafting and patch budding. Amon these bark grafting and flush/cleft grafting were successful. Beheading was done during April and grafting was carried out from June to October. Two-month old sprouts from the beheaded trees were considered best for flush grafting. Matured orthotropic shoots from female trees, light brown in colour and 6-8 months old were best as scion, which showed highest percentage of success. Grafting done during July and October gave highest percentage of success. The growth rate of bark grafted and flush grafted scions were almost similar. The top worked shoots attained on an average, a height of 117 cm and spread of 75 cm with 27 branches and profuse foliage in one year. The study revealed the possibility of transforming male kodampuli trees to productive female trees.

Keywords: *Garcinia gummigutta*, segregation, topworking

PM/OP – 5

Effect of paclobutrazol on fruiting and quality parameters in mangosteen (*Garcinia mangostana* L.)

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ABSTRACT

The mangosteen, known as the queen of fruits is becoming more popular in south India, particularly in Kerala. Mangosteen production and marketing are primarily hampered by irregular flowering and fruiting, and physiological disorder called gamboge. Hence a field trial was conducted at the College of Agriculture, Vellanikkara during 2021-2022 to know the effect of Paclobutrazol (PBZ) on fruiting and quality parameters in mangosteen. The experiment involved five treatments replicated thrice in a CRD with two trees per treatment per replication. The treatments were, PBZ @ 2.3 g (T1); 4.6 g (T2); 6.9 g (T3); 9.2 g ai /tree (T4); and water alone (T5). Treatments were applied on October 2021 as soil drenching in the tree basins. Observations on fruiting characters and fruit quality parameters were recorded. The size of fruits (6.27cm) and average fruit weight (104.84g) was found to be maximum in T3. The treatment T2 (2.03) had higher number of seeds per fruit when compared to control (1.35). The treatment T2 (35.17 g) recorded the maximum percentage of edible portion. Maximum shelf life of 21.82 days was observed in T4. Paclobutrazol had effect on yield expressed in total number of fruits and it was maximum for T4 (203.70 fruits) which was on par with T2 (203.50 fruits). The highest yield was obtained from T4 (19.27 kg). The lowest gamboge infection was observed in T2 (7.45%). Maximum marketable fruits was obtained from T2 (92.5 %). With respect to quality parameters of fruit, TSS was found to be maximum in T1 (14.61). Acidity was the lowest in T2 (0.5%). Though PBZ had no significant effect on reducing sugar, non-reducing sugar and total sugar content of fruit pulp and the highest values were reported in T2 (Non- reducing 10.92% and total sugar 14.23%). The maximum vitamin C content was observed in T4 (17.55 mg/100g). From the study, it can be concluded that application of PBZ @ 9.2 g ai/tree is effective in mangosteen to obtain higher yield and PBZ @ 4.6 g ai /tree (T2) is superior considering the yield, gamboge free fruits, marketable fruits, quality attributes and economic aspects of fruits in mangosteen.

Keywords: Mangosteen, fruit weight, gamboge infection, shelf life

PM/OP – 6

In vitro micro propagation and hardening of red fleshed Dragon fruit [*Hylocereus costariscensis* (F.A.C.Weber) Britton & Rose]

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ABSTRACT

Pitaya (Dragon fruit- *Hylocerus* spp) belongs to family *Cactaceae* and is a futuristic underutilized exotic fruit crop, which begin to produce significant crops 1.5 to 2 years after planting and reach full production after five years. Red flesh cultivar (*Hylocereus costariscensis* (F.A.C.Weber) Britton & Rose) is more nutritious and fetches premium price and hence, farmers are interested in its cultivation. Micropropagation require a small quantity of explant material for production of large quantity of quality planting material in short time. Hence, an effort has been made to explore *in vitro* regeneration responses in explants from field established plants using various PGRs and hardening of regenerated plantlets. Among various explants, basal portion of shoot was best with early (21 days) and high regeneration response (65.23%). Among various PGRs, 0.75mg/l BAP+2.0mg/l Kinetin was found best for highest number of shoots (11.56 per explant) whereas 0.75 mg/l BAP+1.0mg/l Kinetin was found best for early response (8.5 days) and highest shoot height (10% shoots of >2.5 cm and 90% shoots of <2.5cm). The NAA (1ppm) was best for early (7.36 days), higher root numbers (6.29) and high auxiliary shoot sprouts (4.37) and IBA (1ppm) was best for highest root length (5.83cm). The results of all experiment were pooled for developing a protocol and tested for its efficiency, which multiplies a minimum of around 1000 *in vitro* plantlets in a span of six months from initiation of one 6-8cm basal cutting of recently matured shoot that were genetically stable (using ISSR markers) and uniform. The rooted plantlets were subjected to primary and secondary hardening in mist house (in protray using cocopeat-two month old plantlets showed 2.83 shoots with 2.3cm length) and shade net (in poly covers using mixture of soil and cocopeat-four month old plantlets showed 10.6 shoots average 6.8cm length), respectively.

Keywords: Dragon fruit, plant growth regulators, root growth, ISSR markers

PM/OP – 7

Magnesium Deficiency in Avocado: Causes, Symptoms and Management

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ABSTRACT

Avocado (*Persea americana* Mill.) is one of the important exotic fruit crops and considered as high value super food. It is rich in nutrients, antioxidants and health-promoting compounds. Avocado is being largely grown in high rainfall areas and acidic soils, and magnesium deficiency is common phenomenon in these conditions. Magnesium concentration in avocado fruit is high and is essential for improving crop productivity. Therefore proper management and adequate supply of magnesium is essential to achieve its maximum yield potential. Magnesium deficiency is commonly appears in bearing avocado plants when the magnesium concentration in leaves is below 0.2%. The visible magnesium deficiency symptoms in avocado are inter-venial chlorosis with dark veins particularly in leaves of fruit bearing branches. The major causes of magnesium deficiency in plants are poor magnesium in soil due to leaching, soil acidity, and competition with other constituents, etc. and more accumulation in fruits. The magnesium removal of 100 kg avocado fruit is around 15-30 g. The soil sufficiency level of extractable magnesium for avocado seedlings is found to be 200 mg/kg delineated through sand culture experiment. This can be used as threshold level for magnesium management in avocado. The magnesium deficiency in avocado can be treated through both soil and foliar application of magnesium fertilizers. Soil application of dolomite (500 g) or Epsom salt (magnesium sulfate, 50 g) per plant per annum from third year onwards and can be increased 100 g or 50 g every year up to 8th year and maintained thereafter i.e. dolomite (1 k g) or Epsom salt (300 g). Soil application is supplemented with two foliar spray of 0.2% magnesium at 15 days interval during fruit development stage is very useful.

Keywords: Avocado, deficiency, dolomite, Epsom salt, soil application, foliar spray

PM/OP – 8

Alleviating the cracking issue in pomegranate (*Punica granatum* L.) cultivar Bhagwa through soil and foliar nutrient treatment in the arid Western Rajasthan

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ABSTRACT

Pomegranate (*Punica granatum* L.), which is grown in India's dry and semi-arid regions, is widely regarded as a crop that generates foreign exchange. The hardy nature, high return, good keeping quality, high nutritional, therapeutic values, possibilities to force the plant into rest period under water scarcity and flower regulation according to irrigation availability and market demand indicate the opportunities for pomegranate cultivation in arid regions of India. The majority of pomegranate farming on relatively shallow, light-textured, and in this region rocky soils with little moisture content and good nutrient retention. In these soils, Using fertilizer wisely and in moderation assumes tremendous importance. This research study was conducted to address the prevalent issue of cracking in pomegranate fruit under the arid conditions of the western Rajasthan region as it affects the quality and marketability of pomegranate crops in this area. To address this issue, we conducted a comprehensive field study to investigate the effectiveness of soil and foliar nutrient prescriptions of $ZnSO_4$, $FeSO_4$, $MgSO_4$ and Boric acid, focusing on identifying the optimal nutrient combinations and application methods for mitigating fruit cracking. The application of nutrients as soil application and first foliar spray of nutrients were done in the second week of July, followed by one month after the first spray during two consecutive years (*mrig bahar*), 2020-21 and 2021-22. Soil and foliar application of nutrients significantly improved the fruit quantity and quality by decreasing the cracking problem up to 60%. In summary, application of $ZnSO_4$ @ 50 g + $FeSO_4$ @ 50 g + $MgSO_4$ @ 50 g + Boric acid @ 25 g + $ZnSO_4$ @ 0.2 % +$FeSO_4$ @ 0.2 % + $MgSO_4$ @ 0.2 % + Boric acid @ 0.1 % through both soil and foliar method can contribute to improved quality, increased yields and enhanced profitability for farmers by reducing the critical issue of fruit cracking.

Keywords: Nutrient management, cracking, soil and foliar application

PM/OP – 9

Influence of nitrogen and potassium application on growth and yield of jamun cv. AJG-85 under high density planting system

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ABSTRACT

Jamun is an under-exploited indigenous fruit tree of India. It is one of the nutritious fruits and excellent tree of agro-forestry and social forestry. The nutrient requirement of jamun differs from region to region due to soil support system, which imparts desired changes in growth and flushing in a set of climatic conditions. A field study was conducted during 2018-19 and 2019-20 on "Growth and yield dynamics of jamun cv. AJG-85 under varied pruning, nitrogen and potassium levels in high density planting system" at Arabhavi, Karnataka. The research results revealed that the values for plant spread north-south (3.79 m) and canopy volume (33.60 m^3) in N_1, stem girth (10.75 cm) and plant spread east-west (3.84 m) in N_2 and plant height (5.14 m) in N_3 were found highest 9 months after fertilizer (MAF) application. The values for stem girth (10.99 cm) and plant spread north-south (3.77 m) in K_1, plant spread east-west (3.71 m) in K_2, plant height (5.14 m) and canopy volume (32.39 m^3) in K_3 were found highest 9 MAF application. In interaction, significantly the highest plant height (6.11 m), north-south canopy spread (4.35 m), east-west canopy spread (4.04 m) was recorded in the N_2K_4 (200 g N and 200 g K/plant) nutrition. Significantly highest total number of fruits per plant (317.78) in N_1, highest yield per plant (3.882 kg) and yield per hectare (4.313 t) was recorded in N_2.

Keywords: Jamun, AJG-85, canopy volume, yield

PM/OP – 10

Impact of customized nutrient solution through enhanced efficiency fertilizers (EEF) on productivity, quality, soil health and climatic resilience in Grapes

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ABSTRACT

Horticultural crops vary a great deal in their nutrient removal patterns depending upon respective targeted yields. Balanced nutrient management (primary, secondary & micronutrients) as per the crops and their stages plays an important role in improving the productivity and quality, significant saving in nutrient losses, providing nutrient rich produce and reducing GHG emission. Horticultural crops like Grapes, Tomato, Banana, Pomegranate, Melons, Citrus, and others are highly nutrient responsive particularly through fertigation. As per MAL's experience, NUE in horticultural crops can be further improved through right customization of nutrients as per respective crop and their stages in comparison to nutrients applied on individual basis through fertigation. MAL conducted multilocation trials (Maharashtra, Karnataka, Gujarat, Rajasthan etc) for the development of Crop & Stage Specific Customized Water Soluble Fertigation Grads along with complete package using 20: 80 principle of nutrient ratio (soil vs. fertigation) for Grapes, Tomato, Pomegranate, Banana, Melons, Citrus, Potato, Sugarcane, Chilli and other fertigated crops. These **Grades** or complete package solutions were launched under the brand name "**SOLUTEK**" in 2020-21 for Grapes, Tomato, Pomegranate & in 2023-24 for Banana Under the Solutek fertigation solutions, 80% nutrients go through Solutek Grades and 20% nutrients go through soil applied Enhanced Efficiency Fertilizers (EEF) powered by Nutrient Unlock Technology . These Solutek grades and solutions are thoroughly tested, validated, and evaluated against **RDF** through straight fertilizers for 3 years on Grapes at ICAR Institute for Grapes (NRCG, Pune), Tomato at IIHR, Bangalore and Pomegranate at NRC, Pomegranate, Solapur. In all these evaluation, Solutek solutions not only increased the productivity and fruit quality(physical, chemical &nutritional)in different crops, but also improved the NUE significantly by saving significant quantities of nitrogen, phosphorus and potash versus existing RDF and common farmer practices. In Grapes, as per three year's study (2020-21,2021-22& 2022-23) at NRC Grapes, Pune; there is an average of 17 % increase in yield, two days increase in shelf-life as well as 62% saving in nitrogen dose (99kg/Ha against the RDF-240 kg/ha in April+October pruning). The type of nitrogenous fertilizers used and water management decide the impact on climate change because of emission of GHG. Therefore, development of climate smart technologies for mitigation of GHG emissions is the need of the hour. MAL has already been contributing to this national endeavor.

Keywords: Nutrient management, productivity, quality, soil health, climatic resilience

PM/OP – 11

Effect of NPK doses on yield and nutrient removal of pink-pulped Kamalam (Dragon fruit) in Alfisols of the Deccan Plateau of India

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ABSTRACT

Kamalam fruit is one of the most important suitable crops for tropical and subtropical regions. The pink-pulped one is gaining popularity to grow extensively due to its rich nutrient content and antioxidant properties. The fruit yield is 20 to 45 tonnes per hectare per year, which requires huge amounts of inorganic fertilizer. With this, gaining knowledge of nutrient removal by fruit trees, especially under abiotic constrained conditions like shallow soils with low water retention and poor fertility condition of Alfisols in the Deccan Plateau is very much required for better yield and to reduce the production cost. Therefore, the experiment was aimed to evaluate the nutrient removal of the kamalam fruit through application of different doses of NPK in Alfisols. The experiment was carried out in a five-year old pink pulped kamalam fruit orchard in Alfisols field at ICAR-IIHR's experimental farm, Hirehalli. The experiment was laid out in a randomized block design with three replications and thirteen treatments (each treatment having three poles, one pole has four plants) for three consecutive years (2020-2022). The samples were collected after fruit harvest for nutrient analysis. The nutrient content of fruit pulp, peel and leaf samples were recorded and nutrient uptake was computed through biomass of fruit, peal and leaf. The maximum total nutrient removal per year per hectare was observed to nitrogen (556 kg), phosphorus (70.6 kg), potassium (941.9 kg), calcium (507.0 kg), magnesium (236 kg), sulfur (163 kg), iron (2.62 kg), manganese (2.81 kg), zinc (1.20 kg) and copper (0.40 kg). However, treatments T_2 (200:150:650 g NPK/pillar/year), T_9(700:275:300 g NPK/pillar/year) and T_{13} (450:275:650 g NPK/pillar/year), have recorded the highest fruit yield (35.6, 34.2 and 33.9 t/ha) and dry biomass yield (6.43, 6.96 and 6.78 t/ha), respectively. In which T_2 recorded the highest fruit yield with nutrient uptake of N, P, K (478.3, 64.0, 884.3 kg/ha, respectively), Ca, Mg, S (437.4, 236.3, 90.8 kg/ha, respectively), and micronutrient Fe, Mn, Zn and Cu (2.17, 1.83, 0.81 and 0.28 kg/ha respectively). The highest biomass yield was observed in treatment T13 with uptake of N, P, K (493, 70.6, 802 kg/ha, respectively), Ca, Mg, S (612.0, 220.3, 120.5 kg/ha, respectively), and micronutrient Fe, Mn, Zn and Cu (2.20, 2.58, 0.97 and 0.30 kg/ha respectively). From this study it is concluded that T2 (200:150:650 g NPK/pillar/year) had significantly higher fruit yield and nutrient removal than other treatments.

Keywords: NPK doses, nutrient removal, fruit yield, biomass yield.

PM/OP – 12

Impact of auxin and bio-formulation on rooting vigour and success of air layers in rose apple (*Syzigium jambos* L.).

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ABSTRACT

Asexual propagation of rose apple is confirmed to root suckers, but there is greater scope of air layering method to utilize its potential, to understand this, investigation was carried out during 2016 and 2017 in two same seasons. It was in rose apple block, at Mudigere, Chikkamagaluru district of Karnataka. The study revealed that for establishment of rooting growth and success of rose apple air layers by using auxin and bio-formulation. Among the nine treatments the IBA @ 2000 ppm was registered minimum in days for root initiation (51.44 and 51.13), maximum number of primary roots per air-layer (9.70 and 9.55 cm), highest length of primary root (12.09 and 12.40 cm), diameter of roots (2.6 and 2.48 mm), root volume (2.51 and 2.77 ml), more rooting percentage (88.01 and 87.62 %), fresh weight (13.42 and 13.63 g), dry weight (6.18 and 6.31 g) vigour of layer (511.48 and 511.61 g) and layer percentage. Which was on par with Panchagavya (5 %.), with respect to both the two season. List observation was recorded in control. The study pointed out that, among the different auxins tried, IBA @ 2000 ppm helped in better induction of rooting and layer success percentage by over 100 and 99.66 per cent as against 76.25 and 46.06 per cent in the control. The next promotive effect in this regard was by treatment of NAA 2000 ppm **,** IBA 1000 ppm**,** and Panchagavya (5 %.), which recorded 96.47 and 96.95, 96.45 and 96.19 and 96.05 and 95.55 per cent, respectively. Hence, this study concluded that in hill zone of Karnataka, rose apple can be propagated by air layering by media of soil, sand and FYM (1:1:1) and 2000 ppm of IBA ppm helps in better rooting and layer success of rose apple.

Keywords: Air layering, rose apple, IBA, panchagavya, rooting percent, layer percent

PM/OP – 13

Effects of plant growth regulators on yield and quality of rambutan (*Nephelium lappaceum var. lappaceum*)

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ABSTRACT

An experiment was conducted to study plant growth regulators (PGRs) for control of flowering in rambutan, and to increase fruit size of rambutan. Three PGRs namely NAA, GA3 and 3-5-6 TPA with different concentrations viz., NAA @ 20ppm, NAA @ 40ppm, GA3 @ 50 ppm, GA3 @ 100 ppm, GA3 @ 150 ppm, 3-5-6 TPA@ 25 ppm and 3-5-6 TPA@ 50 ppm were used on rambutan trees at Venkatramannagudem, West Godavari district, Andhra Pradesh. The PGRs NAA and GA3 were applied to the main branches of at 15 days before anthesis. The results showed that all PGRs induced flowering of rambutan 4-8 days earlier than control and had profound effect on yield and fruit size. These treatments were designed in randomized complete block design (RCBD) with three replications. The results showed that maximum fruit length was observed on GA3 50 ppm (fruit length 4.7 cm) followed by GA3 100 ppm (4.0 cm) and maximum fruit weight was observed in GA3 50ppm (34.1 g) followed by 3-5-6 TPA@ 25 ppm (31.0g). Maximum number of flowers per panicles were observed in GA3 150ppm (377.7) and maximum TSS was observed in GA3 @ 50ppm (21^0Brix) which is at par with GA3 @ 40 ppm and GA3 @ 100 ppm. Among three growth regulators studied at different concentrations, GA3 50ppm is found to superior in reducing fruit drop, increase in fruit size, yield and quality.

Key words: Rambutan, plant growth regulators, yield, fruit quality

PM/OP – 14

Zinc use efficiency of arecanut (*Areca catechu* L.) varieties as influenced by varied levels of zinc

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ABSTRACT

In the realm of arecanut cultivation, particularly in regions with acidic laterite soils where arecanut is a significant crop, zinc (Zn) is one of the most deficient vital micronutrient. In this context, a sand culture experiment was conducted at ICAR-Central Plantation Crops Research Institute, Regional Station, Vittal, to assess the response of arecanut varieties to varying zinc concentrations and to determine their zinc use efficiency. Seedlings of eight arecanut varieties *viz.,* Mangala, Swarnamangala, Madhuramangala, Shatamangala, South Kanara Local, Thirthahalli, Sirsi Arecanut Selection-1 and Hirehalli Dwarf were grown with three different levels of zinc (0.031 ppm, 0.093 ppm, and 0.156 ppm) for six months. The outcomes highlighted the significant interactions between zinc levels and arecanut varieties. Wherein, the variety 'Madhuramangala' exhibited the highest dry matter production (9.92 g) at a moderate zinc level. A positive correlation was evident between zinc uptake and zinc use efficiency (ZUE) (r=0.26*), indicating that increased zinc uptake led to enhanced ZUE. Additionally, a strong positive correlation was observed between the dry weight of fine roots and zinc uptake (r=0.68*). Among different varieties, 'Thirthahalli' and 'Madhuramangala' showcased the maximum ZUE(0.034 g μg^{-1}) at lower zinc levels. These findings led to the classification of 'Madhuramangala' as both efficient and responsive to zinc, while 'Thirthahalli' was deemed efficient but unresponsive to zinc. On the other hand, variety 'Hirehalli Dwarf' exhibited the lowest ZUE. This study indicates that each variety responds uniquely to different zinc concentrations, emphasizing the importance of identifying zinc-efficient arecanut varieties which can contribute to optimized cultivation practices, reduced costs, and an environmentally sustainable production approach. Furthermore, these findings offer valuable insights for arecanut cultivators and researchers seeking to enhance the efficiency and sustainability of arecanut cultivation, particularly in regions grappling with zinc deficiency issues.

Key words: Arecanut, varieties, zinc, zinc uptake, zinc use efficiency

PM/OP – 15

Impact of pruning months with different heights on growth and flower yield of *Jasminum* spp. (*Jasminum sambac, Jasminum auriculatum* and *Jasminum grandiflorum*).

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ABSTRACT

An investigation was carried out at the Farmer fields Department of Floriculture & Landscaping, TNAU, Coimbatore to study the effect of pruning, on growth and flowering of *Jasminum* species *i.e.,* (*Jasminum sambac, Jasminum auriculatum* and *Jasminum grandiflorum*). The level of pruning height two levels of pruning (45 cm and 60 cm) *Jasminum sambac* and 30 cm from the ground was followed in *Jasminum auriculatum* and *Jasminum grandiflorum* and pruning (8 months) every month was done except in the peak season (4 months) of flowering. Regarding *Jasminum sambac* under two different heights 60 cm from the ground gave better results when compared to 45 cm. Pruning during the last week of August reached the highest plant height, number of shoots and maximum yield (g/plant) whereas, the lowest yield (g/plant) was observed in November pruning. The interaction between pruning levels and pruning months showed significant results in *Jasminum sambac*. Pruning during the last week of October gave the highest plant height, number of shoots and maximum yield (g/plant) whereas, the lowest plant height, number of shoots and yield (g/plant) was observed by December pruning in *Jasminum auriculatum*. Pruning during the last week of October gave the highest plant height (cm), number of shoots and maximum yield (g/plant) whereas, the lowest plant height (cm) and number of shoots were observed by November and yield (g/plant) December pruning in *Jasminum grandiflorum*. The influence of pruning months was significant with yield.

Keywords: *Jasminum sambac, J. auriculatum , J. grandiflorum*, pruning height , pruning season

PM/OP – 16

Influence of organics on phenology of chia (*Salvia Hispanica* L.) under agro-condition of Jabalpur, Madhya Pradesh, India

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ABSTRACT

The influence of organics on phenology of chia (*Salvia hispanica* L.) var. Chiampion -B-1 was investigated under agroclimatic conditions of Jabalpur, Madhya Pradesh, India. Afield experiment was conducted with fifteen treatments in a randomized block design during *rabi* 2018-2019 and 2019-2020. The organics comprised of FYM, vermicompost, biogas spent slurry, neem seed cake, microbial contortia (consisting of 1-Phosphorus solubilizing bacteria, ii- *Azotobacterchrococcum* and *Pseudomonos* spp. Each 4kg ha^{-1}), Jeevamrita and humic acid. The organics were compared in 14 different combinations with recommended dose of fertilizers NPK 57.5:40: 24 kg ha^{-1} + 10 t farm yard manure ha^{-1}. The study revealed 13 phenological stages of chia viz., germination (24hr), radical emergence (2 days), plumule emergence above soil (3days), epicotyl elongation (4days), leaf appearance (4days), initiation of spike (42 days), branching (45days), spike elongation (42-69 days), flower primordia initiation (42 days), blooming of 50% spikes (52-67 days), seed setting (50-100 days), seed maturity (80-100 days), seed ripening (100-115 days). These growth, development and differentiation processes were highly influenced by different organic treatments and variation in climatic parameters during the two years of experimentation particularly temperature and photo period. During first year, the life of span of chia was delayed by 4 days in all the treatments as compared to second year. The number and spikes length, seed weight per spikeand per plant as well as per hectare were also lower during first year than the second year owing to interaction of extremely lower temperature. During second year the significant higher number (46.56) and length of spikes (21.49cm), seed weight per spike (0.37g), per plant (16.10g) and yield (1000.55 kg ha^{-1}) was observed with application of (RDF+microbial consortium + Jeevamrita+ humic acid) as compared to RDFonly. It may be due to synergistic effect with application of microbial consortium Jeevamrita and humic acid.

Keywords: Chia, organic farming, vegetative growth, seed yield

PM/OP – 17

Enhancement of dye yield through nutrient interventions and biological extractions in Indigo (*Indigo feratinctoria* L.)

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ABSTRACT

Indigo (*Indigo feratinctoria*) is an important and potential dye plant for commercial exploitation. Considering the importance of this crop and due to very limited research work in nutritional application, this study has been undertaken to study the influence of graded levels of N and P on herbage yield, dye content and dye yield of Indigo. Factorial combination of four levels of nitrogen viz., N_0, N_{10}, N_{20} and N_{30} and four levels of phosphorus viz., P_0, P_{40}, P_{50} and P_{60} were studied under factorial randomized block design (FRBD) with three replications. Biometric observations *viz.*, plant height, number of branches, number of leaves, biomass, fresh weight of shoot, fresh weight of leaves, herbage yield, dye yield, dye content, Dye recovery, glucoside content, N and P uptake were recorded at 120 days after sowing. The results of the experiment revealed that maximum values for plant height (198.2 cm), number of branches (165.8), number of leaves (2562.3), biomass (869.2 g), fresh weight of shoot (798.3 g), fresh weight of leaves (319.3 g) and herbage yield (9.57 tonnes) were recorded from the treatment $N_{30}P_{60}$. However, the highest glucoside content (0.81 %) was observed in $N_{20}P_{60.}$ Similarly, the maximum herbage yield (9.57 t ha^{-1}) and dye yield (180.6 kg ha^{-1}) was observed in $N_{20}P_{60.}$ The highest N uptake of 52.87 kg ha^{-1} recorded in $N_{30}P_{60}$ was statistically superior to $N_{30}P_{50}$ which recorded 50.13 kg ha^{-1}. Similarly, maximum uptake of P (13.29 kg ha^{-1}) was recorded in $N_{30}P_{60.}$ From the experiment, it is concluded that application of 20 kg N along with 60 kg P per hectare is the optimum dose for maximizing the dye yield and quality of Indigo. The biomass obtained from the experiment was collected and subjected to extraction. In this context, an attempt was made to standardize the extraction of indigo from *Indigoferatinctoria* L. for maximizing the dye recovery and maintaining quality through various extraction methods. This experiment consisting factorial combinations of four levels of method of extraction *viz.,* Conventional method; Microbial method; Hot water treatment and Chemical method and seven levels of duration of fermentation *viz.,* 0, 4, 8, 12, and 16, 20 & 24 hours. The method of extraction showed significant influence on indigo content and dye yield. The highest dye recovery and indigo content was recorded with microbial fermentation method. The microbial method not only increased the yield and quality but also reduced the duration of extraction.

Keywords: Indigo, dye recovery, nutrients interventions, biological extraction

PM/OP – 18

Effect of Aluminium sulphate and lime on colour intensification of Hydrangea (*Hydrangea macrophylla* Thunb.) cut flower under protected cultivation

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ABSTRACT

An experiment was conducted innaturally ventilated polyhouse experimental block ofCollege of Horticulture,Mudigere during the year 2022-23 with an objective to intensify the colour of hydrangea cut flower. The experiment was consisting of seven treatments *viz*., T_1 (control), T_2 (Aluminium sulphate@60g), T_3 (Aluminium sulphate @90g), T_4 (Aluminium sulphate @120g), T_5 (Lime@200g), T_6 (Lime@250g) and T_7 (Lime @300g per meter square) replicated thrice.The treatment was given twice as drench application at grand growthstage, laid out in Randomized Complete Block Design (RCBD). Significant differences were obtained for morphological, flowering and quality parameters. Among different treatments maximum plant height (46.45cm), plant spread north – south (57.37cm), leaf length (22.38cm) and number of leaves (24.00) recorded at eight monthsafter planting and minimum days to bud initiation (221.00 from pinching), duration of flowering (60.00 days), head diameter (29.00 cm) was recorded maximum in T_7 (Lime@ 300g). Minimum days taken from bud formation to fully opened flower (27.50) was recorded in T_4(Aluminium sulphate @ 120g). However, treatments did not exhibitsignificant differences fornumber of flowers per plant, stalk length and stalk girth. Vase life (26.00 days) recorded maximum in T_6(Lime@ 250g).The use of Aluminium sulphate and Lime proved to be promising on colour intensification of Hydrangeafrom pink to Purple Violet group N82 - Strong purple A (blue) and Red Purple group 64 - Strong purplish red C (dark pink) as observed in RHS colourchart. Meanwhile, indicating increase in anthocyanin content ranging from 462.32 – 714.87 mg/g of fresh petal and pH of petal sap is significant from 4.12 (blue – acidic condition) to 7.84 (pink – basic condition) according to treatments.Hence, morphological and flowering parameters proved best in T_7(Lime @300g), besides maximum score of cut flower acceptability 4.70 was reported in T_4 (Aluminium sulphate @ 120g).

Keywords: Hydrangea, cut flower, protected cultivation, colour intensification

PM/OP – 19

Standardization of suitable vegetative propagation method in Rue (*Ruta graveolens* L.)

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ABSTRACT

Rue is a medicinal plant fromthe Rutaceae family, originating from the Meditteranean region. It is a medicinal plant with both conventional and contemporary pharmaceutical uses.It is a stimulant, emmenagogue, diuretic,abortifacient, and resolvent intraditional medicine. Due to its effectiveness in treating a wide range of human diseases and the presence of many compounds from various classes of natural products, including neuroactive compounds potentially able to promote neuroprotection, it has drawn more attention in modern medicinal chemistry. It is called 'Arutha' in Malayalam and is grown as a garden plant in higher altitude areas of Kerala's Idukki and Wayanad districts.Due to the emerging demand and short supply of this plant in Kerala, a study was conducted at the College of Agriculture, Vellanikkara to find out the suitable vegetative propagation method in Rue using stem cuttings and various plant growth regulator (PGR) formulations. Terminal, semi-hardwood, and hardwood cuttings were treatedwithIBA at 250 ppm and at 500 ppm, NAAat 250 ppm and500 ppm, combinations of IBA and NAA together at 250 ppm and 500 ppm, and Keradix (commercial rooting powder) andplanted in polybags of size 5"x6" filled with potting media consisting of sand, soil and FYM in the ratio of 1:1:1 in December 2022 and observations were taken upto 120 days after planting. The results showed that, out of the 27 treatment combinations used, the terminal cuttings treated with IBA and NAA together at 250 ppm is ideal for the propagation of Rue, which showedthe highest sprouting percentage (100%) at 30 days after planting, higher survival rate of 63.33%, and a higher number of primary and secondary roots (34.33 and 222.66 respectively) at 120 days after planting.

Keywords: *Ruta graveolens*, stem cuttings, IBA, NAA, terminal cuttings

PM/OP – 20

Response of gerbera var. Arka Nesara to different growing substrates

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ABSTRACT

Conventionally, gerbera (*Gerbera jamesonii*) is cultivated on soil under polyhouses. However, the growth, yield and quality of gerbera is influenced by soil-borne pests and diseases, nutrient immobilization, leaching, seepage, water and nutrient run-off, poor aeration and soil compaction. To overcome the above challenges in gerbera production, deploying soil-less growing substrates with ideal physical and chemical characteristics seems to be exceptionally advantageous. Keeping this in view, a study was carried out in ICAR-Indian Institute of Horticultural Research, Bengaluru with four different growing substrates *viz*., Arka fermented cocopeat (AFC) + FYM (1:1 v/v), AFC + rice husk (2:1 v/v), AFC + FYM + rice husk (1:1:1 v/v/v) and red soil + FYM + rice husk (2:1:1 v/v/v) to identify the best soil-less media for cultivation of gerbera var. Arka Nesara. Results showed that the maximum plant height (31.95 cm), number of leaves (13.64/ plant), leaf length (19.60 cm), leaf breadth (10.74 cm) and petiole length (5.41 cm) were noticed with the plants grown on AFC + FYM + rice husk (1:1:1 v/v/v) at three months after planting. Furthermore, the above media induced earlier flower bud initiation (117.76 days), flower bud opening (11.56 days) and harvestable maturity (17.70 days) thus achieving the first flower harvest within 135.46 days of planting. Moreover, gerbera plants produced profuse number of flowers (29.62/ plant/ year) with better flower quality in terms of stalk length (48.81 cm), flower diameter (9.36 cm), percent dry matter content in flower (22.27 %) and vase life (11.23 days) when grown on AFC + FYM + rice husk (1:1:1 v/v/v). Thus, it can be concluded that Arka fermented cocopeat, farmyard manure and rice husk combined at the ratio of 1:1:1 (v/v/v) could be an ideal alternative to soil-based media for the cultivation of gerbera var. Arka Nesara.

Keywords: Arka fermented cocopeat, farmyard manure, gerbera, rice husk, soil-less media and substrate

PM/OP – 21

Impact of crop geometry and plant nutrition on yield, quality and nutrient uptake of davana (*Artemisia pallens* Wall) cv. Theni under northern dry zone of Karnataka

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ABSTRACT

An experiment was carried out on impact of crop geometry and plant nutrition on yield, quality and nutrient uptake of davana (*Artemisia pallens* Wall.) cv. Theni under Northern dry zone of Karnataka during *rabi* 2021-22 at Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, Bagalkot.The experiment was laid out in factorial RCBD with three replications consisting of 3 levels of spacing (S_1: 15 × 7.5 cm, S_2: 20 × 10 cm and S_3: 30 × 10 cm) and 3 levels of fertilizer (F_1: 60:30:20, F_2: 90:30:30 and F_3: 120:40:40 kg ha^{-1}NPK) with 9 treatment combinations. Among various spacing levels, 20 x 10 cm (S_2) spacing recorded maximum number (87.40) of inflorescences $plant^{-1}$, hundred flower weight (3.83 g), flower head: biomass (0.62), fresh herbage yield ha^{-1} (11.29 t), dry herbage yield ha^{-1} (2.83 t), essential oil content (0.24 %), oil yield (10.73 kg ha^{-1}) and highest total uptake of nutrients (43.54, 7.27 and 28.63 kg NPK ha^{-1}). Application of 120:40:40 N, P_2O_5, K_2O kg ha^{-1} (F_3) level of fertilizer recorded maximum number (96.51) of inflorescences $plant^{-1}$, hundred flower weight (4.12 g), flower head: biomass (0.58), fresh herbage yield ha^{-1} (12.78 t), dry herbage yield ha^{-1} (3.16 t), oil yield (15.46 kg ha^{-1}) and highest total uptake of nutrients (48.25, 8.38 and 36.77 kg NPK ha^{-1}).

Keywords: *Artemisia pallens* Wall., Davana, fertilizer, nutrient uptake, crop geometry

PM/OP – 22

Effect of organic manures, consortium of bio fertilizers and inorganic fertilizers on productivity and biochemical parameters of mint (*Mentha arvensis* L.)

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ABSTRACT

A field experiment on effect of organic manures, consortium of bio fertilizers and inorganic fertilizers on productivity and biochemical parameters of mint (*Mentha arvensisl*.) was carried out at the Department of Horticulture, Faculty of Agriculture, RVS college of horticulture, Sempatti, Tamil Nadu during 2007-2009. The experiment was laid out in randomized block design with 16 treatments in three replications. The treatment consisted of two organic manure (Farm yard manure@ 25 t ha and vermicompost 5 t ha), three levels of inorganic fertilizers (NPK 100%200:50:40 Kg/ha and 75% - 150:37.5:30 kg/ha and 50% 100:25:20 kg ha) along with the consortium of bio fertilizer which consist of azospirillum, phosphobacteria and vam each 2kg ha. The results of present study revealed that application of NPK @ 75 percentage (150:37.5:30 Kg/ha) + vermicompost @ 5t/ha + consortium of Biofertilizer resulted in improving the growth characters viz., plant height, plant spread, no of laterals, no of leaves, leaf area, and yield. The physiological parameters like chlorophyll content and quality parameters like essential oil content, where also favorably influence by this treatment. With respect to the plant nutrient uptake and post-harvest soil nutrient status. The treatment combination of NPK 100 percent (200:50:40 kg/ha) + vermicompost @ 5t/ha + consortium of Biofertilizer and NPK 100 percent (200:50:40 kg/ha) + FYM @ 25 t/ha + consortium of Biofertilizer proved to be the pest when compared to other treatment combination From the result of the present study it could be concluded that application of NPK 75 percentage (150:37.5:30 Kg/ha) + vermicompost@ 5t/ha + consortium of Biofertilizer can be consider as the best treatment for improving the growth, herbage yield and oil content in mint.

Keywords: *Mentha arvensis*, INM, yield, quality

PM/OP – 23

Influence of light intensity potting medium and container type on growth of *Dendrobium* orchid cv. Emma White on vertigrow structures

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ABSTRACT

Vertical orchid farming is gaining recognition as an innovative and sustainable approach particularly well-suited for high-value crops like *Dendrobium* orchids. This study delves into the critical elements of vertical orchid cultivation focusing on key factors *viz.,* growing media and pot size using Factorial Completely Randomized Design. This study also investigates the influence of these factors on growth parameters in *Dendrobium* cv. Emma white with relation to incident light. Significant variations was found among different treatment combinations. The plants grown on vertical frames using combination medium of coconut husk, charcoal and tile bits in a 1:1:1 v/v ratio in netted pots recorded the highest number of pseudo bulbs (4.91), pseudo bulb length (34.19 cm) and internodal length (6.29 cm) under an average PAR value of 90.29 $\mu olm^{-2}s^{-1}$ followed by the plants grown on vertical frames in charcoal media in netted pot which recorded 4.86 number of pseudo bulbs with pseudo bulb length of 31.03 cm and internodal length of 5.96 cm. This treatment combination also recorded highest number of leaves (7.39), leaf length (17.87 cm), leaf width (6.54 cm) and leaf area (90.56 cm^2) where in the average PAR value was 88.39 $\mu olm^{-2}s^{-1}$ which was followed by plants grown on vertical frames using combination medium of coconut husk, charcoal and tile bits in a 1:1:1 v/v ratio in netted pots which recorded 7.08 number of leaves with leaf length of 16.87 cm, leaf width of 5.93 cm and leaf area of 79.98 cm^2. Conversely, plants grown on vertical frame using tile bits in 6" pot recorded the lowest number of pseudo bulbs (3.49), pseudo bulb length (23.83 cm), internodal length (5.19 cm), number of leaves (5.75), leaf length (12.69 cm), leaf width (4.23 cm) and leaf area (42.70 cm^2) where in average PAR value was 86.95 $\mu olm^{-2}s^{-1}$. Hence, vertical orchid cultivation systems utilizing the optimal combination of growing media and pot size with appropriate incident light can significantly enhance the growth parameters of *Dendrobium* orchids.

Keywords: Dendrobium orchid, light intensity, potting medium, container type, growth, vertigrow structures

PM/OP – 24

Optimization of *in-vitro* protocol for direct regeneration of bulbs from scale *ex-plant* of *Lilium longiflorum* cv. "Gran Paradiso"

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ABSTRACT

Easter lily (*Liliumlongiflorum*) is a fascinating, exotic bulbous flower commercially grown as a cut flower and potted plant worldwide. Lilies are propagated by vegetative means through mother bulbs or scales but the major disadvantage of vegetative propagation is low bulb multiplication ratio. In India, the flower growers depend on the import of quality planting material from the European countries. To resolve this issue to an extent present investigation was carried out in *Liliumlongiflorum* cv. 'Gran Paradiso' to standardize a complete *in-vitro*protocol for the production of disease free plantlets from inner scale explants. Different doses of growth regulators in combination were optimized for initiation of direct regeneration of bulblets. Results showed that, Pre-treatment to inner scale ex-plants with Carbendazim (0.2 %) + Mancozeb (0.2 %) + Streptocycline 300 ppm for 2.5hr followed by Surface sterilization with ethanol for 120seccombined with 0.1% $HgCl_2$ for 7 min was found effective for reducing maximum contamination.The best medium for per cent direct shoot organogenesis (97.00 %) was obtained from the medium supplemented with MS + BAP + NAA (1.0 + 0.2 mg L^{-1}). The *in vitro*bulbs were rooted to 100% in the media containing MS + Activated Charcoal (1.0 mg L^{-1}).100 % plant survivalwas recorded when the rooted bulbs were hardened in glass bottles containing polypropylene caps. Hence, a complete *in vitro* protocol from plant regeneration to acclimatization has been standardized using inner scale *ex-plant*s in our experiment. This protocol will be helpful in providing true to type plantlets and is suitable for year round mass multiplication of lily bulbs with minimized bulb import.

Keywords: Mass multiplication, innerscale*ex-plant*, direct shoot organogenesis, acclimatization,

PM/OP – 25

Effect of half-strength MS medium supplemented with plant growth regulators on *in vitro* response in Bird of Paradise (*Strelitzia reginae* L.)

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ABSTRACT

Propagation of Bird of Paradise (*Strelitzia reginae* L.) from seeds is a slow and complicated process due to the hard endocarp that encloses the seed and hinders germination. A study was undertaken to optimize *in vitro* protocol for mass multiplication of 'Bird of Paradise' (*Strelitzia reginae* L.). The experiment consisted of four treatments with growth regulators, *viz.*, GA_3 @1mg L^{-1}; GA_3 @3mg L^{-1}; GA_3 @5mg L^{-1}; and, GA_3 @1mg L^{-1} + BA @1mg L^{-1} with various medium components (½ MS + Sucrose @1% + Gelrite 3g L^{-1} + Inositol 100mg L^{-1} + Thiamine-HCl @1mg L^{-1} + Biotin 2mg L^{-1}; and, medium with ½ MS + Sucrose @1% + Gelrite 3g L^{-1} + Inositol 100mg L^{-1} + Thiamine- HCl @1mg L^{-1} + Biotin 2mg L^{-1} (Control). Results from the experiment showed the significant differences between the treatments. The maximum rate of contamination was found in control while, minimum was in GA_3 @ 5 mg L^{-1} and GA_3 @ 1mg L^{-1}+ BA @ 1 mg L^{-1} treatments. Higher rate and percentage of culture response (zygotic embryos germinated) were recorded in GA_3 @ 1 mg L^{-1}. Growth parameters such as shoot length (cm), root length (cm) and number of leaves per plant were maximum in ½ MS+ Sucrose @ 1% + Gelrite 3 g L^{-1} + Inositol 100 mg L^{-1} + Thiamine- HCl @ 1 mg L^{-1} + Biotin 2 mg L^{-1} + GA_3 @ 1 mg L^{-1}+BA @ 1 mg L^{-1} treatments. On the basis of overall results, our study confirmed that the media composed of ½ MS+ Sucrose @ 1% + Gelrite 3g L^{-1} + Inositol 100mg L^{-1}+ Thiamine-HCl @1mg L^{-1}+ Biotin 2mg L^{-1}+ GA_3 @1mg L^{-1} accelerated the germination rate and the combination of GA_3 @1mg L^{-1} + BA @1mg L^{-1} growth regulators showed the better growth performance in *in vitro* propagation of 'Bird of Paradises' (*Strelitzia reginae L.*)

Keywords: Bird of Paradise, germination, plant growth regulators, *in vitro*, zygotic embryos

PM/OP – 26

Effect of different fertigation levels on growth and flower production in gerbera (*Gerbera jamesonii* L.)

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ABSTRACT

The study titled "Effect of different fertigation levels on growth and flower production in gerbera (*Gerbera jamesonii* L.)"conducted at Punjab Agricultural University examined the impact of fertigation treatments T_1 to T_5 with 60, 80, 100, 120 and 140% of commercial fertigation schedule, respectively on gerbera variety Levia through drip system. The experiment was carried out for seven months from March to September in 2022. From the results, treatment T_3(100% NPK) recorded maximum plant height (28.66 cm), plant spread (50.88 cm), leaf area (110.47 cm^2) and maximum chlorophyll content (SPAD value 56.10).The treatment T_3(100% NPK) was also recorded best in flowering parameters as it took least number of days for bud opening (17.88) and has maximum flower diameter (9.45 cm), flower stalk diameter (0.70 cm), number of flowers per plant (12.55) and number of flowers per m^2(43.80). This can be due to the improved availability of optimum water-soluble fertilizers (WSF) in the root zoneand enhanced nutrient utilization through fertigation. In contrast, treatment T_1(60%NPK) recorded minimum plant height (26.99cm), plant spread (31.99 cm), leaf area (74.80 cm^2) and minimum chlorophyll content (SPAD value 48.97) and T_1(60% NPK) tookmaximum number of days for bud opening (21.66) and has minimum flower diameter (8.12 cm), flower stalk diameter (0.60 cm), number of flowers per plant (7.44).Thus, the fertigation treatment T_3(100% NPK) performed well both for vegetative and flowering parameters of gerbera.

Keywords: Gerbera, fertigation treatments

PM/OP – 27

Effect of sowing date and nitrogen on quality of beet leaf (*Beta vulgaris* var. *bengalensis*)

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ABSTRACT

The experiment entitled "Effect of sowing date and nitrogen on quality of beet leaf (*Beta vulgaris* var. *bengalensis*)" was conducted during summer, 2020 at Vegetable Research Farm, RHRS, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India. The experiment was laid out in Split plot design with five replications. The experiment was arranged with three levels of sowing date (D_1:1st Fortnight of January D_2:2nd Fortnight of January and D_3:1st Fortnight of February) and four doses of nitrogen (N_1:0 kg N ha^{-1}, N_2:50 kg N ha^{-1}, N_3: 75 kg N ha^{-1} and D_4: 100 N kg ha^{-1}). Total chlorophyll content (1.91 mg g^{-1}), moisture content (88.51 %), ash content (7.37 %) and iron content (4.56 ppm) in plant from the 2nd cutting was recorded higher in 1st fortnight of January sowing (D_1). Among the nitrogen doses, ascorbic acid (71.07 mg 100 g^{-1}), total chlorophyll content (2.18 mg g^{-1}), moisture content (89.22 %) and ash content (8.65 %) were obtained higher with application of nitrogen @ 100 kg ha^{-1} (N_4). The iron, nitrogen and potassium content (4.71 ppm, 1.83% and 2.67 %, respectively) in plant and nitrogen (231.18 kg ha^{-1}) in soil were higher under nitrogen at 100 kg ha^{-1} (N_4). Beet leaf sown at 1st fortnight of January with 100 kg N ha^{-1} (D_1N_4) had given the best performance in the quality parameter *i.e.* total chlorophyll content (2.30 mgg^{-1}).

Keywords **:** Sowing date, nitrogen, iron content, total chlorophyll, fortnight.

PM/OP – 28

Effect of various sources of nitrogen and performance on vegetable amaranthus (*Amaranthuus tricolor* L.)

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ABSTRACT

The present experiment entitled "Effect of Various Sources of Nitrogen and Performance on Vegetable Amaranthus (*Amaranthuustricolor* L.)" was conducted during two consecutive summer of 2020 and 2021 at Horticulture Research Farm, Department of Horticulture and Post-Harvest Technology, PalliSikshaBhavana, VisvaBharatiSriniketan, West Bengal. The trial was laid down in randomized block design (RBD) with four replications and five treatments *viz*. T_1: 100% N Inorganic + 0% N FYM + 0% N VC, T_2: 75% N Inorganic + 12.5 % N FYM + 12.5% N VC, T_3: 50% N Inorganic + 25% N FYM + 25% N VC, T_4: 25% N Inorganic + 37.5% N FYM + 37.5% N VC, T_5: 0% N Inorganic + 50% N FYM + 50% N VC. Results of the two years data revealed that, there was significant statistical variation in plant height (cm), leaf width (cm) , leaf area (cm^2) petiole length (cm) , stem diameter (cm) , plant weight (gm) yield per plot (kg) , yield per hectare(q) , chlorophyll A (mg/100gm) , chlorophyll B (mg/100gm)) Total chlorophyll (mg/100gm), Ascorbic Acid (mg/100gm) and protein content (g/100gm) whereas number of leaves and leaf length (cm), and stem diameter (cm) observed statistically non – significant. However Maximum plant height (52.55 and 54.3cm), Number of leaves (15.76 and 16.3) leaf width (6.7 7.5cm), petiole length (6.4 and 7.5 cm), plant weight (53.4 53.9 gm) yield per plot (6.11 and 7.44 kg) , yield per hectare (200.01 and 212 q/ha), chlorophyll A (42.76 and 40.56 mg/100gm) , chlorophyll B (20.44 and 21.42 mg/100gm) Total chlorophyll (37.9 and 40.56 mg/100gm), ascorbic Acid (988.02 and 831.09 mg/100gm) protein content (44.98 49.87 g/100gm) and B: C ratio (1.50 and 1.52) was recorded with the application of treatment T_4 and maximum leaf length (17.2 and 17.5cm), leaf area (122.98 127.75cm^2) and stem diameter (1.67 and1.42cm) was reported in T_2 during both year of study respectively. It was evident that inorganic nitrogen replacement with organic nitrogen from 25 to 75% is possible in vegetable amaranth without much affecting yield.

Keywords : Amaranthus, FYM, protein and vermicompost

PM/OP – 29

Influence of plant density and deblossoming on zombie pea (*Vigna vexillata*): an underutilized nutritious vegetable

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ABSTRACT

Vigna vexillate belonging to the family Fabaceae is a potential and under-exploited legume known by several names viz. tuber cowpea, zombi pea, wild cowpea, etc. In India, it is found in the hilly-subhilly tracts of peninsular India and in the Himalayan region. Protein content in tubers of *Vigna vexillata* was recorded up to eightfold higher than that in sweet potato and tapioca. It is a climate-resilient legume and reported as a source of biotic and abiotic stresses tolerance. In thiscontext, astudy was conducted at the ICAR-Central Tuber Crop Research Institute (CTCRI), Regional Centre, Bhubaneswar, during the winter season of 2021-22 in order to analyse the effects of plant density and deblossoming on performance of tuber cowpea. The trial was laid out in the Split plot design with 8treatments and 3 replications. There were 4 levels of spacings (S_1-45 cm ×15 cm, S_2-45 cm × 30 cm, S_3- 60 cm ×15 cm and S_4- 60 cm ×30 cm) in the main plot and 2 levels of deblossoming (F_1-flower removal and F_2-flower retention) treatments in the sub plot. Results revealed that maximum final plant height (69.03 cm) leaves /plant(11.13) and branches/plant(13.10) were observed in S_4.Maximum tuber length(16.17 cm), tuber girth (16.08 cm),) tubers/plant (2.6) and tuber yield/plant(121.85 g) were found in case of S_4. Highest tuber yield (150.85 q/ha) was obtained at the closest spacing S_1(45 cm x 15 cm). Deblossoming resulted in maximum final plant height (72.45 cm)plant girth(3.31 cm), branches/ plant(13.72), leaves/plant(11.81),tuber length(16.07 cm), tuber girth(16.39 cm), tubers / plant(2.47), tuber yield/plant(129.94 g) and tuber yield/hectare (120 q/ha). Among the interactions, maximum tuber yield/hectare was produced in S_1F_1(158.14 q/ha).

Keywords : Agro-morphological traits, deblossoming, plant density, tuber vegetable, zombi pea

PM/OP – 30

Insights into vegetative propagation of moringa-grafting and stem cuttings

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ABSTRACT

Perennial Moringa (*Moringa oleifera*) is traditionally cultivated using limb cuttings of 1 to 1.5m length. This limits the availability of planting material to meet the increasing demand of the farmers. The present study was undertaken to develop an efficient grafting protocol for the high yielding moringa variety-Anupama and to study the influence of age, length and growth, regulators on growth and development of stem cuttings. Four different root stocks were used for grafting scions of Anupama variety. The percentage success of grafting was highest when Anupama was used as a root stock followed by *Moringa stenopetala* and AD4.The histological studies of the graft union at weekly interval, showed wound healing within three weeks of grafting. The grafted seedlings when field planted, started flowering and fruiting from the first year onwards whereas the seedlings raised from seeds remained in vegetative stage. The yield gap of grafted plants and plants raised from cuttings reduced in the second year. In the second study taken up on propagation of moringa using stem cuttings, semi-hardwood cuttings of 35 to 55 cm length and 10 cm girth were found to be on par with 1.5 m long cuttings with respect to sprouting percentage, root and sprout growth. Treatment of stem cuttings with IBA 1000ppm was found to be most promising in initiating sprouting of cuttings. For successful vegetative propagation grafting is an efficient technique comparable to traditional limb cuttings with an additional advantage of producing a greater number of vegetative propagules per mother plant. Two-to-three-fold increase in the number of stem cuttings per mother plant can be achieved by using semi-hardwood cuttings of shorter length.

Keywords : Traditional, cuttings, propagation, grafting, hardwood

PM/OP – 31

Seasonal influences in Indian bean varieties for flowering and yield

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ABSTRACT

Dolichos bean (*Lablab purpureus* L.), commonly known as Indian Bean, is one of the important indigenous legume vegetable crops of India. It is primarily grown for tender pods. In addition to tender green pods, immature green seeds are also used as vegetable and dry seeds as pulse. Pods and seeds of dolichos bean are rich in protein, minerals, vitamins and fiber. India is the one of the primary centers of origin and diversity of pole type vegetable dolichos bean (*Lablab purpureus* var. *typicus)* resulted in collection and evaluation of around 282 genotypes from all over the country. Flowering plasticity, especially in response to temperature and photoperiod, is a common adaptive feature of plants including legumes. In general, all cultivars are highly photoperiod sensitive to flowering. ICAR-IIHR has so far developed and released 13 varieties of dolichos in bush and pole types. Out of 13, five bush varieties *viz.,*Arka Jay, Arka Vijay, Arka Soumya, Arka Sambhram and Arka Amongh, 7 varieties of pole types *viz.,*Arka Swagath, Arka Krishna, ArkaVistar, Arka Adarsh, Arka Bhavani, Arka Pradishi and Arka Pradhan are photo-insensitive and recommended for cultivation throughout the year. Although the above varieties are classified as photo-insensitive, there is variation in its performance during different seasons. In the present study, 12 varieties of dolichos (bush and pole types) were evaluated during *kharif*, *Rabi* and Summer seasons for two year during 2021-23. Observation on flowering and fruiting were recorded in addition to other physiological parameters like rate of photosynthesis and transpiration along with stomatal conductance. Overall, the bush type genotypes showed relatively lower photosynthesis rate as compared to pole types. The photosynthesis rate in the bush type ranged from 21.00 (Arka Vijay) to 22.93 (Arka Jay) µmol m^{-2} s^{-1} . Whereas, in the pole type it ranged from 21.54 (Arka Krishna) to 27.04 (ArkaSwagath) µ mol m^{-2} s^{-1}. In general, among the bush type varieties, Arka Amogh and Arka Sambhram were more stable across the seasons with a yield range of 350-485g/plant. In pole type varieties, Arka Krishna, Arka Vistar and Arka Pradhan recorded the yield range of 0.856 to 1.45kg/plant during all three seasons. The photo sensitive Arka Supriya did not flower during summer and *kharif* season due to its sensitiveness to temperature and photoperiod.

Keywords : Dolichos, flowering, photo-thermo tolerance, varieties

PM/OP – 32

Moonlighting of *Talinum triangulare* L. cv Divya with organic and inorganic fertilizers in south coastal Odisha, Bharat

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ABSTRACT

Waterleaf (*Talinum triangulare*) L cv Divya is an underappreciated leafy vegetable crop that originated from tropical Africa. It can be exploited as an all-season leafy green that could extensively be cultivated in several states of Bharat. With its high Vitamin A in comparison with other leafy greens having more than 8100 IU could play a pivotal role in preventing night blindness in the rural population of Bharat. We investigated the response of Waterleaf to the combination of organic and inorganic fertilizers at Centurion University of Technology and Management, Odisha in 2021 and 2022 using RBD. Various treatments were applied to the soil, including NPK (15:15:15) @400kg ha^{-1}5t ha^{-1}, Poultry Manure (PM) at 5t ha^{-1}, PM at 2.5 t ha^{-1} combined with NPK at 200 kg ha^{-1}, PM at 3.75 t ha^{-1}combined with NPK at 100 kg ha^{-1}, PM at 1.25 t ha^{-1}combined with NPK at 300 kg ha^{-1} and control. Differences were significant in the number of branches, leaf count, stem girth, leaf area, and total foliage yield in both years. Application of PM alone and the complementary use of PM and NPK, regardless of the ratio, promoted the growth of waterleaf and resulted in higher total foliage yield compared to the use of NPK alone. 100 kg ha^{-1} of NPK combined with 3.75 t ha^{-1}of PM, yielding 60.03 t ha^{-1}in 2021 and 64.65t ha^{-1} in 2022 outperformed other treatments by 47% to 68% in 2021 and 45% to 72% in 2022. It is concluded that the combination of organic manure with mineral fertilizer, with 100 kgha^{-1}of NPK and 3.75 t ha^{-1}of PM or 200 kg ha^{-1}of NPK and 2.5 t ha^{-1}of PM treatment, can effectively support waterleaf production. It is economical to apply 5 t ha^{-1}of PM alone compared to the sole application of 400 kgha^{-1}of mineral fertilizer for waterleaf production in south coastal Odisha.

Keywords : Moonlighting, waterleaf, organic, inorganics

PM/OP – 33

Effect of organic nutrient management practices on growth, yield and quality of Broccoli (*Brassica oleracea L var. italica*) cv. "Green Magic"

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ABSTRACT

The School of Agricultural Sciences, Dabok, in Udaipur, Rajasthan, conducted a field experiment in the winter season of 2022–2023 to investigate the impact of organic nutrient management practices on the growth, yield, and quality of broccoli (Brassica oleracea L. var. Italica) grown on the variety Green Magic in light-textured soil. The treatments included Farm Yard Manure (20 t/ha), Vermi compost (8–10 t/ha), Poultry Manure (2 t/ha), Neem Cake (2 t/ha), and Jeevamrut spray (500 l/ha). The experiment was set out in a randomized block design with three replications. The results of the study showed that the growth, yield, and quality of broccoli were significantly influenced by various organic manures. Treatment T_9: 75% RDN through Neem cake, 75% of FYM and *Jeevamrut*spray @ 500l/ha at 30 and 60(DAT) had the highest growth, yield, and quality, weighing 9694.40 g, while the bare minimum output from T1 was 5891.20 g; or Control (No manure).Therefore, the combined use of Neem cake, FYM & *Jeevamrut* spray is foundbetter for the growth and development of broccoli.

Keywords : Growth, organic manures, neem cake, FYM, jeevamrut, broccoli

PM/OP – 34

Effect of foliar application of salicylic acid (SA) along with micronutrients (Boron & Zinc) on growth and yield of parthenocarpic cucumber (*Cucumis sativus* L.)

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ABSTRACT

Cucumber (*Cucumis sativus* L.) holds significant economic and nutritional importance. To augment its growth and yield, nutrients play a very vital role. In 2022, a study was conducted at the Department of Horticulture, University of Agricultural Sciences Bangalore, to assess the impact of foliar application of salicylic acid (SA), boron and zinc on growth and yield of parthenocarpic cucumber. The experiment encompassed the application of two different concentrations of SA, specifically 200 mg kg-1 and 400 mg kg^{-1}, alongside zinc at 25 mg kg^{-1} and boron at 50 mg kg^{-1}. With eight treatment combinations, each replicated thrice under Randomized Block Design. The three foliar sprays were administered on the 25th, 35th and 45th days after sowing. The combination of SA at 400 mg kg^{-1} with boron at 50 mg kg^{-1} and zinc at 25 mg kg^{-1} demonstrated noteworthy results with respect to growth parameters namely, vine length (333.33 cm), node count of 45.46, and leaf area measuring 565.149 cm^2, at 60 days after sowing. Additionally, this combination yielded the highest fruit yield per vine (4.37 kg) and an overall total yield of 136.78 t ha□¹, suggesting potential synergistic effects. SA stimulated various aspects of plant growth, root development, leaf expansion, and chlorophyll production, resulting in healthier and more vigorous cucumber plants. Boron played a crucial role in proper fruit development, facilitating the movement of nutrients within the plant and leading to larger and well-shaped cucumbers. Adequate zinc levels promoted healthy root development, enabling efficient water and nutrient absorption from the soil. The response to foliar application of SA at 400 mg kg^{-1} with boron at 50 mg kg^{-1} and zinc at 25 mg kg^{-1} exhibited significant variations among treatments, offering promising avenues for the advancement of cucumber cultivation.

Keywords : Foliar spray, micronutrients, parthenocarpic cucumber, salicylic acid

PM/OP – 35

Effect of fertigation on quality of curry leaf (*Murraya koenigii* Spreng.)

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ABSTRACT

An experiment on Effect of fertigation on quality of curry leaf (*Murraya koenigii* Spreng.) was conducted at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam during 2011 to 2013. The experiment was laid out in a randomized block design (RBD) with four replications constitute six treatment. The results have shown that among fertilizers the highest essential oil (0.187 per cent), ascorbic acid (3.8 mg/100g), crude protein (5.7 per cent), iron content (3.48 per cent), calcium content (910.14 mg/100g) and phosphorus content (0.82 per cent) were recorded by the treatment T_6 (100 % RDF through fertigation)

Keywords **:** Curry leaf, quality, fertilizers, fertigation

PM/OP – 36

An optimised substrate combination for cultivating exotic king oyster mushroom (*Pleurotus eryngii*)

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ABSTRACT

Pleurotus eryngii, commonly known as king oyster mushroom, is a sizable, edible fungus native to Europe and Asia. Although it is scarce in its natural habitat, it is cultivated globally and celebrated for its buttery taste and eggplant-like texture, especially in certain Asian culinary traditions. This species goes by various common names, including French horn mushroom, king trumpet mushroom, and trumpet royale. Its moniker "king oyster" is bestowed upon it due to its regal appearance, versatility in the kitchen, consistent cap and stem quality, long shelf life, and its role as a prolific source of diverse bioactive compounds compared to other oyster mushrooms. King oyster mushrooms boast a wealth of nutrients, including carbohydrates, fats, and proteins. Additionally, they are a source of essential elements like sodium, niacin, dietary fibers, sugars, and a variety of vitamins and minerals, such as riboflavin, phosphorus, manganese, copper, iron, potassium, pantothenic acid, and magnesium. Because of their exceptional nutritional profile, king oyster mushrooms offer significant health benefits. *P. eryngii* possesses various medicinal properties, including an anti-inflammatory protein called PEP, which has demonstrated its ability to inhibit the growth of colon cancer cells in both human tissue cultures and live mice, without harming healthy cells. Utilizing lignocellulosic waste presents an economical means of organic recycling and supports mushroom cultivation. Different agricultural and lignocellulosic waste materials are employed for this purpose across the globe. ICAR-IIHR has conducted evaluations using locally available agricultural substrates and varying spawning rates to cultivate king oyster mushrooms successfully. A substrate blend comprising 37.5% sawdust, 37.5% maize cob powder, 12.5% rice bran, and 12.5% wheat bran, with 60% substrate moisture and 10% spawning, consistently yield with 60% biological efficiency.

Keywords : King oyster, edible fungus, mushroom, mushroom cultivation

PM/OP – 37

Performance of exotic vegetable crops at high altitude high rainfall areas of Coorg region

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ABSTRACT

Exotic vegetable farming is a profitable venture and become source of livelihood to the many farmers and contributing significantly to food security in country. Domestic production of exotic vegetables has been growing at a fast clip over the last ten years. Exotic vegetable has major two niche market hotel industry and export. Kodagu is endowed with unique climate superiority over many parts of country and exotic vegetables respond well to cultivation in hilly areas giving good scope for cultivation. Farmers of Coorg are interested to grow exotic vegetables in their estate/back yard/kitchen garden or left out portion of plantation areas for small scale to get attractive income and also to fulfil their domestic needs. Moreover, being a popular tourist spot of the country, lot of demand for exotic vegetables for hotels. home stays and resorts for salad and other culinary purposes. Hence, study was carried out during *rabi* reason at CHES, Chettalli, Kodagu, Karnataka to evaluate suitable exotic vegetables in open conditions at Coorg region during winter season. Among the twelve exotic vegetables evaluated during *rabi* season, the performance of Lettuce, broccoli, red cabbage, chinese cabbage and zucchini were performed well in terms of yield and quality. In lettuce, among the nine hybrids evaluated, the net marketable yield was ranged from 190 – 540 g and the highest leaf head yield was noticed in Hybrid Grishma @540g.The curd yield of broccoli was ranged from 107 – 680 g and the highest curd yield (0.680 kg) was observed in Fiesta hybrid. In case of red cabbage, among the six hybrids evaluated, the maximum head weight of 1.60 kg was observed in Primero hybrid. In case of Chinese cabbage, Apollo hybrid (2.45 kg) and Zucchini, Dark zucchini hybrid recorded 2.88 kg per plant. There was no major pest and diseased incidence was observed in field except anthracnose incidence in Lettuce. The significant variation in biochemical constitutes and nutrient content of various exotic vegetables were observed and documented. There were no significant differences in storage quality of evaluated exotic vegetable hybrids except lettuce.

Keywords : Exotic vegetables, lettuce, broccoli, red cabbage, zucchini, high altitude cultivation

PM/OP-38

Mineral Profile of Under-Utilized and Exotic Fruits of Humid Tropics: A Comparative study for Bio-nutritional Source

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ABSTRACT

The mineral composition of some selected under-utilized and exotic fruits of humid tropics were investigated and evaluated for their nutritive value as bio-nutritional source. Under-utilized fruits such as jackfruit, Jamun, pomegranate, pummelo and dragon fruit are domesticated popularly throughout India while minor fruits as karonda, rambutan, and exotic fruits such as avocado, sour sop are grown as wild fruit species and consumed in south eastern hilly regions of India. Information on nutritional value of many of these fruit species is scanty and these fruits have been shown to possess valuable antioxidants of great nutritional and therapeutic values. The highest concentration of sugar was observed in laxman phal (Annona muricata) (12.45%) and rambutan (*Nephelium lappaceum*) (11.42%) while karonda (*Carissa carandas)* (23.84%) contained high content of ascorbic acid among minor fruits indicating good source of ascorbic acid or vitamin C. Among under-utilized fruits, karonda fruits contained high potassium (1.69g%), calcium (0.95g%) and iron (202 mg/kg) while in avocado fruits among exotic fruits found to be rich source of potassium (2.89g%), calcium (0.78g%) and iron (180 mg/kg) which are essential for making good of worn out cells, building of red blood cells and maintaining body mechanisms (WHO, 1996), thus serve as best alternative source of bio-nutrition. Fresh pulp of jamun (*Syzygium cumini)* was found to be rich in carbohydrate (13.51%) and protein (3.14%) and remarkably higher contents of calcium and iron was observed in seed of Jamun which serves as best fruit bio-nutritional source. Maximum proportion of micronutrients especially iron and zinc content was seen in septum and aril portion of pomegranate. The study indicate the scope of using these edible under-utilized and exotic fruits for dietary supplement since their valuable ingredients as ascorbic acid or vitamin C, protein, iron, potassium and calcium and thus can be identified as promising fruits for bio-nutritional source.

Keywords: Mineral nutrients, Under-Utilized and Exotic Fruits, Bio-nutrition, Humid Tropics

PM/OP-39

Floral Biology-based technologies to enhance the yield and quality of dragon fruit (*Hylocereus undatus* [Haworth] Britton & Rose)

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ABSTRACT

Dragon fruit, an exotic crop, has become increasingly popular in India with an estimated area of about 50,000 ha in the next five years.The preliminary information on yield data from farmers' fields revealed that the productivity of dragon fruit is very low (12-18 t ha^{-}) as compared to traditionally growing countries (30 to 40t ha^{-}). The yield loss of up to 60-70% was observed due to flower drop because of rain-induced pollen washout affecting pollination.Moreover, the actual yield of white-fleshed varieties is very low (10-15 t ha^{-1})due to the production of a greater proportion of smaller fruits despite its potential yieldof 35-40 t ha^{-1}.A series of experiments involving floral biology was conducted at ICAR-NIASM during 2020-23 and results revealedthat continuous and heavy precipitation during the anthesis causes drastic pollen washout and thus affected the pollination, fruit set andthereby yield.It was evident thatbagging, sheltering, and supplementary manual pollinationpreventedthe drop-off of flowers and immature fruits. Further, it was also found that delayed and partial pollination was a major cause of smaller and poor-quality fruit production in white-fleshed varieties. The supplementary manual self- and cross-pollination improved the size and enhanced the yield between 30-40% and 80-100%, respectively. In addition, the produce with 60-70% higher grade (350-450 g) fruits having bright color was also obtained. Supplementary pollinationtechnologyparticularly cross-pollination can be included as one of the crop management practices in dragon fruit as it enhanced not only the fruit size and qualitybut also preventedrain-induced flowerdropand reducedthe maturity of fruit by one week. Consequent upon the improvement in the quality of the produce by adopting the technologies, the produce fetches premium price and would facilitate in doubling the income of the farmers.

Keywords:dragon fruit, exotic crop, productivity, pollination, anthesis, quality

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Theme – 3
Production Management
Poster Presentations

PM/PP – 1

Impact of seed treatment and growth medium on germination and seedling vigour of tamarind (*Tamarindus indica* L.) "

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ABSTRACT

At Fruit Research Station, Imaliya, Department of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.), a field experiment was conducted entitled "Impact of seed treatment and growth medium on germination and seedling vigour of tamarind (*Tamarindusindica* L.) " during 2021–2022. Twenty treatment combinations of seed treatment with varying concentrations of gibberellic acid and different growing medium were arranged in AFRBD. The germination and growth parameters of the seeds were significantly improved under the seed priming with GA_3 and grown in different media. Further, the combination of seed treatment with GA_3(200 ppm) and growing media (Soil + Vermicompost + Biofertisol) was found to be more beneficial in terms of all the metrics related to seed germination and growth parameters. The days taken to first germination, days to 50% germination, germination percentage at 30 DAS, and growth parameters, such as seedling height at 30, 60, 90, and 120 DAS, number of leaves per seedling and stem girth at 30, 60, and 90 DAS, respectively, length of the root, fresh weight of shoots, dry weight of shoots, fresh weight of roots, dry weight of roots, leaf area, seedling vigour index- I, seedling vigour index- II, and survival percentage at 120 days after sowing, were found to be significantly superior over rest of the treatment.

Keywords: GA_3, biofertisol, vermicompost, tamarind, germination, growing media.

PM/PP – 2

Effect of different chemical and physical treatments on germination and seedling vigour of chironji (*Buchanania lanzan* Spreng.).

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ABSTRACT

In order to accomplish the objectives of the present study, the experiment "Effect of different chemical and physical treatments on germination and seedling vigour of chironji (*Buchananialanzan*Spreng.)" was conducted 2020-21 at the Research Field Department of Fruit Science, College of Horticulture, Mandsaur (M. P.). Detail of treatments T_1 (Soaking in KNO3 solution 1.5 % for 24 hrs.), T_2 (Soaking in KNO_3 solution 2.5 % for 24 hrs.), T_3 (Soaking in $H_2SO_4$5 % for 5 minutes), T_4 (Soaking in H_2SO_4 5 % for 10 minutes), T_5 (Soaking in GA_3 250 ppm for 24 hrs.), T_6 (Soaking in GA_3 500 ppm for 24 hrs.), T_7 (Mechanical scarification breaking of seed coat through hammering), T_8(Hot water treatment 60ºC for 20 minutes), T_9 (Alternate wetting 36 hrs. and drying 24 hrs.), T_{10} (Alternate wetting 48 hrs. and drying 24 hrs.), T_{11} (Soaking in water for 4 days), T_{12} (Soaking in water in 6 days) and T_{13} (Normal sowing).Result revealed that minimum number of days (29.18 days) for seed germination, number of days for 50 per cent seed germination(36.02 days), maximum germination percentage after 30 days(2%), and germination index (0.94%) were observed in treatment T_7 (mechanical scarification breaking of seed coat through hammering) and treatment T_5 (soaking in GA_3 250 ppm for 24 hrs.) was recorded the maximum value of survival percentage(62.92%), seedling height(6.38 and 9.79 cm), number of leaves per plant(4.11 and 6.16), leaf area(16.75 and 24.07 cm^2), collar diameter (0.18 and 0.29 cm), root length(9.63 and 12.73 cm) at 60 and 90 DAS, respectively. Similarly maximum fresh shoot weight (7.18 g), fresh root weight (3.8 g), shoot and root ratio (0.93), dry shoot weight (4.66 g), dry root weight (1.86 g) and seedling vigour index (682.07) was also notice in treatment T_5 (soaking in GA_3 250 ppm for 24 hrs.) at 90 DAS.

Keywords: Chironji, germination index, seed, vigour, GA_3, scarification.

PM/PP – 3

Effect of different growing media and IBA concentrations on growth and rooting of hardwood cuttings of Fig (*Ficus carica* L.)

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ABSTRACT

The propagation of fig (*Ficus carica* L.) through hardwood cuttings offers a promising avenue for commercial production and conservation of this valued fruit crop. Effect of various growing media and indole-3-butyric acid (IBA) concentrations on the growth and rooting characters of hardwood cuttings of fig was investigated. Experiment was conducted at Department of Fruit science KNK College of Horticulture, Mandsaur (M.P.) in year 2022 using a factorial randomized complete block design with three replications consisted sixteen treatments. Hardwood cuttings obtained from healthy mother plants were treated with different IBA concentrations i.e. 1500, 3000, 4500 and 6000 ppm and planted in various growing media namely soil and vermicompost (1:1), Soil and FYM (1:1), soil and cocopeat (1:1) and soil-based mixture. The results of experiment were revealed the significant variations in rooting and growth characteristics based on the different growing media and IBA concentrations at 60 DAP. The maximum plant height (23.50 cm), shoot thickness (5.97 mm), no. of sprouts per cutting (6.92), fresh weight, dry weight, no. of roots (10.60), length of roots (21.42 cm), diameter of roots (2.83 mm), rooting percentage (81.91%), numbers of leaves per plant (4.80), leaf area (62.67 cm^2), SPAD value (27.53), survival percentage (76.93%) and minimum days taken to first sprouting (10.00) was observed in cuttings treated with 4500 ppm IBA planted in the soil and cocopeat mixture. Conversely, the control treatment (soil with IBA @ 1500 ppm) exhibited the lowest rooting percentage and growth characters across all the treatments.

Keywords: Fig, IBA, soil, cocopeat, vermicompost

PM/PP – 4

Pollinizers in fruit crops

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ABSTRACT

The mechanisms that promote self and cross pollination in fruit trees and emphasizes the importance of pollination for fruit growth. The preferred arrangement of pollinizer varieties in commercial orchards like suggesting recommendations such as planting every third plant in the third row as a pollinizer or top working commercial varieties with pollinizers. Some mechanisms that promote self-pollination include cliestogamy and chasmogamy, while mechanism that promote cross-pollination include protogyny, protandry, and heterodichogamy. Self-incompability is another mechanism that ensures cross-pollination in some plants. The role of pollinators in carrying pollen from the male part of flower to female part. Pollinizer varieties, which produce compatible pollen with the main cultivar, are recommended for commercial orchards. Pollinizers should have synchronization of flowering with the main cultivar, be regular and prolific bearers, free from major insect pests and diseases and adaptable to the agro-climatic region where the main cultivars grow. Different pollinizers varieties required for different fruit trees. Overall, proper pollination techniques and arrangement of pollinizer varieties can greatly impact fruit set, yield and quality in commercial fruit production.

Keywords: Pollination, pollinizer, self-incompatibility, cliestogamy, protogyny, protandry, heterogamy

PM/PP – 5

Evaluation of priming techniques on germination and seedling vigour in Kokum (*Garcinia indica*)

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ABSTRACT

A study entitled, Evaluation of priming techniques on germination and seedling vigour in Kokum (*Garcinia indica*) was conducted at Agricultural Research Station, Anakkayam, Malappuram district of Kerala, during 2022-2023 with an objective to assess the influence of priming techniques on germination and seedling vigour in Kokum. As we know, one of the major importance of seed priming techniques was to enhance seed germination and seedling vigour. The main issue of raising seedlings and producing quality planting material of kokum were low seed viability, poor seed germination and slow seedling growth. Seed availability is also limited for one to two months. To address those issues, an investigation was done by adopting different priming techniques like halopriming, hydropriming, solid matrix priming, biopriming and nutri priming. The primed kokum seeds were treated at three different time intervals, 6,12 and 24 hours. The seeds were collected from the field of ARS Anakkayam, and the treated seeds were sown in polybags. The experiment was laid out in Completely randomized design. Seed germination percentage, Mean germination time, seedling vigour index, number of leaves, shoot length, root length, fresh weight and dry weight of root and shoot, leaf area index were the observations recorded. Among different seed priming techniques, bio priming using *Pseudomonas fluorescens* recorded lowest value with respect to mean germination time and highest value for stem length and root length. With respect to fresh weight of root, fresh weight of shoot, dry weight of shoot, dry weight of root and number of leaves, seeds nutri primed with vermiwash recorded highest value.

Keywords: Nutri priming, bio priming, germination, root growth

PM/PP – 6

Evaluation of priming techniques on germination and seedling vigour in Soursop (*Annona muricata* L.)

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ABSTRACT

A study entitled 'Evaluation of priming techniques on germination and seedling vigour in Soursop (Annona muricata L.)' was conducted at Agricultural Research Station, Anakkayam, Malappuram district of Kerala, in the year 2022-2023, with an objective, to evaluate the effect of different priming techniques in germination and seedling vigour in soursop. Different seed priming techniques such as hydro priming, halo priming, acid priming, hormonal priming, priming using coconut water and scarification using sand paper were selected for this study. The seeds were collected from the field of ARS Anakkayam. The treated seeds were sown in polybags, filled with potting mixture. The experiment was laid out in Completely randomized design. Halopriming, hydropriming, solid matrix priming, biopriming and nutri priming were the priming techniques adopted for this study. Seed germination percentage, mean germination time, seedling vigour index, number of leaves, shoot length, root length, fresh weight and dry weight of root and shoot, leaf area index were the observations recorded. With respect to mean germination time lowest value was recorded by hydro primed seeds followed by scarification using sand paper. Hydro primed seeds recorded highest number of leaves and leaf area index. With respect to shoot length, fresh weight of shoot and dry weight of shoot, scarification using sand paper recorded the highest value. With respect to root length, halo primed seeds recorded the highest value. Likewise, acid primed seeds recorded better result with respect to fresh weight of root.

Keywords: Hydro priming, germination time, leaf area, root growth

PM/PP – 7

Unveiling the magic of photoselective netting in fruit cultivation

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ABSTRACT

Fruit crop cultivation is facing numerous challenges such as climatic change, pest pressure, and limited resources. Photoselective netting is an innovative agricultural technology that has emerged as a viable method to address these problems and enhance the optimum growth and productivity of fruit crops. Itis a practice of covering crops with nets that can filter intercepted solar radiation together with their protective function. Photoselective nets are plastic netsinto which various chromophores as well as light-dispersive and reflective elements are added during manufacturing. Initially, it wasknown as "ColorNets", the name waslater modified to photoselective nets. These nets fall into two categories: colored nets (red, yellow, green, and blue) and neutral nets (pearl, white, and grey). Since these nets are composed of holes and translucent photoselective plastic threads, they create a blend of natural unmodified light along with diffused spectrally modified light, transforming the direct light into scattered light. The spectral manipulation promotes photomorphogenic responses and scattering improves the light penetration into the dense plant canopy. Fruit crops that use photoselective netting perform better in terms of fruit yield, color, size, and internal and external quality and also have protection from environmental hazards, making harsh microclimates more optimally suited for plant growth. Photoselective nets with different chromatic properties can differentially affect various attributes of tree performance. High photosynthesis rates were observed under the red net, while the yellow net encourages deeper root systems. Pearl and yellow nets are effective in controlling insect pests and the viral diseases they carry. Photoselective netting is a transformative smart tool in fruit crop cultivation, offering various benefits ranging from light optimization and stress mitigation to sustainable farming practices.

Keywords: Photoselective netting, fruit crops, solar radiation, light

PM/PP – 8

Technologies used for cultivation in dragon fruit cultivation

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ABSTRACT

Dragon fruit, a recently introduced super fruit in India, is considered to be a promising remunerative fruit crop. Dragon Fruit is a climbing fast growing cactus species which has received worldwide recognition not only as an ornamental plant but also as a fruit crop and industrial source of compounds. It has high demand in national and international markets. Originate from Mexico and Central South America. Fruit is named as pitaya because of the bracts or scales on the fruit skin and hence the name of pitaya meaning ‘‘the scaly fruit’’. It is a long day plant with beautiful night blooming flower that is nicknamed as “Noble Woman” or “Queen of the Night”. The fruit is non climacteric, large oblong with red peel and large green scale. It has widely brought about high content of nutrients medicinal and cancer preventing effects. The biggest advantage of this crop is once it planted, it will grow for about 20 years. One hectare could accommodate 1000 to 2000 plants. The agronomic practices are easy and less expensive. The neglected mine areas where other commercial crops are not suitable to cultivate, it has the potential to survive in a dry area and adaptive to various marginal soil conditions. Now it is knocking door in various agro-climatic zone of India. The most successful tidings are coming from Gujarat where it is cultivated as monocrop. It bears fruit in the second year after planting. Attains full production within five years. It is fast return future crop. The requirement of water and tillage practices of dragon fruit are low. Due to fewer pest and disease attacks it requires minimal after care.

Key words: Dragon fruit, queen of the night, remunerative, future crop

PM/PP – 9

Standardization of crop regulation practices for higher yield and better quality in pomegranate (*Punica granatum* L.)

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ABSTRACT

Pomegranate (*Punica granatum* L.) is an important exotic fruit crop of arid and semi-arid regions. It is originated from Iran and India is one of the secondary centres of origin for pomegranate. Worldwide, it is cultivated over 6 lakh ha with an estimated annual production of about6 million tonnes. India is the largest producer of pomegranate. In India, pomegranate is cultivated over 2.76 lakh ha with an annual production of 31.4 lakh tonnes and productivity of 11.4 t/ha. Due to its immense medicinal and nutritional values, it has greater demand in domestic and international market. Though pomegranate is basically deciduous in nature, it behaves as evergreen, partially deciduous and deciduous in tropical, sub-tropical and temperate zones respectively. India is the only country in the world, where pomegranate fruits are available throughout the year. It becomes possible through crop regulation (bahar treatment) and in general, farmers go for *ambia*, *mrig* and *hasth bahar*. Crop regulation in pomegranate leads to uniform flowering and regular fruit set. With the objective to develop the crop regulation practices, experiments were conducted during 2018-2023 to standardize crop regulation practices in pomegranate. Four stem training system has been found to be superior compared to other training systems with respect to yield. Foliar spray of Ethrel @ 200 ppm followed by Ethrel @ 600 ppm at one week later was found highly effective with 92.5% defoliation over single spray of Ethrel @ 2000 ppm, on 9 days after spray. Among different pruning methods, Light pruning of pomegranate by removing shoots up to 6” from the tip before defoliant spray has been highly effective over the unpruned trees for flower bud initiation, yield. Foliar spray of GA3@ 50ppm on 30 and 60 DAA was found to be superior with better grade fruits and increased yield of 25-30% over the control. Foliar application of 2,4-D @ 20ppm has been highly effective in control of flower drop (post-set drop) over the control with minimum flower drop. Fruit thinning has been highly effective in enhancing the fruit yield besides fruit size and grading. Light thinning in pomegranate by removing the surplus setting of fruits helped attaining optimum yield with better quality. Four stem training system and other crop regulation practices viz., split application of Ethrel, light pruning of shoots, flower drop control through application of 2,4-D, fruit size enhancement through gibberellic acid spray, fruit thinning etc were standardized as the crop regulation practices for enhanced yield and better quality fruits in pomegranate.

Keywords: Ethrel, pruning, four stem training, thinning

PM/PP – 10

Differential responses of planting time and auxin on rooting and growth behaviour of hard wood cuttings of wild pomegranate in sub- tropics of Jammu

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ABSTRACT

Vegetative propagation of wild pomegranate through cutting is the most convenient method of obtaining true to the type and fully developed plants in markedly lesser timewith improved rooting and reduced mortality of rooted cuttings. The presentinvestigation was carried out to elucidate the influence of planting time and auxin treatments onthe rooting and growth of hardwood cuttings of wildpomegranate. The experiment was carried out at Research Farm, Division of Fruit Science, SKUAST-Jammu, Chatha during 2020 to 2021. The Randomized BlockDesign(Factorial) was used with 28 treatmentcombinations comprising 7 auxin levels (IBA 2000, 2500 & 3000 ppm, NAA 2000, 2500 & 3000 ppm and control without IBA/NAA) and 4 planting times (15th& 30th December and 15th& 30th January). Each treatment was replicated thrice. The results revealed cuttings treated with IBA 2500ppm and plantedon30thJanuaryhad maximumrooting percentage,freshweightofshoot and root,numberofleavespercutting, leaf area, dry weightof shoot and root, average root length, diameter of longest root, length of longest root, fresh and dry weight of roots. Whereas, the partitioning coefficient of stem was maximum in IBA (2500 ppm) planted on 30th January but the partitioning coefficient of root was found maximum in NAA (2500 ppm) planted on 30th December. Thus 2500 ppm was found to be the optimum concentration of IBA (auxin) and 30th January was the most suitable time for planting hardwood cuttings of wild pomegranate under subtropical conditions to produce quality plants with a good root and shoot system.

Keywords**:** Indole-Butyric Acid,N-Acetic Acid, Hardwood cuttings, Wild pomegranate.

PM/PP – 11

Carbon dioxide enrichment for enhanced rootstock production in jackfruit (*Artocarpus heterophyllus* Lam.)

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ABSTRACT

The effect of elevated carbon dioxide(CO_2) on the growth of jackfruit seedlings was investigated. Seedlings were grown under four experimental treatments comprising two CO_2 treatments (elevated CO_2 environment, elevated CO_2 environment along with 3 % urea spray at fortnightly interval) and two standard conditions (urea spray 3% at fortnightly interval and control).The rootstocks subjected to treatments under elevated CO_2 condition and 3% foliar urea spray for two and four months treatment gave the best growth responses. Significant difference was observed among all growth parameters like shoot height, shoot girth, number of leaves, (at 60 and 120 days after sowing), leaf area, root weight, shoot weight and dry matter production (at 120 days after sowing).The elevated CO_2 was maintained by the trench system, which maintained CO_2 concentration of 590 ppm on an average, which is approximately 200 ppm higher than the surrounding atmosphere. Modifying the microclimate through evolution of carbon dioxide through decomposing organic compounds like coir pith inside a trench system, along with additional nitrogen fertilization is a cost-effective method for raising active rootstocks of jackfruit which is important for improving the success rate of budding.

Keywords: Jack fruit, urea spray, growth parameters, leaf area

PM/PP – 12

Exploring feasibility and techniques for dragon fruit cultivation in Devgad's Lateritic Rock Terrain

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ABSTRACT

Dragon fruit, scientifically known as *Hylocereus* spp, is a tropical fruit belonging to the Cactaceae family. This exotic fruit has gained global attention for its unique appearance, vibrant colors, and remarkable nutritional benefits. In recent years, dragon fruit has become a focal point of interest within the agricultural community due to its ability to thrive in diverse climatic conditions and its potential economic value. Its hardy nature and adaptability make it suitable for cultivation in regions with challenging terrains, including lateritic rock areas like Devgad, where the conditions might not initially seem conducive for traditional agriculture. The unique growth habit of dragon fruit, where it grows on climbing cacti that require support from poles or trellises, adds an element of intrigue to its cultivation. As seen in the proposed research study focusing on varying pole heights, these support structures can influence the growth, flowering patterns, and ultimately, the yield of dragon fruit plants. This study aims to contribute to the existing body of knowledge by shedding light on how varying pole heights impact dragon fruit cultivation and yield, presenting valuable insights for farmers, researchers, and agricultural enthusiasts alike. Dragon fruit plants grown using the 6' pole system showed 12-26% more flower buds, 10-18% more fruits and 14% heavier total fruit weight compared to those of the 5' and 7', respectively.

Keywords: Dragon fruit, pole system, flowering pattern

PM/PP – 13

Effect of different doses of IBA and rooting media *on* rooting of stem cutting of dragon fruit [*Hylocerous undatus* (Haworth) Britton & Rose)]

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ABSTRACT

The study focused on the effect of different concentrations of IBA (500, 1000, and 1500 ppm) on different types of rooting media (i.e., soil, sand, soil + sand, soil + cocopeat, sand + cocopeat, soil + sand + cocopeat). The interaction of these different combinations on the rooting characteristics of dragon fruit was studied. The cuttings were collected from a one-year stem with 2 to 3 nodes with 15-cm-long cuttings would be used for planting. Cuttings were treated with IBA by quick dip methods, and for this, the required amount of IBA was weighed and dissolved in a few ml of 80% ethanol, and then volume was made up to one litre using distilled water. The cuttings were dipped in the solution for 10 seconds and planted in a polybag. Rooting percentage was found by dividing the number of cuttings rooted by the total number of cuttings multiplied by 100, and survival percentage can be found by dividing the number of cuttings that survived 3 months after planting by the total number of cuttings planted multiplied by 100. The result revealed that the exogenous application of IBA 1500 ppm with the media combination of soil + sand + cocopeat (I_3M_6) significantly increased the days taken for root initiation (13.67 days), number of roots per cutting (65.67), fresh weight of roots (3.07 g), dry weight of roots (1.70 g), length of longest roots (31.17 cm), days taken for initiation of sprouts (17.17 dyas), sprout length (16.27, 25.10, and 34.43 cm), number of sprouts per cuttings (2.70, 3.20, and 3.97) at 30, 60 and 90 DAP, respectively), rooting percentage (89.20 percent) and survival percentage (87 percent) over the other treatments.

Keywords: Dragon fruit stem cutting, rooting media, IBA (Indole-3-butyric acid)

PM/PP – 14

Effect of different seed treatments on seed germination and seedling growth of Burmese Grape (*Baccaurea sapida* Muell.Arg.)

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ABSTRACT

The Northern parts of West Bengal are the richest source of diversity of many tropical and sub-tropical minor fruit crops. Burmese grape (*Baccaurea sapida* Muell. Arg.) is one of the most popular and potential minor fruit plants belonging to the family *Euphorbiaceae*. The plant is native to South Asia region growing wild as well as in homestead condition in Nepal, India, Myanmar, Bangladesh, South China, Indo-China and Thailand. The plants are propagated through seeds and seeds are recalcitrant in nature. The present study was conducted on Instructional farm of Uttar Banga Krishi Viswavidyalaya in the year of 2018-2019 to evaluate the role of different chemicals on seed germination and seedling growth behaviour. The data recorded from the experiment revealed that the seeds treated with thiourea 100 ppm for 12 hours showed highest germination percentage (87.33%), germination value (6.46), mean germination time (26.99 days) and seedling vigour index (1396.24) whereas, total biomass (0.22) was highest on seeds treated with thiourea 500 ppm for 12 hours. Seed treated with KNO_3 @100 ppm for 12 hrs also thrive good result on germination percentage and germination value. Whereas hot water treatment was recorded minimum results for all the characters over control.

Keywords: Burmese grape, germination, KNO_3, seed, thiourea.

PM/PP – 15

Increase the yield and quality parameters of red flesh dragon fruit (*Hylocereus costaricensis*) grown under coconut plantation using plant growth regulators

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ABSTRACT

Dragon fruit (*Hylocereus costaricensis*), otherwise called 'Pitaya or Kamalam' has recently drawn much attention of the growers worldwide, not only because of their red purple colour and economic value as food products but also for their enormous health benefits. Coconut being widely spaced owing to its morphological features provides ample opportunities for cropping in the interspaces. Active root zone of coconut is confined to 25 per cent of the available land area and the remaining area could be profitably exploited for raising subsidiary crops. The fruit setting percentage in dragon fruit under coconut plantation was found very less. The yield and quality of the fruits can be affected by the application of plant growth regulators. The present study aimed to evaluate the influence of GA3 and NAA on yield and quality of five yr old red flesh dragon fruit grown under coconut plantations. A field experiment was carried out at ICAR-CPCRI, Kasaragod with five treatments replicated six times in Randomized Block Design. The treatments included GA3 @ 20 ppm, GA3 @ 40 ppm, combination of GA3 @ 20 ppm + NAA @ 20 ppm, GA3 @ 40 ppm + NAA @ 20 ppm and control. The treatments were applied at 7, 14, 21 days after fruit set. The results showed that application of GA3 @ 40 ppm + NAA @ 20 ppm increased the fruit length (13.05 cm), fruit weight (620.04 g fruit-1) and fruit yield (28.56 kg tree-1) significantly. The study concluded that the combination of GA3 and NAA at appropriate concentrations could improve yield and fruit quality of red fleshed dragon fruit under coconut plantations.

Keywords: NAA, GA3, red flesh, fruit yield, fruit length

PM/PP – 16

Elaeocarpus spp : A Potential alternative to olive oil productionfrom Eastern Himalayas

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ABSTRACT

Elaeocarpus spp are underutilized and endemic fruits of Eastern Himalayas locally known as Bhadrasey were consumed in small scale in its native range. Bhadrasey bears a small apple-sized fruits with glossy, pale green skin containing green, oily flesh surrounding a single seed. The flavor of fruit is similar to olive and hence known as Himalayan olive. To explore the potential of *Elaeocarpus spp.*for large scale human consumption, thequantity and quality parameters of the fruits of two different *Elaeocarpus spp. viz. Elaeocarpus lanceaefolius* and *Elaeocarpus sikkimensis* from 8 different places of *Elaeocarpus spp.* rich regions of Eastern Himalayas were evaluated and compared with olive (*Olea europaea*). Our report showed its significance as the first attempt on quality analysis of *Elaeocarpus spp* from Eastern Himalayas. Fruit weight of *Elaeocarpus sikkimensis*is more or less equal to olive but *Elaeocarpus lanceaefolius* showed higher fruit weight than olive. The pulp content of *Elaeocarpus spp.* was found lesser than olive. The dry pulp weight was directly proportional to the oil percentage in *Elaeocarpus spp.* Oil and polyphenol contents were higher than olive. The acid value of *Elaeocarpus spp.* was less and within the permissible limit to suit as edible oil. The free fatty acid and oleic acid percentage were found similar to the olive. As this crop is an underutilized, the result from this study is expected to have impact for commercial scale utilization of the crop.

Keywords: *Elaeocarpus* spp*,* Himalayan olive, oleic acid content, acid value

PM/PP – 17

Effect of IBA and NAA on the rooting and vegetative growth of hardwood cuttings in common Fig (*Ficus carica* L.)

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ABSTRACT

The present investigation was carried out at Horticultural Nursery of Rani Lakshmi Bai Central Agricultural University (RLBCAU), Jhansi during the year 2021, in order to study the effect of different levels of IBA and NAA on the rooting and vegetative growth of hard wood cutting in common fig. The experiment was laid out in Completely Randomized Design in eleven treatments with three replications. The treatments comprised of IBA (500, 1000, 1500, 2000, 2500 ppm) and NAA (500, 1000, 1500, 2000, 2500 ppm) by quick dip method along with control. The result indicated that IBA (2500 ppm) was found to be best in terms of early sprouting (10.26 days), Sprouted cutting (88.84 %), survival percentage (87.29 %), number of roots cutting^{-1} (12.35 and 20.86), length of longest root cutting^{-1} (23.01 cm), length of shoot (12.37 cm and 26.19 cm), shoot diameter (1.59 cm), number of shoot cutting^{-1} (1.73 and 2.06) , fresh weight of roots cutting^{-1} (12.72 g), dry weight of roots cutting^{-1} (4.75 g) fresh weight of shoot cutting^{-1} (32.73 g), dry weight of shoot cutting^{-1} (9.19 g), number of leaves (8.77 and 11.40), leaf size i.e. length and width (14.20 cm and 13.56 cm), fresh weight of plant biomass (45.46 g) and dry weight of plant biomass (13.94 g).

Keywords: Fig, IBA, NAA, Hardwood cutting

PM/PP – 18

Response of rooting of mulberry plants to different time of air layering

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ABSTRACT

Mulberry (*Moras spp*.) belongs to family *Moraceae*. Mulberry variants native to India mostly fall under the *M. indica* genus. It is a resilient plant that can survive in a range of agro-climatic situations. Mulberries have high nutritive values and are frequently used in fruit salads, juices, smoothies, desserts, and other dishes. Mulberry is a woody perennial fruit tree having deep root and rapid growth. Mulberry plants are frequently propagated through stem cutting, so it is important to choose the cuttings carefully in order to achieve the necessary maturity, thickness, and stem length. In mulberry, a great number of studies primarily on stem cutting have been conducted on a large scale whereas studies on the air layering in response to different time of months have been found very rare. The present experiment entitled "Response of rooting of mulberry (*Moras spp*.) plants to different time of air layering" was conducted at College of Agriculture, Navsari Agricultural University, Bharuch (Gujarat). A study aimed at optimizing propagation and adventitious rooting technique of mulberry air layer was conducted. The experiment was laid out with eight treatments in a Completely Randomized Design and replicated three times. The treatments comprise of four months T_1: 1st fortnight of June, T_2: 2nd fortnight of June, T_3: 1st fortnight of July, T_4: 2nd fortnight of July, T_5: 1st fortnight of August, T_6: 2nd fortnight of August, T_7: 1st fortnight of September, T_8: 2nd fortnight of September and a control (untreated). Effect of these treatments on rooting of air layered mulberry plants in response to days taken to rooting, number of roots and length of roots (cm) were recorded. The result showed that air layering in mulberry plants during 2nd fortnight of July took minimum days for rooting and had maximum number of roots as well as length.

Keywords: Propagation, air layer, rooting

PM/PP – 19

Effect of different seed treatments on germination and seedling growth of chironji (*Buchanania lanzan* Spreng.)

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ABSTRACT

Chironji,(*Buchanania lanzan* Spreng.), a member of the family *Anacardiaceae*, originated in the Indian subcontinent. It assumes great significance due to its multifarious uses and capacity to withstand adverse climatic conditions. the kernel is highly nutritious and rich in protein (25-30%) and yield sweet oil. This species has high socioeconomic value providing livelihood to tribal population of the area. Unfortunately, over exploitation and indiscriminate harvesting leading severe threat to it, hence urgent conservation efforts are required at all levels. the experiment was carried out under propagation chamber at College Farm, during 2023 and laid out by Completely Randomized Design and fifteen treatments *viz*.,T_1: Absolute control; T_2: Water soaking for 24 hrs.; T_3: Hot water treatment (99 ± 1°C for 10 second); T_4: Hot water treatment (99 ± 1°C for 30 second); T_5: Mechanical scarification (break seed coat by hammering); T_6: H_2SO_4 @ 2.5 % for 10 minute; T_7: H_2SO_4 @ 5 % for 10 minute; T_8: GA_3 @ 200 ppm for 24 hrs.; T_9: GA_3 @ 400 ppm for 24 hrs.; T_{10}: Cow urine @ 10 % for 24 hrs.; T_{11}: Cow urine @ 20 % for 24 hrs.; T_{12}: Cow dung slurry @ 10 % for 24 hrs.; T_{13}: Cow dung slurry @ 20 % for 24 hrs.; T_{14}: Beejamrut @ 5 % for 24 hrs.;T_{15}: Beejamrut @ 10 % for 24 hours. Among seed soaking treatments,T_5[Mechanical scarification (break seed coat by hammering)] significantly recorded minimum number of days taken for germination (24.53) and maximum germination percentage (63.67).Whereas, maximum seedling height (8.72 cm and 13.51 cm) and number of leaves (6.53 and 7.80) were noted under treatment T_8 (GA_3 @ 200 ppm for 24 hrs.) at 90 and 150 DAS, respectively. Maximum fresh and dry weight of shoot (12.50g and 3.50g, respectively), fresh and dry weight of root (8.26 g and 1.56g, respectively), root/shoot ratio (0.66) and survival percentage of seedling (60.00) were observed in treatment T_8 (GA_3 @ 200 ppm for 24 hrs.) at 150 DAS.

Keywords: Seed treatment, beejamrut, germination

PM/PP – 20

Response of salicylic acid and triacontanol on quality attributes of ber (*Ziziphus mauritiana* Lamk) cv. Gola

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ABSTRACT

A field experiment entitled "Response of salicylic acid and triacontanol on quality attributes of Ber (*Ziziphus mauritiana* Lamk) cv. Gola" conducted during 2020-21 at Instructional Farm, Department of Horticulture, College of Agriculture, Ummedganj (Agriculture University, Kota). It consisted of 16 treatment combinations with four levels of salicylic acid (control, SA @ 100, 150 and 200 ppm) and four levels of triacontanol (control, TRIA @ 5.0, 7.5 and 10.0 ppm) and replicated thrice in Factorial Randomized Block Design. The application of salicylic acid @ 150 ppm among the different concentrations proved significantly superior over rest of the treatments in respect to quality parameters *viz*., maximum chlorophyll content in leaves (3.86 mg/g), nitrogen content (1.84%), phosphorus content (0.33%), potassium content (1.57%), TSS (18.48^{O} Brix), minimum acidity (0.389%), maximum TSS acidity ratio (47.90), highest ascorbic acid content (102.28 mg/100g), reducing sugar (5.11%), non-reducing sugar (4.36%) and maximum total sugar (9.70%) and at par with the treatment T_3 (10.0 ppm triacontanol) and found lowest in the control.

Key words: Salicylic acid, triacontanol, TRIA, Sugar, Acidity

PM/PP – 21

Seed propagation of santol fruit with different concentration of GA_3 and growing media

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ABSTRACT

Santol fruit an exotic fruit native to Malasian region is less known fruit in India. It is an ornamental evergreen tree also called as cotton fruitor lolly fruit. It belongs to family Meliaceae. The fleshy fruits are known for their nutritional and medicinal values and widely cultivated throughout tropical lowland in South East Asia. The crop is gaining popularity and to meet the demand for planting material three is need to multiply in large quantities. Keeping this in view an experiment on seed germination was carried out at College of Horticulture, Bengaluru during July to October 2022. Seeds were extracted from fresh fruits and subjected to different concentration of GA_3 (100-400 ppm) and sowed in different growing medias (Soil, Soil+Cocopeat, Soil+ FYM, Soil+Vermicompost). The experiment was conducted in completely randomized factorial design with three replication. The results showed that the application of treatment G_3M_3 (santol seeds sowed in Soil + FYM after soaking in GA_3 300 ppm for 24 hours) was found better for early germination (31.17 days), highest germination percentage (70.09), maximum shoot length (11.52 cm), number of leaves (6.33) and survival percentage of santol seedling.

Keywords: Santol fruit, growing media, germination, leaf

PM/PP – 22

Effect of antioxidants and plant bio-regulators on growth, yield and fruit quality of apricot (*Prunus armeniaca* L.) cv. New Castle

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ABSTRACT

An investigation was carried out in the apricot experimental block of the Department of Fruit Science, Dr YS Parmar University of Horticulture and Forestry, Nauni-Solan (Himachal Pradesh) during the year 2019-20. The experiment was laid out in Randomized Block Design consisting of nine treatments replicated thrice. The antioxidants and plant bio-regulators were applied at pink bud stage and repeated at pit hardening stage. The results from the present investigation revealed that antioxidants and plant bio-regulators significantly increased plant growth, yield and fruit quality. Among various treatments significantly highest plant height, trunk girth, annual shoot growth, leaf area, fruit set, fruit retention, fruit yield, fruit size, fruit weight and fruit volume were found plants treated with 50 ppm gibberellic acid. Maximum total leaf chlorophyll content, pulp to stone ratio, total soluble solids, ascorbic acid content, total sugars, reducing sugars and non-reducing sugars were recorded in plants treated with 2000 ppm ascorbic acid. In respect of most of the parameters, GA_3 at 50 ppm had most pronounced effect. However, antioxidants mainly 2000 ppm of ascorbic acid was equally effective to plant bio-regulator (gibberellic acid at 50 ppm). Since, antioxidants are organic compounds and are more readily acceptable than synthetic chemicals, these compounds can be considered as good alternative to chemicals in fruit production.

Keywords: Apricot, growth, leaf area, fruit yield, fruit quality

PM/PP – 23

Normalizing propagation method for dragon fruit under Udaipur Condition

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ABSTRACT

The research trail was carried out at the Horticulture farm, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur during September to December, 2022-23 in 50 % shade net house. The main objective of conducting this research was to normalize or standardize propagation of dragon fruit under Udaipur condition by taking into account various parameters like cutting size of dragon fruit (30 cm and 45 cm), various IBA concentration *viz*. 500 ppm and 1000 ppm, callusing period for one and two weeks (under normal condition without any treatment) and combinations of all. Results obtained showed that the treatment with 30 cm cutting size which was callused for one week and was treated with 1000 ppm IBA gave best results in terms days taken for sprouting, rooting percentage, number of shoots per cutting and survival percentage. Hence, it can be concluded that application of IBA @ 1000 ppm on 30 cm dragon fruit cutting callused (stored) for one week was found best for propagating dragon fruit under Udaipur condition.

Keywords: Cutting size, growth regulators, sprouting, rooting percent, surivial

PM/PP – 24

Response of jamun seedlings to saline water stress

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ABSTRACT

An experiment on influence of saline water stress on morpho-physiological changes in jamun (*Syzygium cumini* L.) seedlings was conducted at Regional Horticultural Research Station, Navsari Agricultural University, Navsari in shade-net house during year 2018. The treatments comprised of seven levels of salinity (EC) *viz*., <0.5, 2, 4, 6, 8, 10 and 12 which were applied as saline irrigation water. Various levels of water salinity produced considerable changes on morphological as well as physiological parameters and significantly influenced the growth, rate of photosynthesis, fresh biomass, sodium content and survival percentage of jamun seedlings.

Keywords: Jamun, salinity, survival, growth, physiological parameters

PM/PP – 25

Effect of media on success of softwood grafts of Jackfruit (*Artocarpus heterophyllus* Lam.)

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ABSTRACT

Experiment was carried out to study the effect of different media on success of softwood grafts of Jackfruit (*Artocarpus heterophyllus* Lam.) during the year 2017-18. Healthy cleaned thoroughly washed more than 3 g weight seeds from ripe soft fleshy fruits were collected and treated with Carbendazim (50 % WP @ 2 g/L) for 5 minutes and sown in polybags having size 6'' x 8" containing different growing media for raising rootstock. Five growing media viz., M_1- Soil + FYM (3:1), M_2- Soil + Vermicompost + Rice husk (2:1:1), M_3- Soil + Vermicompost + Saw dust (2:1:1), M_4- Soil + Vermicompost + Cocopeat (2:1:1) and M_5 - Soil + Vermicompost + Rice husk + Cocopeat (1:1:1:1) were assessed for graft success, survival and growth of softwood grafts of jackfruit in randomized block design with four replications. The results revealed that a mixture of soil, vermicompost, cocopeat and rice husk in 1:1:1:1 proportion (M_5) was found to be the best for early sprouting of graft (15.00 days), graft success (80.63 %) and survival (81.30 %). Similarly, grafts grown on such media gave maximum net returns (Rs. 443.79) with BCR (1.22) and were light in weight (0.950 kg) hence handling and transport of grafts can be easy. The inclusion of saw dust in media was found inhibitory effect for all the aspects under study.

Keywords: Growing media, soil, rice husk, saw dust, graft success, graft survival

PM/PP – 26

Augmenting underutilized mulberry crop within a short timeframe

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ABSTRACT

The underutilized fruit crops are an excellent source of protective food to satisfy the vitamin and mineral requirements of villagers. Apart from their nutritional and therapeutic benefits, few underutilized fruits have a wonderful flavour and stunning colour. These fruit crops are good for growing in drought-prone locations as they can withstand both biotic and abiotic stresses. Since India has a long history of indigenous fruit varieties, several of them have already been suggested for cultivation in commercial scale. One of these neglected fruit crops is the mulberry (*Moras alba*), belongs to the *Moraceae* family. It is a fast-growing fruit tree that is perennial and does well in tropical, subtropical, and temperate climates. The production of silk through the rearing of silk worms is the most significant use of mulberry leaves. Mulberry fruits have some medicinal properties, including laxative, fever-refrigerant, and local uses for sore throat, dyspepsia, and melancholia. Leaves are considered to be diaphoretic and emollient, and a decoction of them is used as a gargle for throat inflammation. Roots and bark are purgative, anthelmintic, and astringent. Because of specific benefits like rapid parent material multiplication and maintenance of the desired plant characteristics, mulberry is commercially cultivated from hard wood cuttings. Taking into account the study on "Response of IBA concentration on rooting of mulberry cuttings" was laid out in Completely Randomized Design comprising of five treatments i.e. Control, IBA 500 ppm, IBA 1000 ppm, IBA 1500 ppm and IBA 2000 ppm. The treatments were replicated for four times. The effects of IBA concentration on rooting of mulberry stem cuttings were recorded. The result indicated that among all the treatments, minimum days taken to sprouting, maximum percentage of sprouted cuttings, length of the roots/cutting and length of longest root/cutting were recorded in IBA 1500 ppm.

Keywords: Mulberry, cuttings, IBA, sprouting, root length

PM/PP – 27

Phenology of flowering in water apple (*Syzigium aqeum Alst.)*

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ABSTRACT

Water apple is botanically called as *Syzigium aqeum Alst.* and belongs to family *Myrtaceae*. This is also known as watery rose apple. Under South Indian conditions, this is considered as an underutilized fruit crop, however there is a great scope commercialization of this crop, owing to nutritional and economic values. Any scientific information on flowering behaviour has direct link with pollination management in commercial orchards as well as crop improvement research programmes. Such information is highly beneficial in efficient orchard management so as to reap the potential yields in water apple. However, the information on flowering behaviour of water apple is very scanty. Under these circumstances, the present investigation was taken up in water apple with the key objective of understanding phenology of flowering of water apple under south Indian conditions. The observations recorded were time of flower bud (Inflorescence) emergence, flower bud development process, and bud growth rate. The results revealed that the flower bud emergence was noticed in two peak flushes during the investigation. The floral bud emergence in the first flush started from 3rd week of July and the floral bud emergence in second flush was started from 2nd week of September. The entire bud development phase from its appearance to the full bloom stage was divided into seven distinct stages. The stage I: A visible protruded flower bud with tiny un-differentiable from the vegetative buds, Stage II: Elongated flower bud looks like a pointed ball, Stage III: Early plump bud stage with prominent pedicels with green in colour. Stage IV: Elongation of the cyme inflorescence, the flower buds are green colour with a funnel shape. Stage V: Growth of flower bud, the flower buds were increased in length and diameter which were recorded as 1.4 to 1.7 cm in length and 0.9 to 1 cm in diameter. Stage VI: Floral buds at premature stage with a clear appearance of the petal at the top of flower bud white in colour and encircling the bud. Stage VII: Floral buds at matured stage, the petals started to split and showed a cleavage on the centre of the bud. The bud growth in length and diameter was recorded on alternative days from flower bud emergence to final matured stage of buds just before opening. The data indicated that in the initial stages, the buds showed a slow growth rate with respect to the bud length and diameter, but after 9th day of developmental stage bud growth gradually increased and the maximum growth of buds was seen after 31st day of floral bud development stages. The maximum bud size of 2.05 x 1.30 cm in length and diameter on 35th day of flower bud emergence was registered.

Keywords: Water apple, flower bud growth, different stages, bud size

PM/PP – 28

Effect on rooting of stem cutting in West Indian cherry (*Malpighia punicifolia* L.) for root and shoot parameters under Periyakulam condition

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ABSTRACT

An investigation was to assess the influence of growth regulators IBA and their combination on rooting of stem cuttings in West Indian cherry (*Malpighia punicifolia* L.) under Periyakulam, Theni district of Tamil Nadu. Based on the experimental results, it was concluded that T6 (1500ppm of IBA) in Semi-hardwood cuttings has given highest rooting of cutting percentage (81.50%), number of leaves per cutting(22), days taken for first sprouting(9 days), number of roots per cuttings(14.52), length of longest root (23.45 cm), fresh weight of roots (2.20g) , dry weight of roots (1.15g), length of leaf (6.5 cm) and width (4.5 cm).The less rooting of cutting percentage (28.00%), number of leaves per cuttings (8), days taken for first sprouting (19), number of roots per cuttings (2.04), length of the longest root(4.31cm), fresh weight of roots (0.32 g) dry weight, of roots(0.08 g), length of leaf (3.4) and width (1.90) was recorded in T14 untreated softwood cuttings.

Keywords**:** West Indian cherry, rooting, stem cutting, IBA

PM/PP – 29

Effect of media, Arka Microbial Consortium and ABA on successful rooting of Dragon fruit cuttings

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ABSTRACT

Dragon fruit (*Hylocereus undatus* Britton & Rose) is an edible, fast growing, perennial epiphytic vine resemblance to cacti and belongs to family Cactaceae. The fruit recently introduced as exotic fruit to India and considered as promising, remunerative and relatively durable fruit crop. Fruit has very attractive color and mellow mouth melting pulp with black color edible seed embedded in the pulp along with tremendous nutritive property. Dragon fruit is propagated sexually by seed and asexually by stem cutting. The cheapest and convenient method of propagation is by stem cutting. Growing media is the important factor for the propagation that gives anchorage to the plants and provides essential nutrients required by the plants. For better rooting and development growing media enriched with AMC possess the advantages like more availability of nutrients in the available forms through natural process. In this regard the experiment was carried out to know the best media composition. The results revealed that the media (Sandy soil + Vermicompost + AMC) and the cuttings treated with ABA were taken significantly less days (31 days) for higher sprout initiation with maximum number of sprouts per cutting (7) and highest percentage of successful rooted cuttings (95 %). Followed by the cuttings grown in media (Sandy soil + Vermicompost) and treated with ABA were taken 39 days to sprout initiation and 4 sprouts per cuttings with 85 percentage of successful rooted cuttings. Whereas, the media without treated with AMC and the cuttings were not treated with ABA resulted higher days to sprout initiation (45 days), lower percentage of successful rooted cuttings (76 %) and lower number of sprouts per cutting (2). The experiment concludes that treatment of AMC to media and cuttings with ABA will helps to produce the successful and quality dragon fruit seedlings.

Keywords: Dragon fruit, growing media, sprouting, rooted cuttings

PM/PP – 30

Effect of severity of pruning and fruit retention on fruit quality of custard apple

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ABSTRACT

The present investigation entitled "Effect of severity of pruning and fruit retention on fruit yield and quality of custard apple" was carried out during 2019-20 and 2020-21 at Dhanaj (Khu), Tq- Karanja, Dist- Washim (MS). The experiment was laid out in Split Plot Design designed with four severity of pruning viz., P_{1-} No pruning (control), P_{2-} Light pruning: the thickness of branch 3-5mm (Refill thickness), P_{3-} Medium pruning: the thickness of branch 6-10mm (Pencil thickness) and P_{4-} Hard pruning: the thickness of branch 11-15mm (Thumb thickness) and fruit thinning are T_{1-} no thinning (control), T_{2-} fruit retention up to 100 fruits per plant, T_{3-} fruit retention up to 80 fruits per plant, T_{4-} fruit retention up to 60 fruits per plant and T_{5-} fruit retention up to 40 fruits per plant. The fruit quality in terms of maximum weight of fruit, length of fruit, breadth, weight of pulp, weight of peel, number of seeds, weight of seed, TSS, total sugar, and titrable acidity were recorded in medium pruning and fruit retention up to 40 fruits per plant, followed by fruit retention up to 60 fruits per plant. The highest TSS:acidity ratio and sugar: acidity ratio was recorded in light pruning and fruit retention up to 40 fruits per plant.

Keywords: Pruning, fruit retention, fruit weight, TSS, total sugar, acidity

PM/PP – 31

Effects of seed storage duration and pre-germination treatments on the vitality and robustness of passion fruit (*Passiflora edulis* var. Flavicarpa) seeds

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ABSTRACT

The duration of seed viability remains uncertain for the majority of Passiflora species. Additionally, the extended period of both natural and induced dormancy contributes to the slow and uneven germination of these seeds. Consequently, an experiment was conducted at KRCCH Arabhavi in Karnataka to investigate how the combination of seed storage duration and pre-germination treatments influences the viability and vigor of passion fruit seeds. The research findings unveiled that seeds sown after being stored for 15 days exhibited a significantly higher germination percentage of 52.71%. Furthermore, these seeds demonstrated superior seed quality parameters, including shoot length (11.58 cm), root length (4.92 cm), fresh weight of the seedling (78.79 mg), dry weight of the seedling (8.27 mg), seedling vigor index-I (901), and seedling vigor index-II (458.96). These parameters exhibited a decreasing trend with varying storage periods. Regardless of the duration of seed storage, it was observed that seeds treated with a 1% thiourea solution for 10 minutes exhibited the highest germination percentage and superior seedling quality parameters. Following this treatment, seeds treated with GA_3 at a concentration of 250 ppm for 10 minutes also displayed favourable germination results and seedling quality characteristics. Indeed, even a slight extension in the storage period of these seeds can bring significant benefits to nurserymen and farmers. The potential advantages are substantial, as it can lead to exponential growth in the propagation and cultivation of these types of seeds. This extended storage period allows for better planning, flexibility, and optimization of resources in agricultural practices, ultimately contributing to improved agricultural productivity and the availability of quality seedlings for farmers.

Keywords: Thiourea, GA_3, seed quality, seedlings

PM/PP – 32

Exploring temperature regimens and dormancy-breaking treatments in passion fruit (*Passiflora edulis* var. Flavicarpa) seeds

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ABSTRACT

As passion fruit, holds considerable economic importance owing to its edible fruit and its recognized medicinal properties, particularly for its intriguing sedative and anxiolytic effects. Moreover, it plays a crucial role in vegetative propagation and serves as a rootstock for other Passiflora species. However, the seeds encounter challenges in establishing a robust plant stand and achieving higher germination rates. The primary objective of this study was to explore the existence of dormancy in Passion fruit seeds and evaluate their suitability for extended storage. The germination experiments involved various combinations of temperature and lighting conditions, while different treatments were applied to overcome seed dormancy, including tegument cutting, warm water immersion, and gibberellin application. The study also evaluated seed viability during storage. The findings indicated that optimal seed germination occurred when seeds were placed on paper at an alternating temperature ranging from 25 °C. Additionally, newly-harvested seeds exhibited both physical and physiological dormancies. Physical dormancy was effectively broken by immersing seeds in water at temperatures of 50 °C for durations of 5 minutes. Meanwhile, physiological dormancy was successfully overcome by 300 ppm of gibberellic acid. Furthermore, when stored in a refrigerated environment and sealed within airtight polyethylene packaging, the seeds maintained their physiological quality.

Keywords: Passion fruit, seed germination, gibberellin, dormancy

PM/PP – 33

Assessing nutrient status and standardizing leaf sampling techniques in jackfruit

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ABSTRACT

The study was conducted in 2020-2021 at the College of Horticulture in Kolar district, which is situated between North latitude 12° 46' to 13° 58' and East longitude 77° 21' to 78° 35', focused on diagnosing nutrient content and standardizing leaf sampling techniques in Jackfruit. The region experiences a semi-arid climate with an average annual temperature of 17°C-34°C and moderate rainfall ranging from 650-800 mm. The experimental orchards featured Alfesols (Red sandy loam) soil. Employing a completely randomized design with ten distinct treatments, each replicated three times, the study assessed treatment impacts across varying environmental conditions. Each treatment, represented by specific trees, facilitated a comprehensive analysis of research objectives. Based on the leaf sampling technique, the standard of leaf nutrient concentrations was summarized and could be used as the standard for nutrient suitability evaluation.

Keywords: Jackfruit, leaf sampling technique, nutrient status, diagnosis, standardization

PM/PP – 34

Study on reproductive phenophases of rambutan (*Nephelium lappaceum L*)

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ABSTRACT

Rambutan (*Nephelium lappaceum L*) is a less-known tropical fruit with a distinctive flavour and high economic worth beyond its enormous health benefits. Since this fruit is gaining huge market demand and export potential, regulation of the harvest stage for higher keeping quality needs to be standardized for which studies on fruit set, maturation and harvest stages are vital. Reproductive bud initiation, flower bud development, fruit set and development, and lastly colour development phase are the four main growth phases that are detailed here. The reproductive bud initiation phase begins with the initiation of a coppery red panicle from the terminal stems, which are tightly linked to the inflorescence and have closed flower buds. As the phase progresses, the panicle turns green. When the pedicel lengthens, protogynous flowers open, and blooms with bi- or trilobed ovaries are visible on the inflorescence, the flower bud development phase effectively commences. The pepper-sized fruits start to get larger during the fruit set and development phase, with one of the bi or tri-lobed ovaries moving on to the next stage while the other two stay rudimentary. The spintrens on globular fruits grow more noticeable as the stages progress, and aril development starts at 50% of the final fruit size. Fruit grows longer and more oblong as it matures, and when the phase comes to a finish, fruits change colour from green to yellow. In the last stage, the spinterns' base begins to change colour, turning red as it slowly advances and spreads across the peel. The base of the spintern widens as the red colour's intensity increases, and the entire fruit turns red at the end of the phase. Ultimately, greater shelf life for rambutans can be achieved by harvesting them at the right point of maturity and by researching their phenophases.

Keywords: Rambutan, bud initiation, fruit set, spintrens, shelf life

PM/PP – 35

Biodegradable eco grow bags for raising arecanut seedlings

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ABSTRACT

A study was conducted at ICAR-Central Plantation Crops Research Institute, Regional Station, Vittal, Karnataka, India, to identify the biodegradable ecofriendly bags for raising arecanut seedlings as an alternative to polythene bags and also to add value to arecanut leaf sheath. Eco grow bags were prepared from arecanut leaf sheath. Arecanut leaf sheath bags were filled with recommended potting mixture for raising arecanut seedlings *viz*., soil:FYM:sand in the ratio of 7:3:2. Polythene bags with same potting mixture were used for comparison. For each treatment (eco grow bags and polythene bags),45 arecanut sprouts were transplanted and arranged in completely randomized design with three replications per treatment. Observations on seedlings growth parameters *viz*., seedling height (cm), seedling girth (cm) and number of leaves were recorded at sixmonths after transplanting. Seedlings growth parameters were recorded from twelve seedlings per replication. Observations recorded on seedling traits indicated that the eco grow bags prepared from arecanut leaf sheath can be used for raising arecanut seedlings as an alternative to polythene bags. Seedling height (cm), seedling girth (cm) and number of leaves were found to be 59.29 cm, 12.9 cm and 3.97 number and 52.28 cm, 13.02cm and 3.89 number in the seedlings raised in biodegradable bags and polythene bags, respectively.

Key words: Eco grow bags, biodegradable bags, arecanut, seedlings

PM/PP – 36

Importance of organics and chemicals on germination, root stock growth and graft-take in Jamun (*Syzygium cumini* Skeels)

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ABSTRACT

The investigation was carried out during 2016 and 2017 in department of fruit science, college of horticulture, Mudigere, Chikkamagaluru district of Karnataka. To study the effect of pre-soaking treatments on germination, growth and graft-take in Jamun. The wild jamun fruits were collected; seeds were extracted required for the experiment and soaked in different nine treatments which were replicated thrice. All pre-soaked treatments promoted significantly earlier germination than control. The seeds pre-treated with Panchagavya 3 per cent recorded significantly lower number of days for the initiation of germination (9.42 and 9.92 days), completion of germination (32.18 and 32.11 days), maximum germination percentage (99.04 and 99.44 %) and germination index (2.90 and 2.88). Whereas rootstock height (21.01 and 21.53 cm). root stock diameter (5.42 and 5.29 mm), number of leaves per root stock (20.12 and 20.33), vigour index (2102.43 and 2102.80 cm), vigour of root stock (605.92 and 605.97 g), graft sprout height (8.94 and 8.88 cm), sprout diameter (6.96 and 6.98 mm) and number of leaves per graft (10.30 and 10.47) were recorded maximum in GA_3 at 100 ppm, Further highest graft success (76.32 and 76.38 %), graft survival percentage (53.87 and 53.38 %), was recorded maximum in panchagavya 3 per cent. While KNO_3 1 % had showed highest root parameters like primary root length (25.81 and 25.04 cm) and number of secondary roots (45.31 and 45.32). List observation was recorded in control. Hence, this study concluded that in hill zone of Karnataka, jamun can be propagated by softwood grafting by treating the seeds with panchagavya 3 per cent and GA_3 at 100 ppm helps in better germination, growth and graft-take in rose apple.

Keywords: Rootstock panchagavya, GA_3, graft-take, vigour index, graft survivability

PM/PP – 37

Standardization on age of rootstock for softwood grafting in avocado (*Persea americana* Mill.) under Hill Zone of Karnataka

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ABSTRACT

Recent days, avocados are commercially propagated through softwood grafting. Age of rootstock is one of the factors that determine success in soft wood grafting. Hence, there is need to standardize proper age of rootstock for soft wood grafting. The study was carried out during the year 2021-22 under normal poly house condition at department of fruit science, College of Horticulture, Mudigere, on study of age of rootstock for softwood grafting in avocado under hill zone of Karnataka. The experiment was laid out in Completely Randomized Design with five treatments and five replications. In this experiment, 60 days old rootstock recorded maximum graft height (46.43 cm), sprout length (12.77 cm), sprout diameter and (2.58 mm) and graft percentage (90.00). Whereas 120 days old rootstock recorded maximum number of sprots (7.28), number of leaves (18.68), graft survival percentage (77.77) and stionic ratio (1.32). Maximum graft height, sprout length, sprout diameter and graft success percentage were recorded in 60 days old rootstock Significantly maximum number of sprouts, number of leaves, stionic ratio and graft survival percentage were recorded in treatment 120 days old rootstock. Rootstocks play a crucial role in determining orchard efficiency in fruit crops. Thus, there is a need to standardize the age of rootstock on avocado grafts. So that the vegetative propagated plants may be provided to the growers to get better yield and quality in future.

Keywords: Root stock, graft survival percentage, stionic ratio, graft success percentage

PM/PP – 38

Influence of IBA and NAA on shoot development in stem cuttings of dragon fruit [*Hylocereus undatus* (Haworth) Britton & Rose]

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ABSTRACT

Dragon fruit is a promising new profitable exotic tropical fruit crop, In the last two decades, it has attracted great attention from farmers as well as consumers due to its high content of essential nutrients and potential economic value. Dragon fruit plants are multiplied through both sexual (seeds) and asexual (stem cutting) methods. Stem-cutting propagated plants produce an economic yield after the first year of planting in comparison to sexually propagated seedlings, which require more than three years for bearing. The root and shoot in cuttings of some species occur without exogenous auxin treatment, but the majority do not root and shoot easily. The study was investigated to standardise the different types of growth regulators and their concentrations, which have a positive correlated influence on the rooting and shooting percentages of dragon fruit stem cuttings. The experiment was laid out using a randomized block design with nine treatments and three replications. The stem cuttings of Dragon fruit treated with IBA, NAA, and their combinations revealed that the minimum number of days taken for sprouting (8.10), the best sprouting percentage of shoots (51.13%), the number of sprouts per (2.05), the length of the newly emerged shoot (14.45 cm), the diameter of the shoot (3.35 mm), the average number of spines per areoles (4.15), the fresh weight of the shoot (52.6 g), and the dry weight of the shoot (10.48 g) were recorded in cuttings treated with IBA 4000 ppm. This was probably because of the simulative actions of exogenous auxin (IBA) in the formation of new shoot tips in stem cuttings.

Keywords: Dragon fruit, rooting, shooting, stem cutting, auxins

PM/PP – 39

Identification of suitable media for rooting and establishment of African marigold through stem cutting

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ABSTRACT

The present investigation identification of suitable media for rooting and establishment of African Marigold through stem cutting was carried out at Pt. K.L.S.College of Horticulture and Research Station during the year 2018-19. The experimental field was presented in acompletely randomized design with three repetitions under the shad net condition. Each replication consisted of 14 treatments. One month old cuttings 8-10 cm long with softwood stem were selected for root initiation. The result showed that the rooting media of cocopeat significantly influence the survival percentage (91.66 %), number of sprouts(6.06), length of shoot (7.40 cm), length of root (5.66 cm),rooting percentage (85%) whereas vermicompost and vermicompost + soilis best for the number of leaves (46.40),fresh weight (730.86 mg) and dry weight (85.93 mg) ofshoot, fresh weight (98.13 mg) and fresh weight (9.70 mg)of root.

Keywords: Rooting media, cocopeat, vermicompost, FYM, stem cutting

PM/PP – 40

Effect of growth retardants on ornamental quality, root growth and vase life of ornamental foliage plant syngonium

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ABSTRACT

An investigation was carried out during December 2021 to May 2022 at college of Horticulture, Dr. Y.S.R Horticultural University, Venkataramannagudem, West Godavari to study the effect of plant growth retardants on growth and quality in ornamental foliage plant syngonium. The experiment was laid out in Completely Randomized Design with thirteen treatments imposed as foliar spray at 30 and 60 days after transplanting. The treatments included were T□ (PBZ @ 50 ppm), T□ (PBZ @ 100 ppm), T□ (PBZ @ 150 ppm), T□ (PBZ @ 200 ppm), T□ (B-nine @ 1000 ppm), T□ (B-nine @ 1500 ppm), T□ (B-nine @ 2000 ppm), T□ (B-nine @ 2500 ppm), T□ (CCC @1000 ppm), T□□ (CCC @ 1500 ppm), T□□ (CCC @ 1500 ppm), T□□ (CCC @ 2000 ppm) and T_{13} (Control). Quality parameters like longevity of leaves (84 days) and vase life of cut foliage (32.45 days) were recorded highest in paclobutrozol @ 200 ppm (T_4). Root parameters viz., root length (74.55), root spread (15.96 cm), fresh weight of root (37.10 g) and dry weight of root (8.95 g) were reported highest by cycocel @ 2000 ppm treatment (T_{11}). Maximum visual plant grade (4.84) was recorded in paclobutrozol @ 150 ppm treatment (T_3) and the visual colour grade was highest (4.84) in cycocel @ 2500 ppm (T_{12}) followed by paclobutrozol @ 150 ppm (T_3) (4.65) and visual root grade was recorded highest (4.75) in cycocel @ 2000 ppm (T_{11}).

Keywords: Syngonium, Paclobutrazol, CCC, visual plant grade, vase life, root length

PM/PP – 41

Effect of paclobutrazol on seed germination and seedling characteristics of African marigold seedlings

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ABSTRACT

African marigold (*Tagetes erecta* L.) is one of the most popular and commercial flowering annuals cultivated in South India. It has excellent demand during various festivals for making decorative garlands, as cut and loose flowers and for other decorative purposes. Marigold flowers are also used inthe cosmetic and pharmaceutical industry.The commercial cultivation of marigold requires growing marigold seedlings in nursery for atleast one month before transplanting them to the main field. However, the marigold seedlings grown in poly housesin protrays exhibit lanky and curved growth. This causes seedling damage especially breaking of stems while transporting and planting in the main field. Control of seedling height is significantin reducing the damage to seedlings. Seed treatment with growth retardants like paclobutrazol (PBZ) has been found to be suitable for controlling the plug height of seedlings of some vegetables. The present study was thus undertaken to study the effect of paclobutrazol on the seedling height of marigold. In the present study, marigold seeds were soaked in distilled water and different paclobutrazol concentrations of 750,1000,1250,1500, and 2000 ppm for 2,4 and 6 hours. The seedlings soaked in a higher concentration of paclobutrazol showed reduced germination percentage, length of shoots and roots 10 days after sowing. The height of the seedlings and height up to the first node was also found to be the highest for control (no soaking) and lowest for paclobutrazol concentration of 2000 ppm (30 days after sowing). The curving of the stem was found to be less prominent or absent in 1500 and 2000 ppm. Soaking seeds in paclobutrazol produced promising outcomes. The study reveals that higher concentrations of paclobutrazol isbenefecial for reducing the height of the seedlings.It can also prevent the lanky growth of seedlings and make them appear greener.

Keywords: African marigold seedlings, paclobutrazol, seed germination, seedling characteristics

PM/PP – 42

Effect of irrigation regimes and fertigation levels in tuberose under black polythene sheet mulched eco system

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ABSTRACT

Tuberose (*Polianthes tuberosa*) is one of the commercially grown flower crops exploitedforcut flower, loose flower and also a source of raw material in perfume industry.Field experiment was conducted to study the effect of Irrigation regimes and fertigation levels on post-harvest available soil nutrient statusin tuberose under black polythene sheet mulched ecosystem at Botanical Garden, Tamil Nadu Agricultural University, Coimbatore. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with three replications. Treatments comprised of three levels of drip irrigation at 75 per cent, 100 per cent and 125 per cent of Computed Water Requirement (WRc) and seven levels of drip fertigation at 100 per cent water soluble and straight fertilizer, 75 per cent WSF + 25 per cent SF, 50 per cent WSF + 50 per cent SF and 25 per cent WSF + 75 per cent SFwith black polythene mulch and without mulch. The results revealed that the drip irrigation with 125 per cent WRc + 100 per cent WSF with mulch showed lower soil available nitrogen, phosphorus and potassium content over the other levels of drip irrigation, fertigation and without mulch.

Keywords: Tuberose, irrigation regimes, fertigation levels, black polythene mulched

PM/PP – 43

Effect of plant growth regulators on vegetative, floral and corm attributes of gladiolus (*Gladiolus hybrida L.*) cv. Pusakiran

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ABSTRACT

A field experiment was carried out during the winter season of 2022–2023 at the Horticulture farm, School of Agricultrual Sciences, Dabok, to investigate the impact of plant growth regulators on the vegetative and floral traits of Gladiolus (*Gladiolus Hybrida* L.) cv. Pusa Kiran. There were ten treatments using three different concentrations of each of the three plant growth regulators, GA3, NAA, and CCC, plus one control. It was discovered that treatment T8: Corms soaked in CCC @ 400ppm resulted in the highest number of leaves per plant, measuring (92.123 cm), whereas treatment T1: Control (Normal water dipped) resulted in the lowest number, measuring (10.162 cm). Early flowering, or 72.52 days, was noted with CCC 200 ppm. T1: The control (Normal water dipped) had the lowest values across all metrics. So, the corms produced the best outcomes fromCycoceal. Therefore, we can conclude that Gladiolus gives best result in all observations with the treatment Cycoceal.

Keywords: Cycocel, gladiolus, plant growth regulator

PM/PP – 44

Study on different growing substrates and their physical properties in gerbera cultivation

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ABSTRACT

With the increasing concern on water and nutrient use efficiency, adequate importance should be given to the physical properties of the growing substrate as it plays a huge role in minimizing the drainage loss, water usage and nutrient leaching to the greater extent thus assuring uninterrupted water and nutrient availability to the plants. An investigation was conducted at ICAR-Indian Institute of Horticultural Research, Bengaluru in an attempt to explore the physical properties of different growing substrates and their effects on growth and yield of gerbera var. Arka Nesara. The growing substrates employed in the study were Arka fermented cocopeat (AFC): FYM (1:1), AFC: rice husk (2:1), AFC: FYM: rice husk (1:1:1) and red soil: FYM: rice husk (2:1:1) on volume basis. With respect to plant performance, copious leaves (13.64/ plant at 3 months after planting) and flowers (29.62/ plant/ year) were produced from the plants grown on AFC: FYM: rice husk (1:1:1) along with earlier first flower harvest (135.46 days), longer flower stems (48.81 cm), bigger flowers (9.36 cm) and prolonged vase life (11.23 days). In terms of physical properties of the media, the above substrate was found to possess the bulk density of 0.28 g/ cc, particle density of 0.71 g/cc, pore space of 59.25 %, water holding capacity of 222.86 % and volume expansion of 35.59 % against 0.72 g/cc, 1.38 g/cc, 46.73 %, 67.25 % and 18.97 %, respectively in red soil: FYM: rice husk (2:1:1). Hence, the better growth and yield obtained with AFC: FYM: rice husk (1:1:1) might be associated with its optimal water holding capacity, porosity and particle density. Thus, it can be concluded that using Arka fermented cocopeat + FYM + rice husk (1:1:1 v/v/v) could improve the physical properties of the media thus enhancing the efficiency and productivity of gerbera var. Arka Nesara.

Keywords: Bulk density, particle density, pore space, volume expansion and water holding capacity

PM/PP – 45

Crop management practices for enhancing yield and quality of *Dracaena reflexa* 'Song of India'

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ABSTRACT

Floriculture is an aesthetic branch of Horticulture. In recent years, it has emerged as a profitable agribusiness in India and worldwide, providing employment and entrepreneurship opportunities in rural and urban areas. Cut foliage has significant potential as an alternative to flowers, particularly during lean periods, yet it remains largely unexploited. Dracaenas, which comprise one of the most important and diverse groups, are popular cut foliage, widely used in both landscapes and homes. Among different varieties of Dracaena, *Dracaena reflexa* 'Song of India,' a popular cultivar, has very high demand in both domestic and international markets. Agronomic practices play a crucial role in determining the yield and quality of cut foliage. The climatic conditions in Kerala are highly conducive to the production of cut foliage, and they can be successfully cultivated as intercrops. But suitable crop management practices for the commercial production of cut foliage are not yet standardized. Hence, a study was conducted at Department of Floriculture and Landscaping, College of Agriculture, Vellanikkara to standardize spacing and nutrient management, for *Dracaena reflexa* 'Song of India'. The experiment was laid out in RBD (Factorial) with two levels of spacing *viz*; 45 x 45 cm and 45 x 30 cm and four levels of nutrients *viz*; 24:6:12 NPK g/plant/year, 48:6:12 g/plant/year, 100g farm yard manure/plant at four months interval and absolute control. Foliar spray of NPK 1:1:1 (19:19:19) at 0.5 % was given at 3 months interval for all treatments, except absolute control. From the study, it could be observed that, the treatment combination of 45 x 30 cm spacing with a nutrient dose of 48:6:12 g/plant/year recorded maximum plant height, plant spread and foliage yield over rest of the treatments during the course of study. The results suggested that application of NPK @48:6:12 g/plant/year with 45 x 30 cm spacing helps to enhance the growth and yield of *Dracaena reflexa* 'Song of India' under kerala condition.

Keywords: *Dracaena reflexa* 'Song of India', spacing, foliar nutrient spray, yield, quality

PM/PP – 46

In vitro multiplication of *Rynchostylis gigantea* an underutilized orchid using embryo culture

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ABSTRACT

Rynchostylis gigantea, an endangered orchid belonging to the Orchidaceae family has seen a decline in its population in the indigenous habitat, due to various anthropological reasons. This orchid produces densely packed pendulous inflorescence with showy, fragrant flowers. Conservation and commercial use of this floriferous, underutilised orchid, without adversely affecting the native population is feasible if rapid multiplication protocols are established. In this study Optimization of medium, culture conditions and growth regulator combinations were formulated for the endangered orchid species *Rynchostylis gigantea* using immature embryos as explants. Maximum germination was observed in ½ Murashige and Skoog (MS) semi solid media. Cultured PLBs produced 5.75 shoots per PLB on medium supplemented with 1.5 mg/l of TDZ. Maximum shoot elongation (1.17 cm) and no. of leaves per shoot (7.5) were obtained on MS medium supplemented with 1.0 mg/l BAP. Number of roots per shoots was higher (1.5) in the medium supplemented with 0.5 mg/ l BAP. The standardized simple protocol for germination, formation of PLBs, shoot elongation and rooting will be highly useful for the conservation of different accessions of *Rynchostylis gigantea in vivo* as well as the commercial micro propagation for quick multiplication and cultivation.

Keywords: *Rynchostylis gigantea*, underutilized orchid, *in vitro* multiplication, embryo culture

PM/PP – 47

Studies on the effect of foliar nutrients on growth and performance of money plant (*Epipremnum aureum*) and philodendron (*Philodendron hederaceum*) under vertical wall

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ABSTRACT

An investigation was carried out to study the influence of foliar nutrients on money plant (*Epipremnum aureum*) and Philodendron (*Philodendron hederaceum*) in modular vertical green walls in the Department of Horticulture, Annamalai Universityduring 2021 - 2023. The experiment comprised of growth regulator (GA_3 @0.1% and 0.2%), foliar nutrient (19:19:19 @ 0.2% and 0.4%) and (13:40:13 @ 0.2% and 0.4%) as foliar spray at 30 days interval. Observations on plant length, number of leaves, leaf length, leaf breadth and internodal length were recorded at 20 days interval from 20 to 180 days of planting. Results of the experiment revealed that the plants sprayed with 13:40:13 @ 0.4% recorded maximum values for plant length (30.52, 41.52, 62.8, 78.48, 84.54, 105.58, 134.44, 149.84and 164.28 cm), leaf length (10.1, 10.2, 10.4, 10.6, 10.9, 11.02, 11.3, 11.6 and 11.9 cm), leaf breadth (6.5, 6.6, 6.7, 7.02, 7.2, 7.3, 7.6, 7.9 and 8. cm) and internodal length (1.06, 1.42, 1.46, 1.6, 1.76, 1.99, 2.1, 2.4 and 2.62 cm) at 20, 40, 60, 80, 100, 120, 140, 160 and 180 days respectively. Similarly, in Philodendron (*Philodendron*) those plants sprayed with (13:40:13 @ 0.4%) (T_6) recorded maximum leaf length (12.1, 12.2, 12.4, 12.5, 12.7, 12.8, 13.2, 13.5 and 13.7 cm), Leaf breadth (4.3, 4.4, 4.6, 4.7, 4.9, 5.1, 5.3, 5.5 and 5.6 cm) at 20, 40, 60, 80, 100, 120, 140, 160 and 180 days respectively. However, the treatment (T_1) (GA_3– 0.1%) for recorded maximum number of leaves (22.3, 27.6, 38.6, 42.6, 46.3, 53.6 58.6, 60.3 and 65.01) at 20, 40, 60, 80, 100, 120, 140, 160 and 180 days respectively. The importance of using foliage ornamentals over vertical garden module is to have a dense foliage to cover the entire mat/wall surface. Hence, more foliage rather than its length and breadth are considered as an important character which constitutes for the aesthetic sense. Therefore, plants sprayed with (GA_3 – 0.1%) (T_1), recorded maximum number of leaves in both the foliage ornamentals. Hence, it was concluded that, GA_3 (0.1%) can be sprayed at 30 days interval to foliage ornamentals under vertical garden module.

Keywords: *Epipremnum aureum, Philodendron hederaceum*, foliar nutrients , growth , vertical wall

PM/PP – 48

Assessment of suitability of spider plant (*Chlorophytum comosum*) under various shade conditions and nutrient requirements for modular vertical walls

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ABSTRACT

An investigation was carried out to study the performance of different shade conditions and nutrients for spider plant (*Chlorophytum comosum*) in modular vertical walls under vertical garden module in the Department of Horticulture, Faculty of Agriculture, Annamalai University (Tamil Nadu) during 2021 - 2023. The experiment was laid out with three nutrient sources viz., Fertilizer stick @ 1 stick/pot, Organic granules @ 1g/pot, DAP @ 0.5g/pot applied at 45 days interval. The above experiment was set at three different shade conditions viz., Full shade(S_1), Partial shade (S_2) and Full sun (S_3). Observations on number of leaves, leaf length, leaf breadth was recorded at 30, 60, 90, 120 and 150 days of planting. Results of the experiment recorded positive significance among the nutrient sources and shade condition. Among the nutrient application, the treatment T_1 (Fertilizer stick @ 1 stick/pot) recorded maximum number of leaves (19.18, 26.29, 28.09, 32.54 and 35.10) at 30, 60, 90, 120 and 150 days respectively. However, maximum leaf length (14.97, 19.32, 23.32, 25.69 and 28.24 cm) and leaf breadth (1.57, 2.20, 2.34, 2.58 and 2.72 cm) was recorded under T_3 (DAP @ 0.5g/pot). Among the shade conditions, the plants grown under Partial shade (S_2) recorded maximum number of leaves (18.03, 23.78, 26.24, 29.47 and 33.06) at 30, 60, 90, 120 and 150 days respectively. The data on leaf length (14.91, 19.46, 22.42, 26.32 and 29.44 cm) and leaf breadth (1.55, 2.19, 2.27, 2.36 and 2.45 cm) recorded maximum values under S_1 (Full shade) at 30, 60, 90, 120 and 150 days respectively. The combined effect of shade and nutrient application showed maximum number of leaves (21.64, 30.68, 32.57, 37.93 and 40.39) in T_1X S_2 (Fertilizer stick x Partial shade) at 30, 60, 90, 120 and 150 days respectively. Similarly, the treatment combination T_3 X S_1 (DAP X Full shade) recorded maximum leaf length (17.83, 24.62, 26.85, 31.38 and 35.69 cm) and leaf breadth (1.85, 2.73, 2.83, 2.91 and 2.95 cm) at 30, 60, 90, 120 and 150 days of observations respectively. The importance of using foliage ornamentals over vertical garden module is to have a dense foliage to cover the entire mat or wall surface. Hence, more foliage rather than its length and breadth are considered as an important character which constitutes for the aesthetic sense. Therefore, plants under Partial shade (S_2), recorded maximum number of leaves in Spider plant. Hence, it was concluded that application of fertilizer stick (T_1) @ 1 stick/pot at an interval of 45 days and those plants kept under Partial shade (S_2) exhibited superior performance of Spider plant under modular vertical walls.

Keywords: *Chlorophytum comosum*, shade levels,nutrients,modular vertical walls

PM/PP – 49

Response of foliar application of micronutrients on growth, flowering and bulb production of LA hybrid *Lilium* cv. Pavia

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ABSTRACT

Now a day the demand of flowers is increasing in domestic as well as international market. Among top ten cut flowers in the world, liliums occupy a prominent position due to its beauty and demand in domestic as well as international market, but in India it is still an underutilized crop due to lack of knowledge about its cultivation practices among farmers and agro climatic conditions. Among commercially grown liliums, LA hybrids (*Lilium longiflorum* X Asiatic types) are hardy and can be easily grown under Indian climatic conditions and no systematic work has been carried out regarding standardization of production technology. With this point of view, present study has been planned. A field experiment was carried out in the floriculture experiment field at ICAR-IARI, New Delhi to study the effect of foliar application of micronutrients (zinc and manganese) on growth, quality and bulb production of LA hybrid lilium cv. Pavia. The experiment was laid out in a factorial randomized block design with two factors ($ZnSO_4$ and $MnSO_4$) comprising five levels (distilled water, 2 g/l, 4 g/l, 6 g/l and 8 g/l) of micronutrients. Among different treatment combination, the plant which are sprayed with $ZnSO_4$ and $MnSO_4$ @ 6g/l each performed better in terms of plant growth parameters*viz.,* numberof leavesperplant(79.13), leaf length (14.08 cm), leaf width (3.21 cm), Leaf Area Index (1.98) and total chlorophyll content in leaves (8.45 mg/g); quality flower attributes *viz.,* stalk length (99.23 cm), number of flower buds per plant (8.53), flower size (20.20 cm) and number of days from flower openingto complete flower withering (15.46 days); bulb attributes *viz.,* number of bulblets per plant (4.60) bulb circumference (14.97 cm), weight of bulb (30.44 g)andbulblets (2.64g), whereas least values were recorded in control *i.e.,* distilled water spray.

Keywords: LA Hybrid Lilium, foliar application, micronutrients, growth, flowering, bulb production

PM/PP – 50

Effect of growth regulators and growing media for enhancing cormel production in gladiolus cv. Punjab Glad 3

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ABSTRACT

The present investigation was conducted in the experimental farm of Department of Floriculture and Landscaping at Punjab Agriculture University, Ludhiana in 2022-23. The cormels of gladiolus cv. 'Punjab Glad 3' of initial size 0.2 cm weighing 0.5- 1g were dipped in solutions of different growth regulators and sowed in two different media i.e. soil and cocopeat. The interaction between two medium lead to the conclusion that soil presented better growth and development of cormels. Whereas, cocopeat enhancedthe growth andnumber of roots/ cormel (5.31) and root length (9.90 cm). In terms of chemical treatment $CaNO_3$@ 1% showed best results in leaf width (1.23 cm), percentage increase in cormel size (90.24%), size of cormel at harvest (2.08cm), percentage increase in cormel weight (89.65%) and weight of cormel at harvest (5.24g). The chlorophyll content (70.86), fresh (1.77) and dry biomass (0.55) were high in KNO_3@1%. The vegetative growth was more enhanced when dipped in GA_3@200ppmas seen in leaf length (39.20 cm), number of roots/ cormel (5.88), root length (8.61). The sprouting percentage was more in control 93.27% followed by $CaNO_3$ (82.69%) and in media containing soil (87.98%). The study concluded that $CaNO_3$ @1% was beneficial in increasing the cormel size and weight in both medium thereby reducing the time for commercial production of corms.

Keywords: Gladiolus, growth regulators, growing media, cormel production

PM/PP – 51

Influence of growth retardants on growth and flowering of crossandra (*Crossandra infundibuliformis*) under field conditions

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ABSTRACT

The present research was carried out in crossandra at ICAR-DFR, Regional Station, Vemagiri, Kadiyam mandal. The experiment was carried out during 2021-22 (September-May). The experiment was laid out in Randomised Block Design (RBD) with ten treatments of plant growth retardants *viz.,*cycocel (500,1000 1500 ppm), paclobutrazol (500, 1000, 1500 ppm) and maleic hydrazide (200, 600, 1000 ppm). The treatments were replicated thrice. Among the growth parameters, the maximum plant height, leaf length and leaf width were recorded with the untreated plants while the minimum was observed with the application of paclobutrazol @ 1500 ppm. The plant spread has increased with the application of cycocel and maleic hydrazide and maximum was recorded with maleic hydrazide @ 600 ppm (T_9) which was on par with cycocel @ 1500 ppm (T_4). Application of paclobutrazol @ 1500 ppm (T_7) recorded the maximum chlorophyll content of the leaves that was succeeded by the treatment T_6 (paclobutrazol @ 1000 ppm). The least chlorophyll content was recorded in the untreated plants. Among the treatments, maleic hydrazide @ 600 ppm recorded the maximum number of branches per plant, leaf area, root-shoot ratio, fresh weight and dry weight of roots. Foliar application of maleic hydrazide @ 600 ppm (T9) significantly improved the flowering parameters *viz.,* number of spikes per plant, number of florets per spike, length of spike, length of the floret, longevity of spike in the field, longevity of florets on the spike, flower yield per plant, hundred florets weight and shelf life of the florets and can be recommended for loose flower production of crossandra.

Keywords: Crossandra, cycocel, maleic hydrazide, paclobutrazol

PM/PP – 52

Optimization of nitrogen application and planting density for desi rose for loose flower production

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ABSTRACT

Rose is the beautiful creation of nature and is universally known as queen of flowers. It has a well-known place in the cultures of almost all countries of the world.It belongs to Rosaceae familyand is native to the temperate regions of the northern hemisphere.One of the species *Rosa gruss-an-teplitz*, commonly known as '*Desi Rose*', is one of the beautiful red roses of the old garden rose section.It is preferred by farmers due to its remarkable colour of flower and recurrent blooming period. Moreover, its cultivation is easy and has assured marketing. The effect of nitrogen and plant spacing was investigated for higher yield of loose flower production.Two years plants were planted at three different spacings 70 x 100 cm, 70 x 90 cm and 70 x 80 cm and were fertilized with four levels of nitrogen 0, 1.5, 2.0 and 2.5 g per plant at monthly intervals starting from pruning. The experiment was laid out in RBD design with 12 treatments each having three replications. The treatment combination of 2.0 g nitrogen with plant spacing of 70 x 100 cm resulted in maximum plant height (109.83 cm), plant spread (95.67 cm), flower weight (3.45 g), number of flowers per plant (389.66),flower yield (0.85 kg) per plant and flower yield (3348.47kg) per acre. The early flowering was recorded in same treatment as it took 54.10 days to bud appearance and hence, early flowering (64.00 days). The peak flowering occurred during the month of April followed by March. Thus, application of nitrogen @ 95.04 kg (206.24 kg urea) equally divided into 12 splits at monthly interval) along with spacing70 x 100 cm had a significant effect in improving the plant growth and flower yield of desi rosein open field conditions in Punjab.

Keywords: Rose (*Rosa gruss-an-teplitz*), nitrogen, spacing, loose flower, yield

PM/PP – 53

Effect of long-term bulb storage on flower regulation in Lilium (*Lilium hybrida* L.)

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ABSTRACT

Study on "Effect of long-term bulb storage on flower regulation in Lilium (*Lilium hybrida* L.)" was conducted at the Research farm, Department of Soil and Water Engineering, Punjab Agricultural University, Ludhiana in the year 2022. The study aimed at finding out the suitability of extended bulb storage in order to produce continuous supply of quality flowers. The experiment was laid out in a Completely Randomized Block Design with four replications. Programmed bulbs procured from Florance Flora were cold stored at 4˚C for duration of 0, 1, 2, 3, 4, 5 and 6 weeks and planted subsequently. It was revealed that storage duration upto 4 weeks resulted in quality produce. A reducing trend was observed in terms of vegetative parameters (days taken to sprouting, plant height, number of leaves per plant and stem thickness) with an increase in storage duration. Greatest variation was observed in stem thickness ranging from 8.46 mm to 6.84 mm. A similar trend was also observed for floral attributes where the flowers with desirable characteristics (days taken to colour break, anthesis and senescence, bud length and flower size) reduced when stored for more than 4 weeks where bud length and flower diameter reduced from 9.07 cm to 7.65 cm and 19.56 cm to 18.21 cm, respectively. So, storage of bulbs up to 4 weeks could be employed by farmers to regulate flowering without compromising flower quality of Lilium.

Keywords: Lilium, bulbs, storage duration, regulation, flower quality

PM/PP – 54

Effect of different light regimes and growing media fortified with oil palm mill waste on growth and quality of syngonium (*Syngonium podophyllum*)

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ABSTRACT

Effect of different light regimes and growing media fortified with oil palm mill waste on growth and quality of syngonium (Syngonium podophyllum) was studied at Dr. YSRHU-COH, Venkataramannagudem, in the year 2023. The experiment was conducted at four varied locations having different light levels and four compositions of growing media in factorial concept. Among the growth parameters studied plant height was found to differ significantly at all growth stages due to light regimes, media composition and their interactions. Syngonium plants grown inside the room recorded the highest plant height followed by those grown on staircase. The lowest plant height was recorded under coconut tree shade. Among different growing media, the media comprising of red soil: empty fruit bunch waste (1:2) recorded maximum plant height followed by red soil: empty fruit bunch waste (1:1). The lowest plant height was observed in red soil. With respect to the effect of interactions, the highest plant height was registered by the combination of inside the room + red soil: empty fruit bunch waste (1:2) followed by staircase + red soil: empty fruit bunch waste (1:2). The lowest plant height was observed in plants grown under coconut tree shade + red soil. Observations on other vegetative parameters viz., plant spread, number of leaves, leaf length, leaf width, leaf area, petiole length, petiole girth followed similar trend and even root parameters viz., number of roots, fresh and dry weight of roots, root length. As regards to quality, maximum visual plant grade, visual colour grade, vase life of cut foliage, in situ longevity of leaves and visual root grade were also found in respective treatments.

Keywords: Syngonium, Light intensity and growing media.

PM/PP – 55

Performance assessment of different mentha species in hydroponic systems for growth, yield and essential oil content

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ABSTRACT

In India, the usage of arable land for crop production is shrinking due to rapid urbanisation and infrastructure development. The crop production in conventional method of farming involves lot of challenges such as seasonal changes, prone to pests and diseases, indiscriminate use of fertilizers and plant protection chemicals and lacking in quality standards. Hydroponics is a method for growing and nurturing plants in a soilless environment by exposing their roots in water nutrient solution.The present study was conducted to examine the performance of five different species of mint viz, Pepper mint (*Mentha piperita*), Japanese mint(*M.arvensis*), Spear mint (*M.spicata*), Bergamot mint(*M.citrata*) and Garden mint(*M.viridis*)in different hydroponic systems viz.,Deep Flow Technique(DFT)- A type, Nutrient film technique(NFT)-Linear system, Linear NFT with Wick system in comparison with conventional soil-based cultivation method under protected conditions as control. Experiment was laid out in FRBD with five replications at Centre of Excellence on ProtectedCultivation, ICAR-IIHR, Bengaluru. Observations on growth and yield traits and essential oil content were determined. Nutrient quantities were computed for 500 litre of water and were given through inlet system. pH of 6.5-6.8 and EC around 1.5-2dSm^{-1} was continuously maintained throughout the trial period. Comparison of differenthydroponic production systems had a significant effect on the plant growth, yield and essential oil content in different species of *Mentha*. The evaluated hydroponicsystems performed better than the soil-based systems and evolved as the most water-efficientcultivation technique. Hydroponically grown mint species yielded significantly higher plant fresh weight than that of soil grown counterparts. Oil yields of all mint species were also significantly higher in hydroponically grown plants. These results prove that hydroponic productionof *Mentha species*will serves as an appropriate and sustainable alternative to conventional soil-basedproduction and are economically more feasible than soil cultivation.

Keywords: Mentha species, hydroponic system,r growth, yield , essential oil content

PM/PP – 56

Assessment of physiology and foliage quality performances of peace lily (*Spathiphyllum wallisii*) under coloured shade nets

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ABSTRACT

The present investigation was carried out to study the effect of coloured shade nets on physiology and quality of peace lily (*Spathiphyllum wallisii*). The experiment was conducted at College of Horticulture, Venkataramannagudem during 2021-22 with four replications in Completely Randomized Design. In this experiment four different coloured shade nets (red, black, white and green) with shading intensity of 50% and control (under tree shade) were used. In all these coloured shadenets performance of *Spathiphyllum* was studied for a period of 135 days. Physiology and foliage quality parameters were observed at various stages (45, 90 and 135 DAP). Physiological parameters like chlorophyll content and photosynthetic rate were recorded maximum in plants grown under black shade net followed by those grown under red shade net whereas, transpiration rate and stomatal conductance were found to be maximum in plants grown under white coloured shade net followed by those grown under red shade net. The foliage quality was better under green shade net in terms of colour intensity and vase life. The black shade net gave overall better performance regarding both physiological and quality parameters and can be suitable for commercial cultivation.

Keywords: *Spathiphyllum*, respiration rate, stomatal conductance

PM/PP – 57

Study of root characteristics of *Syngonium podophyllum* under DFT technique of hydroponics

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ABSTRACT

Hydroponics, a young budding science which can be used as an alternative sustainable production system under limited resource availability conditions.High quality ornamental plants can be produced through hydroponicsas it encourages faster growth. *Syngoniumpodophyllum* is a widely cultivated ornamental foliage plant as it eliminates polluting agents from inside households. An experiment on study of root characteristics of *Syngonium podophyllum* undersolution culture in DFT technique of hydroponics in was carried out at College of Agriculture, Vellayani, Thiruvananthapuram during 2022.The experiment was laid out in completely randomized design. Four doses of Hoagland solution and cooper solution (50%, 100%, 150% and 200%) were given and replicated ten times. Data on root characteristics of the plant under hydroponics was collected in 15 days intervals. The treatment with 150% Hoagland solution in *Syngonium podophyllum* plants showed superior values for number of roots produced at 120 DAP. But the treatment with 150% Hoagland solutionwas observed with highest number of roots from 45 DAP to 105 DAP. Highest values for root length varied among treatments during initial periods of observations while, it showed a significant increase for the treatment with 50% cooper's solution. Highest value for root length at 120 DAP was observed for 50% cooper's solution.

Keywords: Cooper, DFT, Hoagland, Hydroponics

PM/PP – 58

Assessment of the suitability of pot phalaenopsis orchid under different environmental conditions

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ABSTRACT

Phalaenopsis orchid is popular as cut flower and ornamental potted plant throughout the world due to its uniqueness with respect to flower characters, particularly its long *in situ* flower longevity. However, Phalaenopsis is a slow growing plant that is incredibly weather-dependent. The sluggish development of plants and the inability to produce blooms in response to demand are the two biggest obstacles in Phalaenopsis cultivation in the tropics. The present investigation was carried out at the Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore during 2021-'22 for assessment of the suitability of Phalaenopsis orchid under two different growing conditions. The experiment was conducted in Factorial Completely Randomized Block Design. with two factors namely, growing environment with two levels and varieties with eight levels. The two growing environments were shade-net house and polyhouse and the eight varieties were Andorra, Bilbao, Cali, Durban, Nottingham, Torino, Volterra and Washington. Planting materials were six months old tissue cultured plantlets. The study revealed that among the two different environmental conditions compared, shade-net condition suited best for majority of the varieties evaluated and among the varieties, Washington had better performance with respect to vegetative growth parameters.

Keywords: Orchids, Phalaenopsis, environmental conditions, shadenet, vegetative parameters

PM/PP – 59

Effect of cultivation of *Dracaena fragrans cv. Massangeana* as an intercrop in guava

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ABSTRACT

Dracaena fragrans cv. *Massangeana*, a member of the family Asparagaceae, is one of the important cut foliage which is highly exported to different countries from India. Its sword-shaped dark green leaves with a yellow stripe running along the centre, is gaining the attention of commercial growers. Cultivation of *D. fragrans* cv. *Massangeana* as an intercrop in guava was conducted in Research Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during March, 2020 to August 2020. As it is shade loving plant it can be grown as an intercrop. This will be provided greater opportunity for proper management practices under the guava plantation through intercropping dracaena plants. By growing this plant farmers can increase their income by increased production and this can be grown as an intercrop under guava or any other trees so area under production also can be increased. Based on the present investigation it was concluded that *D. fragrans* cv *Massangeana* as an intercrop in Guava (*Psidium guajava* L.) gave the best plant height (108.35cm), number of leaves per plant(33.36), plant spread (E-W (81.71cm) and N-S (91.99cm)), leaf area(333.75cm^2), leaf length (50.52cm), leaf width (9.28cm) fresh leaf weight (22.30g), dry leaf weight (6.09g), Days taken for sprout formation after harvest(36.84) and Vase life (13.30days) of *Dracaena fragrans* cv. *Massangeana*. As compared to the open cultivation when the crop is grown as an intercrop gives better yield as well as other parameters which increase the export quality.

Keywords: Cut foliage, intercrop, export, income, production

PM/PP – 60

Exploring unutilized cultivation techniques and underutilized crops in ayurveda: A systemic review

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ABSTRACT

Ayurveda, an ancient Indian medical system, places a strong emphasis on holistic health and well-being. Its core objective is to promote and maintain the health of individuals through a balanced approach that encompasses dietary and lifestyle choices. Within Ayurveda, various "aharavarga" or food categories are outlined, including Shukadhanya (cereals), Shamidhanya (pulses), Kshudradhanya (inferior cereals), Shakha (vegetables), Phala (fruits), Ikshu (sugarcane), and Taila (oil) varga, among others. Additionally, the discipline of Vrikshayurveda elucidates agricultural and horticultural practices. While many of these crops find widespread use, there exist lesser-known nutritional crops within Ayurveda that remain underutilized. This presentation delves into a systematic review of both published and unpublished data, aiming to shed light on these unexplored cultivation techniques and the underutilized crops of Ayurveda.The primary objective of this presentation is to systematically review selected published and unpublished data on underutilized crops in Ayurveda. Our research entailed a thorough exploration of published data across various electronic databases and extensive manual searches of journals, classical texts, and reference lists of potentially relevant studies. Data extraction was carried out independently by two authors, with any discrepancies resolved through discussions involving a third author. The systematic review reveals that many of these underutilized crops possess remarkable nutraceutical and pharmaceutical properties. Hence, there is a compelling need to explore advanced cultivation techniques and encourage increased production. To harness the potential of these neglected and underutilized crops, a transdisciplinary approach that integrates Ayurveda with fields such as horticulture and agriculture is essential. This collaborative effort will be instrumental in developing these crops and their associated cultivation methods, ultimately contributing to the broader goals of Ayurveda in promoting holistic health and well-being.

Keywords: Ayurveda, unutilized cultivation techniques, underutilized crops

PM/PP – 61

Effect of sowing date and nitrogen on growth and yield of beet leaf (*Beta vulgaris* var. *bengalensis*)

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ABSTRACT

The experiment entitled "Effect of sowing date and nitrogen on growth and yield of beet leaf (*Beta vulgaris* var. *bengalensis*)" was conducted during summer, 2020 at Vegetable Research Farm, RHRS, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat, India. The experiment was laid out in Split plot design with five replications. The experiment was arranged with three levels of sowing date (D_1:1st Fortnight of January, D_2:2nd Fortnight of January and D_3:1st Fortnight of February) and four doses of nitrogen (N_1:0 kg N ha^{-1}, N_2:50 kg N ha^{-1}, N_3: 75 kg N ha^{-1} and D_4: 100 N kg ha^{-1}). Plant height (7.40 cm and 37.14 cm, respectively) at 20 DAS and 40 DAS, number of leaves per plant (5.74 and 12.20, respectively) at 20 DAS and 40 DAS, leaf area (122.54 cm^2) and green leaf yield (8.47 kg $plot^{-1}$ and 14.70 t ha^{-1}) in plant from the 2nd cutting was recorded higher in 1st fortnight of January sowing (D_1). Among the nitrogen doses, plant height at 20 and 40 DAS (8.69 cm and 40.12 cm, respectively), number of leaves per plant at 20 and 40 DAS (6.65 and 13.56), length of leaf (19.76 cm), leaf width (9.32 cm), length of petiole (7.89cm), leaf area (140.23 cm^2), number of cuttings (3.73) and green leaf yield (10.25 kg $plot^{-1}$ and 17.79 t ha^{-1} were obtained higher with application of nitrogen @ 100 kg ha^{-1} (N_4). Beet leaf sown at 1st fortnight of January with 100 kg N ha^{-1} (D_1N_4) had given the best performance in the yield parameter *i.e.* green leaf yield (10.66 kg $plot^{-1}$ and 18.51 t ha^{-1}). The higher net return of ₹ 1,27,671 ha^{-1} was obtained with D_1N_4 (1st fortnight of January and 100 kg N ha^{-1}).

Keywords **:** Beet leaf, date of sowing, nitrogen, yield

PM/PP – 62

Effect of straight and nano fertilizer on growth, yield and quality of cabbage (*B. oleracea* Var. *capitata* L.)

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ABSTRACT

The present investigation entitled "Effect of straight and nano fertilizer on growth, yield and quality of cabbage (*B. oleracea* var. *capitata* L.)" was conducted during two consecutive *rabi* season in year2020-21 and 2021-2022 respectively at Central Research Farm, Regional Research Station, Gayeshpur in Nadia district of West Bengal. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications and nine treatments *viz.* T_1= Control, T_2= RDF dose through straight fertilizer, T_3 = RDF dose through straight and nano fertilizer, T_4= STCR dose for targeting 500q/ha yield through straight fertilizer, T_5 = STCR dose for targeting 500q/ha yield through straight and nano fertilizer, T_6 = STCR dose for targeting 550q/ ha yield through straight fertilizer, T_7 = STCR dose for targeting 550q/ha yield through straight and nano fertilizer, T_8 = STCR dose for targeting 500q/ha yield through straight, nano fertilizer and Sagarika and T_9= STCR dosefortargeting550q/ha yield through straight, nano fertilizer and Sagarika. Two years pooled data revealed that maximum plant height (15.2, cm at 30 DAT, 18.25 cm at 45 DAT and 25.26cm at harvest respectively), number of wrapper leaves (9.32 at 30 DAT, 12.43at 45 DAT and 13.77 at harvest respectively), leaf length (18.23 cm at 30 DAT, 20.6cm at 45 and 25.92 cm at harvest), leaf width (16.1cm at 30 DAT, 21.10 cm at 45 DAT and 24.95cm at harvest), plant weight (2.095 kg), yield per hectare (624. 88q) polar length of head (16.93cm) equatorial length of head (17.45cm), ascorbic Acid (17.35 mg), reducing sugar (2.93%), non- reducing sugar (1.93%), total Sugar (4.91%), moisture content (84.50%) and B: C (1.81) ratio was recorded with the application of treatment T_9 = STCR dosefortargeting 550q/ha yield through straight, nano fertilizer and Sagarika. Whereas maximum TSS was reported (6.70º Brix) was reported in T_6 = STCR dosefortargeting550q/ha yield through straight fertilizer.

Keywords : Equatorial length of head, nano fertilizer, polar length of head, straight fertilizer

PM/PP – 63

Underutilized perennial vegetable crops: for climate resilience

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ABSTRACT

Perennial vegetables are plants which complete their life cycle in more than two years. Once they grow, they start to bear flowers, produce fruits, seeds and the cycle continues for a longer period of time. They do not die after bearing fruits but renew their parts, season after season or perennial vegetables are plants that can live for more than two years and typically come back year after year without needing to be replanted. These vegetables include khejri, aloe-vera, spine gourd, ivy gourd, artichokes, rhubarb, and various types of berries. These types of plants can be a great addition to a garden or farm as they require less maintenance and can provide a steady harvest year after year. Additionally, many perennial vegetables are hardy and can tolerate a wide range of conditions, making them a good choice for areas with difficult growing conditions. Farming with perennials provides an important way of mitigating climate change by means of aerial carbon sequestration. Perennial vegetable cultivation demands less expenditure and gives high returns. Consumption of perennial vegetables makes the availability of nutrients and vitamins at cheaper cost, thereby helps in solving malnutrition in rural areas. Growing of perennials with multiple uses food, fodder and fuel will diversify the income source. Therefore, documentation of traditional crop knowledge and dissemination of information relating to the perennial vegetable food utilization is very essential for conservation of diversity, ecosystem stability, income & food diversification and solving nutritional problems.

Keywords : Spine gourd, ivy gourd, artichoke and perennial vegetable crops

PM/PP – 64

A compatibility study for enhanced production of underutilized vegetable crop-black night shade (*Solanum nigrum)*

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ABSTRACT

The cultivation of underutilized vegetable crops holds significant promise for enhancing food security and diversifying agricultural production. *Solanum nigrum*, a relatively unexplored vegetable crop, possesses nutritional value and adaptability to varied environmental conditions. This study investigates the potential of grafting as a technique to enhance the productivity and overall yield of *Solanum nigrum*. Grafting, a horticultural practice plays a significant role in modern practices, effectively managing both abiotic and biotic stresses. Additionally, it offers the advantage of enhancing the phenotypic traits of the scion.The research presented herein encompasses a comprehensive analysis of grafting methods and their impact on *Solanum nigrum*compatibility status. Rootstock and scion compatibility are explored, considering their influence on plant vigour, disease resistance, and stress tolerance. Furthermore, the study evaluates the histology shedding light on the intricate interactions between rootstock and scion. Experimental results reveal the positive effects of grafting *Solanum nigrum*over wild rootstocks. Grafting *Solanum nigrum* onto selected wild solanaceous rootstocks revealed compatibility among certain species. Additionally, enhancements in crop duration and improved quality parameters were observed. These findings contribute valuable insights into the potential of grafting to optimize the cultivation of underutilized crops like *Solanum nigrum*.In conclusion, this research underscores the significance of grafting as a tool for elevating the productivity and sustainability of underutilized vegetable crops. By harnessing the benefits of grafting, agricultural practices can be advanced to address food security challenges and promote the cultivation of crops like *Solanum nigrum* with medicinal value, nutritious and adaptive. This study calls for further exploration and adoption of grafting techniques to unlock the full potential of underutilized crop species in the pursuit of global agricultural advancement.

Keywords : *Solanum nigrum*, grafting, compatability, histology

PM/PP – 65

Effect of sowing dates and varieties on growth and yield parameters of watermelon grown under low tunnel

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ABSTRACT

A field experiments were conducted during winter season 2020-21 and 2021-22 at MPUAT, Udaipur to find out the effect of sowing dates, and varieties growth and yield performance of watermelon. Three dates of sowing 15th December, 30th December and 15th January, two type variety red fleshed and yellow fleshed replicated thrice in factorial randomized block design. Among the varieties, red fleshed recorded significantly higher growth than yellow fleshed variety. Early sowing date (15th December) produced statistically higher growth parameters than other date of sowing environments along with higher yield. The red fleshed variety exhibited higher growth attributing parameters and yield of watermelon crop.

Keywords : Watermelon, sowing date, varieties

PM/PP – 66

Standardization of plant density, pruning and training for watermelon under rain shelter towards doubling farmer's income

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ABSTRACT

Watermelon is an important cucurbitaceous crop grown in tropical and subtropical areas and has greater global consumption. Compared to traditional method of growing watermelon horizontally, more number of plants can be accommodated by training vertically. As vegetable cultivation in rain shelter is gaining popularity in Kerala, plant density management is essential to obtain greater number of fruits of commercial standard from unit area. Therefore, this study was conducted (2021-2022) at Department of Vegetable Science, College of Agriculture, Vellayani, Kerala, to standardize spacing, training levels and pruning heights on yield and quality of watermelon hybrid 'Saraswati' under rain shelter. The treatments were factorial combinations of three spacing (1.5 m × 0.6 m, 1.5 m × 0.45 m and 1.5 m × 0.3 m), two training levels (single vine, double vines) and two pruning heights (pruned at 2m and unpruned) arranged in randomized block design with two replications and control with horizontal training of vines in open condition. The closer spacing, D_3 (1.5 m × 0.3 m) recorded highest value for yield per plot (78.37 kg). Plants trained to double vine (T_2) and unpruned plants (P_2) recorded highest values for yield per plant and yield per plot. The wider spacing D_1 (1.5 m × 0.6 m) exhibited highest fruit weight and yield per plant. Treatments under rain shelter registered longer crop duration (122.32 days) compared to the control (79 days). The combination of closer spacing without top pruning and double vine training gave highest yield per plot (90.10 kg), net income and BC ratio. It is, therefore, concluded that the combination of closer spacing 1.5 m × 0.3 m and double vined plants without top pruning gave highest yield and net income per unit area in vertically grown watermelon under rain shelter.

Keywords : Watermelon, randomized block design, spacing, pruning, rain shelter

PM/PP – 67

Performance of lettuce variety phule padma (GKL-2) of exotic vegetable under Pune condition

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ABSTRACT

Lettuce is the most important salad crop consumed in uncooked state. Salad crops are now more popular because of their food value in the diet and health awareness worldwide. It is most commonly used in the U.S.A. and now in India it becomes popular. It is a native of Europe and Asia and introduced in India by the Britishers. Lettuce is an annual and belongs to family composite/asteraceae. There are four distinct types of lettuce, Head type (Butter head and Crisp head)-var. *Capitat*a, Leaf type-var. *Crispa*, Cos type-var. *Long folia*, Asparagus type-var. *Asparagus*. (Lebeda *et.al.* 2007). Lettuce leaves contain small amount of opiate-like substance, *lactucarium* ("lettuce opium"), which is mild sedative. (Ryder, 2002; Resh, 2001). Several health-building qualities and many medicinal virtues are contained by lettuce. The loose leaf lettuce is regarded as better food because it is rich in iron and also has more vitamin A and C than the stem variety since it is more exposed to the sun. Greener leaf has more chlorophyll and vitamins. It has rich content of mineral salts especially the alkaline elements. Lettuce used for consumption should be fresh green-leaves. Since lettuce is very low in calories, it has been effective when consumed as a diet food. It is most often grown as a leafy vegetable and used in other kinds of food such as soups, sandwiches and wraps or it can also be grilled. There are very few varieties commercially grown in India. In Maharashtra, around peri-urban area this crop gains more popularity but as on today no new variety or genotype available in Maharashtra for commercial cultivation which is an important constraint in popularizing cultivation of this crop. Hence, to explore the prospects and developing new cultivar, three promising selections *viz*., GKL-1, GKL-2 and GKL-3 were evaluated and cv. Chinese Yellow is used as check for six years. The performance of a selection GKL-2 was found to be most promising higher yield (298.74 q/ha) than check cultivar Chinese yellow (260.27 q/ha) and it is early, having green leaves with shinning and serrated margin, good nutritive value over the check cultivar Chinese Yellow.

Keywords : Chines yellow, chlorophyll, vitamins, lettuce, selections

PM/PP – 68

Productive and physiological performance of single- and cluster-fruit bearing slicing cucumber hybrids modulated by grafting and protected cultivation structures

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ABSTRACT

In recent years, the demand of slicing (mini) cucumber has increased. It is a popular crop of protected cultivation because of profuse fruiting, uniform and attractive fruits, and no requirement of pollination as fruit develop parthenocarpically. Slicing cucumber comprises of two segments, single- and cluster- fruit bearing. The maximization of production with optimized use of resources is important for successful protected cultivation especially in resource scarce regions. The aim of study was to assess the performance of single fruit bearing hybrid (Nefer) versus cluster fruit bearing (Terminator) hybrid, whether non-grafted (normal) or grafted on Cucurbita hybrid rootstock NS-55 (RG 313) under three different low-cost protected structures at ICAR-CAZRI, Jodhpur. Results reveal that grafting improved growth as well as production traits of both types of cucumber by modulating plants physiological characteristics regardless of protected structures in which these were grown. Cluster-bearing hybrid, both grafted and non-grafted, produced higher yield than single fruit bearing hybrid. Among protected structures, naturally ventilated polyhouse (NVP) was found superior to the screen houses i.e., insect-proof nethouse (INH) or shade nethouse (SNH) with regard of cucumber growth and yield. The Micro-climate parameters inside NVP (air temperature, relative humidity and photosynthetic active radiation) were more congenial for cucumber growth than those measured screen houses, thereby facilitating better plant physiological performance in terms of chlorophyll fluorescence, chlorophyll content and, plant water and leaf mineral status. Furthermore, NVP was found to be superior to screen houses for water productivity also, and grafted plants were more water use efficient than their counterpart non-grafted plants. Thus, NVP can be considered a suitable low-cost protected structure in conjunction with grafting to boost cucumber crop and water productivity in arid regions.

Keywords : *Cucumis sativus*, protected cultivation, yield, water productivity, physiological status, sustainable horticulture

PM/PP – 69

Standardisation of fertigation and evaluation of chitosan as a biostimulant on biochemical and morphological traits of seedless watermelon [*Citrullus lanatus* (Thunb.) Matsum& Nakai)

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ABSTRACT

Watermelon [*Citrullus lanatus*(Thunb.) Matsum and Nakai] responds well to fertigation in terms of growth and yield enhancement. Chitosan as a bio stimulant has a potential role in improving yield, quality, biotic and abiotic stress resistance of agricultural crops which can be exploited in the production of watermelon also. In this background a study was conductedto standardise fertigation and to evaluate chitosan as a biostimulant on biochemical and morphological traits of triploid seedless watermelon hybrid, Shonima at Department of Vegetable Science, KAU, Thrissur. The experiment was laid out in split plot design with four fertigation levels and three different concentrations of chitosan as foliar application in subplots. Fertigation levels significantly influenced vegetative and floral characters of watermelon. Longest vine length (3.87m) was recorded by 125% RDF. Male flower anthesis (24.39 days) was found to be early in 50% RDF. Fruit and yield characters along with quality parameters were significantly influenced by fertigation doses. 100% RDF was found to be the best for these characters with maximumfruits/plant (4.52), average fruit weight (1.61 kg), yield/plant (5.97 kg/plant) and lycopene content (5.76 mg/100g). Maximum TSS (8.64°Brix) was recorded in 75% RDF and maximum total sugar (5.38%) in 50% RDF. Chitosan concentrations also influenced fruit, yield and quality parameters of watermelon and foliar application of 0.1% chitosan was found to be superior with maximum fruits/plant (4.25), average fruit weight (1.94 kg), yield/plant (6.23 kg/plant), TSS (8.87°Brix), lycopene content (4.96 mg/100g), reducing sugar (3.54%) and total sugar content (5.38%). Interaction effect of fertigation doses and chitosan concentrations on fruit and yield characters and quality parameters was found to be significant and treatment combination of 100% RDF + 0.1% chitosan spray was found to be the best with maximum equatorial diameter, polar diameter, average frFuit weight (2.38 kg), yield/plant (8.06 kg/plant) and lycopene content (6.72 mg/100g). Maximum TSS (9.46°Brix) and reducing sugar (3.98%) was recorded by 75% RDF + 0.1% chitosan spray. Maximum total sugar content (5.67%) was observed by 50% RDF + 0.1% chitosan spray. The present investigation revealed that the crop duration was reduced during the summer season hence, the recommended dose of fertigation for Shonima (90 days duration) was 43.75: 31.25: 75 kg NPK/ha whereas chitosan concentration was 0.1 % and treatment combination 100 % RDF + 0.1 % chitosan was found to the best for yield and quality parameters of watermelon with maximum returns (BC ratio of 2.01:1).

Keywords **:** Watermelon, sowing date, varieties, parameters.

PM/PP – 70

Standardization of spacing and evaluation of nano nitrogen in cluster bean [C*yamopsis tetragonoloba* (L.) Taub.]

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ABSTRACT

A field experiment was conducted during October 2022 - February 2023to optimize the plant spacing and foliar application of nano nitrogen in cluster bean variety KAU Suruchi for enhancing yield of the crop. The experiment was laid out in split plot design with four replications. The treatments consisted of six spacings (S_1- 45 cm x 20 cm, S_2- 45 cm x 30 cm, S_3- 45 cm x 45 cm, S_4- 60 cm x 20 cm, S_5- 60 cm x 30 cm and S_6- 60 cm x 45 cm) and four levels of nitrogen,*i.e.*N_1-N 20 kg ha^{-1} soil application + 0.4 % foliar spray of nano nitrogen, N_2-N 10 kg ha^{-1} soil application + 0.4 % foliar spray of nano nitrogen, N_3-N 15 kg ha^{-1} soil application + 0.4 % foliar spray of nano nitrogen and N_4-N 20 kg ha^{-1} soil application. Observations on pod length (cm), individual pod weight (g), number of pods per plant and yield per plant (g) were recorded and analysed statistically. The treatment combination S_6N_3 recorded the highest pod weight (4.91g), which was on par with S_5N_3(4.80 g). S_5N_3 recorded the highest pod length (12.64 cm), number of pods per plant (191.85) and yield per plant (452.63 g).

Keywords : Field experiments, soil applications, nano nitrogen, treatments.

PM/PP – 71

Characterization of underutilized vegetable *Citrullus* (Khero) in red and lateritic zone of West Bengal

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ABSTRACT

Vegetable *Citrullus* is an underutilized cucurbit of Red and Lateritic Zone of West Bengal. Regionally it is known as '*Khero*'. During summer 2019, twenty six landraces of Vegetable *Citrullus* were evaluated for six qualitative and twelve quantitative traits at Horticultural Farm of Sriniketan. Presence of significant variation in different growth, flowering, yield and quality traits were observed among the genotypes. The study revealed early flowering in genotype VC-5-3. Minimum days taken for first fruit harvest were recorded in genotype VC-13-3. However, genotype VC-5-2 produced maximum fruit length and circumference. VC-12-2 had significantly higher number of fruits plant^{-1} and higher total fruit yield plant^{-1} than other genotypes. VC-12-2 and VC-12-3-1 outperformed other genotypes for different quality traits such as TSS content, Total sugar content, reducing sugar content, Acidity, Lycopene content and β-carotene content of immature fruit. High GCV, PCV, heritability and genetic advance were noted for number of fruits plant^{-1} and total fruit yield plant^{-1}. Above genotypes are suggested to use in future breeding programme as these are showing superior performance for earliness, higher yield and quality traits.

Keywords: Yield, quality, traits, genotypes, carotene, lycopene.

PM/PP – 72

Potential vegetable crops of Mizoram for the future

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ABSTRACT

The Mizoram state is one of the most predominant areas with rich diversity of wild fruits, tubers, edible leafy plants and herbs. These floras are endowed with enriched nutritional, immense traditional medicinal value and high economical potential with target consumers for the regions. The traditional knowledge and consumption of wild edible plants of Indian ethnic communities are rich and unique in the world. The people of the region have hereditary traditional knowledge of consuming wild plants and plant parts *viz*. fruits, leaves, floral bud, flowers, and tender leaves and tubers as a source of food. Amongst them, few vegetables *viz*., Baibing [*Alocasia fornicata (Roxb.)*], Kawhtebel [*Trevetia palmate* Roxb.] Lengser *(Elsholtzia ciliate)* are cultivated in small scale for horticultural purposes, without scientific intervention. On the other hand, majority of the crops are directly harvested from wild habitats. Such as Vaube (*Bauhinia variegata*), Tumthang [*Crotalaria tetragona* Roxb. ex Andr], Tumbu (*Musa paradisica*), Sekhupthur[*Begonia infata* C.B. Clark], Aidu [*Amomum dealbatum Roxb*] etc. flowers are harvested for vegetables. In addition, Phuihnam (*Clerodendron indicum*), Fangra (*Canavalia cathartica*), Kuangkuah (*Ipomea aquatic* Forsk.), Dum Zawngtah (*Neptunia oleracea*), Chakawk (*Diplazium esculentum*), wild *Solanumsp*., purun zung *(Allium hookeri*),Hrui zik (*Alpinia nigra*), chimchawk (*Aralia racemosa* var. *foliosa*), Buarze (*Blumea lanceolaria),* Bal (*Colocasia esculanta*), Kawrthin deng (*Dillenia indica* L.), *Dioscorea sp.,*Saisu (*Ensete superbum),* Sihneh (*Eurya cerasifolia),* tree tomato [*Solanum betaceu (Cav.*)], Khanghu [*Acacia pennata* (L., Willd.], Zawngtah [*Parkia timoriana(DC.) Merr*], Thingthupui (*Dysoxylum procerum*), Pelh (*Gnetum gnemon*) and Anchiri (*Homalomena aromatic*) are the economically potential vegetables of Mizoram worth exploring. Henceforth, the ethno-botanical information and the technological intervention of these potential plants can solve the problem of malnutrition and socio-economic status of the ethnic people.

Keywords : Under-exploited crops, Mizoram, exploration, nutraceutical, socio-econimic

PM/PP – 73

Climate resilience in horticulture crop

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ABSTRACT

Climate conditions play a major role in agriculture. The phenology of fruit crops is the relationship between plant growth and environmental conditions. Due to climate change, the whole phenology of crops might change or be affected, especially the reproductive phase. Climate resilience is very important to avoid crop loss and poverty levels around the world. Climate-resilient agriculture protects production practices from uncertain weather patterns and helps in cultivate high-quality crops. We should protect the crop from adverse climate change through the use of agricultural production technologies. Vegetable crops must be safeguarded from climate change through the use of technologies such as protected cultivation methods, drip irrigation, mulching for weed control, and enhanced abiotic and biotic-resistant varieties. Specifically, with high-value crops like tomatoes, cucumbers, and capsicum, we can get more profit. We can mitigate climate change problems with the use of some improved varieties, such as drought-prone varieties and abiotic and biotic stress-resistant varieties. In fruit crops, crop-based climate adaptation through rootstock, cultivars, modified crop management practices, adjusting cropping season and method, and implementing the new cropping technologies. Now a days, new gene editing technologies such as CRISPR/Cas9 are allowing the rapid development of climate-resilience-smart crops. So, we aim to improve climate resilience through the development of genetically improved climatic resilience crops and varieties and some new farming technologies.

Keywords : Climate change, mitigation, rootstock, resistant cultivar, crop resilience, gene editing technology.

PM/PP – 74

Impact of biostimulants on growth, yield and quality of sweet potato (*Ipomoea batatas* L.) Cv. CO-34

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ABSTRACT

The present inspection titled "Impact of biostimulants on growth, yield and quality of sweet potato (*Ipomoea batatas* L.) Cv. CO-34" was carried out at Protected cultivation unit, Department of Vegetable Science, College of Horticulture & Forestry Jhalawar,Agriculture University, Borkhera, Kota, 324001 (Rajasthan) during the winter season of 2020-21.The main objectives of the present investigation were to be find out the effectof Humic acid and seaweed ongrowth,yield and quality of Sweet potato.The experiment consisted of twelve treatment combinations having four levels each of humic acid (0, 10, 20 and 30 ml/l) and seaweed (0, 1 and 2 ml/l) in Factorial Randomized Block Design. There was a significant effect of biostimulants (humic acid and seaweed) on growth, yield and quality of sweet potato alone and combination over control. The treatment combinations H_3S_2 (humic acid 30 ml/l and seaweed 2 ml/l) recorded the maximum growth parameters, yield parameters and qualitative parameters.

Keywords : Biostimulants, humic acid, seaweed, sweet potato, growth, yield

PM/PP – 75

Amplification of growth and yield of taro (*Colocasia esculenta*) through integrated nutrient management

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ABSTRACT

Growing concerns and awareness regarding environmental degradation, food safety, and human health have generated interest over the use of organic manures in farming. Taro being an underexploited crop which is predominantly grown in warmer regions for its palatable cormels, leaves and petioles and also a supplement to potatoes. In the view of this context a field experiment was conducted during February-August 2020 at Tiruvannamalai district, Tamil Nadu, India to study the influences of organic manures on the yield of taro (cv. Sree Rashmi). The experiment was laid out in randomized block design with nine treatments replicated thrice. Organic manures used for the study were farmyard manure, vermicompost, neem oil cake, phosphobacteria were applied as basal form and sea-weed extract, effective microorganisms, and panchagavya, were soil drenched on the day of sowing, 30th and 60th days after sowing as per the treatment. Results revealed that the maximum values of growth and quality parameters viz. plant height on 45, 90, 135 days were 45.72 cm, 97.43 cm, 144.99 cm, number of leaves/plant 11.24, leaf length 45.48 cm, number of cormels/plant (20.34), length of the cormels (11.28 cm), diameter of cormels (6.61 cm), girth of cormels (15.23 cm), single cormel weight (30.43 g), weight of the mother corms (599.28 g), total cormel yield/plant (618.94 g), total cormel yield/plot (24.13 kg), were recorded under the treatment of RDF + vermicompost (5 t/ha) + sea weed extract (5 ml/ litre) +phosphobacteria (2 kg/ha) proved best treatment in respect of these parameters. Among all the organic manures sea-weed extract combined with vermicompost and phosphobacteria proved beneficial in respect of yield and yield attributes. The minimum values of all these characters were recorded under control. The use of organic manures proved to be eco-friendly in taro cultivation for sustainable yield and quality of cormels as well as for maintaining soil health.

Keywords: Cormels, phospobacteria, soil health, vermicompost, organic manure

PM/PP – 76

Performance of protectively cultivated vegetables with different irrigation regimes under reduced runoff farming

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ABSTRACT

A greenhouse experiment was conducted during *kharif* 2020-21 and 2021-22 at AICRP for Dryland Agriculture, UAS, Bangalore, to examine the effectiveness of sensor based irrigation on the growth, yield and economics of high value vegetable crops, namely broccoli, capsicum, cherry tomato and pole bean under protective cultivation. The experiment was laid out in factorial- RCBD design with 16 treatments comprising four irrigation level *viz.,* 75, 50, 25 % available soil moisture (ASM) and surface irrigation as check. The results revealed that sensor based irrigation schedule at 75 % ASM recorded higher growth parameters *viz.,* plant height, leaf area and total dry matter of broccoli (70.27 cm, 4778.24 $cm^2$and 110.99 g $plant^{-1}$, respectively), capsicum (130.46 cm, 4991.57 $cm^2$and 150.66 g $plant^{-1}$, respectively) and pole bean (194.26 cm, 2946.29 cm^2 and 54.66 g $plant^{-1}$, respectively) and cherry tomato (211.73 cm, 5248.24 $cm^2$and 185.53g $plant^{-1}$, respectively) at 120 DAT/P compared to 25% ASM. Further, the higher mean yield of broccoli (27.55 t/ha), capsicum (48.59 t/ha), pole bean (37.08 t/ha) and cherry tomato (42.02 t/ha) was recorded for irrigation scheduled at 75 % ASM compared to 25% ASM (18.71, 40.81, 26.48, and 35.44 t/ha, respectively). The maximum net returns was with broccoli (Rs. 4,67,059 ha^{-1}), capsicum (Rs. 9,57,313 ha^{-1}), pole bean (Rs.8,57,082 ha^{-1}) and cherry tomato (Rs. 9,41,803 ha^{-1}) with irrigation schedule of 75 % ASM, which is attributed to higher yield with lesser cost of production. Among different vegetable crops, pole beane merged as the most remunerative crop with higher B:C ratio (4.59) followed by cherry tomato (3.82), capsicum (2.86) and broccoli (2.52). thus irrigation with 75 % ASM was found superior for growth, yield and economics of high value vegetables under protected cultivation.

Keywords: Broccoli, capsicum, cherry tomato, pole bean, irrigation and reduced runoff farming

PM/PP – 77

Effect of different levels of potassium and boron on growth and yield of carrot (Pusa Kesar) (*Daucus carota* L.)

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ABSTRACT

The investigation entitled "Effect of different levels of potassium and boron on growth and yield of Carrot (*Daucus carota* L.)" was carried out atexsperimental plot, Department of Horticulture,V.N.M.K.V., Parbhani, during *Rabi*2017-18. The experiment was laid out in a Randomized Block Design with thirteen treatments replicated twice, comprised ofBoron and potassium. The results found above study, maximum germination (97.07%), plant height (68.75 cm), number of leaves (10.75), fresh weight of roots (8.68 g), fresh weight of leaves (233.74 g), root length(25.85 cm), root diameter (5.57 cm),shoot length (64.15 cm),yield per plot (8.02 kg),yield per hectare (212.29q) recorded in T_{12}- Potassium @ 90 kg/ha + Boron @ 15 kg/ha. Hence, considering the positive effects of the different levels of potassium and boronit was found to be significant for carrots grown under Marathwada condition.

Keywords: Potassium and boron, carrot, growth, yield

PM/PP – 78

Softwood grafting technique for multiplication of elite jamun (*Syzygium cumini* Skeels) genotypes

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ABSTRACT

Jamun is a tropical fruit species, part of the Myrtaceae family, is a single seed berry; when ripe has slightly sweet and astringent taste. As this crop has gained importance due to its medicinal and nutritive value, there is a demand for early bearing and dwarf tree with high yield potential. Commercial multiplication of the varieties through standard propagation technique also plays significant role in area expansion of jamun. The most common and simplest method of raising the jamun tree is from seeds. Seed propagation is not advisable as it results in latebearing. Asexual propagation techniques are the easy and best way to retain certain characters of variety. In the view of propagating the elite genotypes collected from Kolar district of Karnataka, a study on softwood grafting was conducted at Department of Fruit Science, College of Horticulture, Bengaluru during2021-22. The experiment was laid out in Completely Randomized Design (CRD) with four treatments replicated five times. The per cent graft success was recorded highest in KJA-13 (70.00 %) genotype followed by KJA-21 (56.00 %). The per cent survivability was highest in KJA-21 (91.66 %) while, the graft survival was not observed in genotype KJA-23, significantly maximum graft height (18.50 cm) was observed in KJA-13 and maximum graft girth (5.42 mm) was observed in KJA-12 at 90 DAG. Comparatively, highest number of sprouts was found in KJA-21 (1.85), whereas lowest value was recorded in KJA-12 (1.45) at 90 DAG. The highest number of leaves was recorded in KJA-13 (8.20) and lowest in KJA-12 (6.24) at 90 DAG. The grafted plants obtained from the study can be further assessed for their growth and yield parameters in near future.

Keywords: Jamun, propagation, survivability, graft success

PM/PP – 79

Histological changes in jamun (*Syzygium cuminii* Skeels.) bud differentiation and phytohormones quantity by paclobutrazol application

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ABSTRACT

Jamun (*Syzygium cuminii* Skeels.) is a versatile fruit tree of rich nutritive and medicinal (antidiabetic) properties. Its demand is increasing day by day for commercial exploitation in India. Off season concept and application of growth promoting hormones added a major advantage to increase production of jamun fruits. The present study was carried on field-grown seventeen years old jamun trees to study the influence of paclobutrazol application on vegetative and fruit bud differentiation. The trees were drenched with paclobutrazol (1.0g a.i. / m^2 of canopy diameter) during October, 2018. Histological variation in bud differentiation and changes in phytohormonal responses were observed in treated trees. Fruit bud initiation process was twelve days earlier in paclobutrazol treated trees compared to control. Out of 100 buds observed, the maximum number (89.16 ± 0.81) of buds were sprouted when compared to control, also the maximum number (38.5 ± 0.76) of vegetative buds got differentiated into fruit buds. Analysis of phytohormones viz., Gibberellic Acid (GA) and Abscisic Acid (ABA) through HPLC revealed that the GA content was reduced in paclobutrazol treated bud (67 per cent) and leaves (70 per cent) and the ABA activity was found to increase in paclobutrazol treated bud (32 per cent) and leaves (27 per cent) than the untreated bud and leaves respectively at the time of differentiation.

Keywords: Jamun, Paclobutrazol, Bud differentiation, Gibberellic acid, Abscisic Acid and HPLC

PM/PP – 80

Study on minimizing the flower drop and increasing yield and quality of dragon fruit by using different pollination methods

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ABSTRACT

Dragon fruit, a potentially lucrative crop, has recently made its debut in India as a superfruit. Growers from across the country are eager to cultivate this fruit due to its captivating color, luscious pulp, edible seeds within the pulp, and outstanding nutritional benefits." This exotic fruit isn't only attractive; it also holds betalains, which are like natural antioxidants and food dyes. These betalains are rich in essential nutrients. The flower plant doesn't achieve optimal production due to incompatibility issues. Only10% of the genotypes (*Hylocereus spp*.) were self-compatible and the plant's self-incompatibility is demonstrated by the spatial segregation of its sexual organs, which include approach herkogamy and dry type stigma. So, Manual cross-pollination is required to maintain fruit set and development of fruit. The use of pollen from various plant types and varieties can result in fruits of varying weights and the process of cross-pollination can also influence the quality of the fruit. The flower is anticipated to open during the afternoon, while crossing done during the mid night. Where we use different crossing methods like control, shaking of flowers and hand pollination of red and white dragon fruit. In which hand pollination showed the best result. This pollination method has led to improved fertilization, resulting in larger fruits with increased size, diameter, length, and weight, along with higher sugar content and a reduction in fruit drop rates.

Keywords: Hand pollination, shaking, flower drop, fruit set, yield

PM/PP – 81

Effect of season and growing conditions on the success of softwood grafting in avocado (*Persea americana* Mill.)

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ABSTRACT

The season and growing conditions are most important factors which limit the grafting process due to long unfavorable conditions. The temperature and relative humidity during winter and spring seasons under the different growing conditions plays vital role in the graft success. Hence, present study was carried to suitable month and growing conditions on the success of softwood grafting in avocado during the year 2022-2023 at department of fruit science, college of horticulture, Mudigere. The experiment was conducted by using two factors namely growing conditions and grafting months. The different conditions, grafting months and their interaction displayed significant difference on graft parameters. Among the grafting months, grafting performed on 15th February had significantly recorded highest number of sprouts (4.91), number of leaves (14.17), graft height (35.10 cm) and graft success (85.50%) at 120 DAG. With respect to different growing conditions, polyhouse is significantly registered highest number of sprouts (5.23), number of leaves (13.52), graft height (33.72 cm) and graft success (82.82) at 120 DAG. Among the different treatment combination interaction, grafting performed during 15th february under polyhouse condition had significantly maximum number of sprouts (5.52), number of leaves (16.00), graft height (37.50 cm) and graft success (93.60) at 120 DAG due to the active sap flow is noticed which resulted in good graft union. From this study, it was found that grafting in during 15th February under the polyhouse condition confirmed significantly better results compared to other treatments in avocado.

Keywords: Avacado, polyhouse, graft height, sprouts, graft success percentage

PM/PP – 82

Studies on effect of impregnated bags on quality of mango (*Mangifera indica* L.) *cv*. Mallika

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ABSTRACT

The investigation entitled, on "Studies on effect of impregnated bags on quality of mango (*Mangifera indica* L.) cv. Mallika was conducted at (AICRP) on irrigation and water management, VNMKV Parbhani. from February to June in the year 2016-17. Fruit at 30 days after the fruit set is selected for bagging. The size of the bags was 25*20 cm, while, bagging the filter paper bags impregnation with different insecticides, pesticides, and chemical solutions. The impregnated bags werestapled properly so that it will not fall down as well as there will not be open space for entry of any insects or rain etc. which constituted the various impregnated bags (filter paper bags) of different seven treatments undertaken in randomized block design viz., T1 Methoxam treated bag, T2 decis treated bag, T3 Potassium metabisulphite treated bags, T4 Methoxam + Decis treated bags, T5 Potassium metabisulphite + Decis treated bags, T6-Untreated bags, T7- Control (no bagging), Mango fruits were subjected to seven treatments with three replication at 30 days after the fruit set. We have studied quality attributes up to 12 thday after harvesting fruit with 3rd, 6th, 9th, and 12 thday intervals at the ripe stage.The maximum TSS (21.92 %), reducing sugar (7.14 %), non-reducing sugar (12.72%), total sugar (20.47%), β- Carotene (15395 µg/100g), and ascorbic acid(20.60 mg/100g) were, recorded significantly superior in T3 (KMS treated bag). Further, the highest shelf-life was noticed in T3 (10.73 days) similarly whereas minimum (plw) was noticed (7.14%). While comparing average sensory score showed top ranking performance in the same treatments were improved at the ripe stage over control. These results could help to improve the quality of mango found the best result at 9th days after harvesting of fruits.

Keywords: Mango, Mallika, filter paper bags, quality, shelf-life

PM/PP – 83

Hydroponics – a futuristic approach for sustainable fruit production

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ABSTRACT

Soil is the vital growing element for plants which provides nutrients, minerals, water and anchorage for plant growth. Plants grow in the soil from the very beginning of the earth. However, today soil-based agriculture is in jeopardy as quarter of arable land has been declared unproductive, unfertile and unsuitable to perform agriculture activities due to inadequate soil management, soil degradation, fast regional climate changes, rapid urbanization, industrialization, continuous cropping, frequent drought and limited water availability. To overcome this, an alternative farming technology is in need and one such promising alternative is hydroponics method of cultivation. Hydroponics is the emerging sector of horticulture that deals with growing of plants in nutrient solution thus it emerges with a viable alternative for the production of fruit seedlings, because this culture system stimulates the production of high number of seedlings per m^2 in quick time & seedlings of high quality. Hydroponics, an innovative agricultural technique, offers a multitude of advantages, with its potential to significantly boost yields while affording precise control over essential variables such as water, fertilizers, climate, and pest management. This heightened level of control translates into enhanced productivity and increased economic gains for farmers. Hydroponics has rapidly gained momentum and popularity, emerging as the fastest-growing sector within modern agricultur. Beyond its primary applications in cultivating small-sized fruit crops like strawberries, hydroponic systems exhibit efficacy in seedling production and the hardening of micro-plants, expanding its potential impact on sustainable fruit production. This technology shines as a beacon of hope for the future of fruit farming, offering solutions to enhance sustainability and agricultural prosperity.

Keywords: Hydroponics, sustainable fruit production, quick time, high quality, high number

PM/PP – 84

Effect of plant spacing and nutrient levels on growth and yield of red cabbage (*Brassica oleracea* var. *capitata frubra*)

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ABSTRACT

Red cabbage occupies a notable status within the category of exotic vegetables, primarily due to its recent introduction to our country. The need for standardizing its production technology becomes essential. Among the numerous factors that impact the potential yield of red cabbage, spacing and nutrient management emerge as critical factors to be taken into account. An experiment was conducted to investigate the impact of plant spacing and nutrient levels on the growth and yield of red cabbage. This experiment involved three distinct spacing configurations (45cm x 30cm, 45cm x 45cm, and 45cm x 60cm) and nutrient levels (75% RDF, 100% RDF, and 125% RDF). The experiment was designed as a Factorial Randomized Block Design (FRCBD) and carried out at the Department of Horticulture, University of Agricultural Sciences, GKVK, Bengaluru, during the 2021-22 period. This study indicates that spacing and nutrients promote the vegetative growth of plants. The spacing configuration of 45cm x 60cm with 125% RDF resulted in the most significant outcomes, including the highest number of leaves (28.93), maximum plant height (36.71 cm), maximum fresh weight of the head (1421.80 g) and highest head volume (1360.19 cc), Conversely, the spacing configuration of 45cm x 30cm with 75% RDF demonstrated the early head initiation (45.60 days) and the most compact head formation (0.38). The highest yield per hectare (74.43 t) and the most favorable cost-benefit ratio (2.18) were achieved with the spacing configuration of 45cm x 30cm using 125% RDF. Moreover, the examination of soil samples indicated that the soil under the 45cm x 60cm spacing configuration with 125% RDF had the highest levels of available nitrogen (252.71 kg/ha), phosphorus (75.74 kg/ha), and potassium (140.81 kg/ha). Furthermore, under the same spacing configuration, the plants exhibited the greatest uptake of nitrogen (375.93 kg/ha), phosphorus (35.94 kg/ha), and potassium (185.11 kg/ha).

Keywords: Fresh weight, Head volume, Nutrient, Red cabbage, Spacing.

PM/PP-85

Effect of spacing and flower inducing chemicals on flowering, yield and fruit quality of mango (*Mangifera indica* L.) cv. Amrapali

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ABSTRACT

The flowering intensity and fruiting of individual mango plant under high density is comparatively low due to poor light interception, low carbohydrate reserve, fluctuation in environmental factors like floral inductive temperature and presence of higher number of weakly inductive vegetative shoot. Application of flower inducer such as paclobutrazol (PBZ) and potassium nitrate (KNO_3) helps in modification of plant physiological activities and promote optimum flower induction under humid tropical condition. Keeping the above facts in view, a field experiment was carried out in 8-year-old existing bearing mango orchard (cv. Amrapali) planted under four different spacings (S_1: 2 m x 2 m, S_2: 4 m x 2 m, S_3: 4 m x 4 m and S_4: 8 m x 2 m) and subjected to six levels of flower inducer chemical treatments (C_1: PBZ @ 0.25 g a.i. / m of canopy spread, C_2: PBZ @ 0.50 g a.i. / m of canopy spread, C_3: PBZ @ 0.75 g a.i. / m of canopy spread, C_4: KNO_3 @ 2%, C_5: KNO_3 @ 4% and C_6: control-without application of any chemical. The results revealed that application of paclobutrazol @ 0.75 g a.i. per meter of canopy spread induced panicles 22 days earlier than control trees. While, application of paclobutrazol @ 0.50 g a.i. per meter of canopy spread recorded maximum flowering intensity of 73.98% with hermaphrodite flower (14.56%) and sex ratio of 0.170. Plants spaced at 4 m x 4 m and treated with paclobutrazol @ 0.50 g a.i. per meter of canopy spread recorded the maximum flowering intensity (82.48%), higher fruit set at pea bud stage (6.47%), number of fruits per tree at harvest (54.42) and fruit yield (11.12 kg/tree) as compared to other treatment combinations, whereas as chemical treatments had no significant impact on fruit quality.

Keywords: Paclobutrazol, potassium nitrate, canopy spread, flowering intensity

PM/PP - 86

Study on phenology of custard apple (*Annona squamosa* L.) at six stages of fruit maturity

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ABSTRACT

The custard apple (*Annona squamosa* L.) tree is a tropical fruit species with significant nutritional qualities. The state of Maharashtra has excellent soil and climatic conditions for the cultivation of the species. The present study aimed to evaluate the phenological behavior in terms of fruit developmental and nutritional parameters along with effect of climacteric temperature on fruit maturity of custard apple tree cv. Phule Purandar at different times. The experiment was set up at the hot semi arid eco region of north-western part of Maharashtra state, also known as Western Khandesh. A fruit maturation cycle were evaluates, July 2021 to October 2021, and 800 buds which were distributed among 10 plants were sampled with six phelological growth stages at 15 days interval from observed peanut size stage of fruit maturity. The fruit length (2.07-11.99 cm), diameter (2.12-12.25 cm) and weight (4.43-291.30 g) were noticed picked between 4th and 5th stages. The fruit N, P and K concentration (1.030-2.095%, 0.158-0.650% and 0.669-1.025%) and its adjoining leaf N, P and K concentration (1.120-2.175%, 0.11-0.21% and 0.400-0.594%) respectively, were shows different trends of variations during phenological growth stages. The study showed a significant correlation between various phenological and nutritional traits and among these traits along with climatic parameters temperature (19.32°C to 31.94°C), which gives basic idea about fruit nutritional flows during fruit growth and development and proves how the phenological behaviour of the species is influenced by climatic conditions.

Keywords**:** Phenology, fruit growth stage, nutrient, temperature, custard apple

Theme – 4
Post Harvest Management and Nutraceuticals
Oral Presentations

PHMN/OP – 1

Minimally processing of breadfruit using chemical elicitors

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ABSTRACT

Breadfruit (*Atrocarpus altilis*) is an underutilized fruit found in the tropic coastal zones of the world. In India, the breadfruit is found in the belts of coastal Kerala, Tamil Nadu, and Konkan regions. It is grown in the forest areas and as a kitchen garden tree. The fruit is rich in carbohydrates (59-67%), Protein (10%), Thiamine (B1), Niacin (B3) and several minerals. The breadfruit being a seasonal and climacteric fruit has 2-4 days of shelf-life. In the peak of the season, a breadfruit tree can bear 150-250 fruits depending on the size and age of the tree and the majority of fruits come to harvest at the same time. This creates a glut-like situation in the market. The climacteric nature further augments the senescence and other ripening-related maladies thereby causing postharvest losses. Minimal processing of the breadfruit at tender mature green stage and ripe stages will benefit the farmer and consumer by reducing losses and availability of fruit in ready-to-eat/cook form, fetching better price and market visibility, respectively. The present study was carried out to minimally process the breadfruit treated with different chemical elicitors and to study their effect on postharvest quality and shelf-life of breadfruit. The breadfruit was harvested from the Nagarcoil region of Tamil Nadu, and brought to lab for minimal processing. The fruit was peeled and dipped in clean water to avoid browning of the fruit. It was cut into small cubes by removing the core of the fruit. The fruit pieces (200 gm) were treated with chemicals such KMS (250 & 350 ppm), $CaCl_2$ (2%) and Ascorbic acid (0.2 & 0.4%) for 10mins and shade dried to remove excess water. They are packed in 250ml PP trays and stored at room temperature for quality studies. The results revealed that KMS (350ppm & 250ppm) was able to extend the shelf-life of minimally processed breadfruit up to 12 days with better sensory attributes and quality parameters such as antioxidants, phenols, flavonoids, Vit-C were retained well with lower acidity and electrolyte leakage followed by $CaCl_2$ (2%). Whereas, The TSS was non-significant in KMS and $CaCl_2$-2% treated fruits.

Keywords: Underutilized, fruit, quality, shelf-life, antioxidant

PHMN/OP – 2

Dragon fruit blended ready-to-serve beverage: optimization based on biochemical parameters and storage stability

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ABSTRACT

Dragon fruit, also known as pitaya (*Hylocereus undatus*), is an exotic fruit originating from Central America. It features vibrant pink or yellow skin and white or red flesh containing black seeds. This fruit is rich in essential nutrients and offers potential digestive and immune benefits. Its unique appearance and mild sweetness make it a versatile ingredient in various dishes. However, the high market price of dragon fruit poses a challenge for dragon fruit-based products. To address this issue, blending dragon fruit with other widely accepted fruits is a viable solution. A study conducted at the Department of Post Harvest Technology, College of Agriculture Vellayani, Kerala Agricultural University, aimed to optimize a blending formulation using dragon fruit (D), pineapple (P), and lime (L) juices. Different treatment combinations were tested, including blended proportions (50D:50P and 70D:30L) and pure juices (100P, 100L, and 100D). Biochemical analysis revealed that the 50D:50P blend had the highest total soluble solids (TSS), total sugar, reducing sugar, vitamin C, and beta-carotene content (12.5□ Brix, 10.8%, 6.25%, 10.9 mg/100g, and 109 µg/100g, respectively). This was followed by 100P, 70D+30L, 100L, and 100D. Sensory analysis also indicated a higher acceptance of the 50D:50P blend. In terms of antioxidant activity, 70D:30L showed the highest levels. When the blended beverages were subjected to storage stability analysis, there was a significant increase in TSS, total sugars, reducing sugar, and titrable acidity in the 50D+50P blend (16%, 20.5%, 32.1%, and 45%) compared to the 70D+30L blend (13.3%, 17.3%, 30.2%, and 68%). Conversely, there was a significant decrease in ascorbic acid, beta-carotene, and antioxidant activity in the 50D+50P blend (40%, 18.07%, and 28%) compared to the 70D+30L blend (28%, 82.6%, and 14%). In conclusion, the study found that preparing ready-to-serve beverages by blending 50% dragon fruit with 50% pineapple was the most acceptable option in terms of biochemical and nutritional parameters. However, the 70% dragon fruit and 30% lime blend exhibited higher antioxidant activity.

Keywords: Dragon fruit, blending formulation, biochemical analysis, sensory analysis

PHMN/OP – 3

Effect of packaging, ventilation, and ethylene scavenger on postharvest quality of manila tamarind var. PKM 1

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ABSTRACT

Manila tamarind grows naturally on waste land or being planted at community lands for its edible fruits. Fruits are rich in Vitamin C which boosts the immune system. Ripe fruits are manually harvested when peel colour turns from green to pink or when aril becomes white in colour. Fruits can be stored for a few days at room temperature. Hence to reduce the fruit spoilage percentage and increase the quality and shelf life of manila tamarind, it requires good packing materials. With this background, the present study was conducted to explore the effect of packaging, ventilation and ethylene scavenger on postharvest quality of manila tamarind var. PKM 1. The investigation was designed in Completely Randomized Block Design (CRD) with seven treatments and four replications. Uniformly matured non split pods were utilized for the study. The treatments consisted of T_1 - Polybag 100-gauge thickness + no vent, T_2 - Polybag 100 gauge thickness + no vent + paper shreds, T_3 - Polybag 100 gauge thickness + no vent+ purafil, T_4 - Polybag 100 gauge thickness + no vent + paper shreds + purafil, T_5 -Polybag 100 gauge thickness with pinhead holes, T_6 - Polybag 100 gauge thickness + 1% vent and T_7 - Control. The results obtained from the experiment showed that at the end of storage, the lowest physiological loss in weight (2.5 %) and acidity (0.35 %) were observed in T_4 (Polybag 100 gauge thickness + no vent + paper shreds + purafil). The quality characters of non-split fruits i.e, the highest total soluble solids (8.49^o Brix), total sugars (5.55 %), reducing sugars (1.85 %), non reducing sugars (4.7 %) and ascorbic acid (338 mg 100 g^{-1}) with enhanced shelf life upto 6 days were registered in T_4 (non split pods in polybag 100 gauge thickness + no vent + papershred + purafil) and the same technology can be recommended for commercial exploitation.

Keywords: Manila tamarind, packaging, ventilation, ethylene scavenger, postharvest

PHMN/OP – 4

Changes in physico-chemical composition of avocado (*Persea americana* Mill.) fruit during different stages of growth and development

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ABSTRACT

In India, avocado is mainly grown as a backyard crop in states of Kerala, Karnataka, Tamil Nadu, and coastal Maharashtra. However, the cultivation of avocado for commercial purpose has recently started. The present study was conducted to determine the changes in physico-chemical composition of avocado fruit during different stages of growth and development in seven avocado accessions which are grown at IIHR experimental farm, Hirehalli. Fruits were tagged on the day of fruit set and samples were collected at different time intervals (30, 60, 90, 120, 130, 140 and 150 days after fruit set (DAFS) to observe the changes in fruit weight (g), pulp weight (g), fruit length (cm), fruit width (cm), specific gravity, titratable acidity (%), carbohydrates (%), protein (%) and fat (%) content. The study revealed that, fruit weight (0.75-419.49 g), pulp weight (0.69-358.60 g), fruit length (1.25-14.42 cm) and fruit width (0.96-7.60 cm) increased with the advancement of fruit growth and development. The specific gravity (<1.00) decreased as the fruit attained maturity. Titratable acidity was decreased while carbohydrates (1.23-5.94 %), protein (0.61-3.52 %) and fat (0.96-17.89 %) content increased. It is concluded that, up to 30 DAFS there were no significant changes in all the parameters however, rapid changes in the physico-chemical composition of avocado fruit was found from 30 DAFS. Higher accumulation of carbohydrates, protein and fat in the avocado fruit took place between 60 and 130 DAFS. On later stages, changes in physico-chemical composition of fruits were non-significant.

Keywords: Avocado, physico-chemical composition, days after fruit set (DAFS), fruit weight and fat content.

PHMN/OP – 5

Wood apple fruit powder: a novel ingredient for cookies

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ABSTRACT

Wood apple (*Feronia limonia* L.) is an underutilized, nutritionally rich fruit with medicinal properties, containing phenols, flavonoids, ascorbic acid, and dietary fiber. It is traditionally used in Ayurvedic medicine for various ailments. Processed wood apple products are gaining popularity for their health benefits and unique flavor. However, there is untapped potential for small-scale entrepreneurs and groups to develop such products. In this study, we assessed the impact of adding wood apple fruit powder to cookies, focusing on physicochemical, nutritional, and sensory aspects. The results showed no significant difference in weight, diameter, spread ratio, hardness, and water activity between control and wood apple cookies. Wood apple cookies had significantly higher levels of ascorbic acid (87.07 mg/100g), polyphenols (704.73 mg GAE/100g), and antioxidant activity (2.00 mg AEAC/g) compared to the control. Proximate composition did not significantly differ. Organoleptically, wood apple cookies scored similarly to the control for overall acceptability (7.36 on a 9-point hedonic scale). This suggests that wood apple fruit powder can replace refined wheat flour in cookies without affecting their physical characteristics. Adding wood apple powder enriches cookies with bioactive compounds, making them functional snacks and promoting wood apple consumption.

Keywords: Wood apple, cookie, value added product, functional food

PHMN/OP – 6

Cashew apple pomace based nutri rich cookies

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ABSTRACT

Cashew apple is a fruit that is often overlooked despite its potential health benefits and economic value due to the high content of tannin, which is responsible for the acrid and bitter taste. Cashew apple utilization is a very neglected area in the world. The majority of farmers throw cashew apples as they are in the field, creating a foul smell during decomposition. Furthermore, after the extraction of cashew apple juice, pomace is left as is. The utilization and management of pomace pose significant challenges. Therefore, in this study, cashew apple pomace powder was used as one of the flour blends for the preparation of cookies. Cashew apple pomace (CAPP) was blended with wheat flour to make cookie dough without adding maida (refined flour). The cookies underwent physical, biochemical, and sensory evaluation. The CAPP and wheat flour blend cookies did not significantly differ in terms of their weight, diameter, height, and spread ratio. However, significant differences were observed in the volume and density of the cookies. The new formulation is rich in crude protein (6.84%), crude fat (13.3%), and ash (92.30%) contents, as well as higher fiber (6.33%) compared to other cookies. Cookies incorporated with 20-25% cashew apple pomace were highly accepted by the panelists. Cashew apple pomace cookies have a unique taste, aroma, and mouthfeel compared to locally available cookies. Thus, the cashew apple pomace powder-based cookies stand out functionally due to their nutraceutical values.

Keywords: Cashew apple, pomace, tannin, phytonutrients, cookies

PHMN/OP – 7

Collection and evaluation of Karonda selections suitable for pickling

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ABSTRACT

A significant portion of the population currently suffers from various nutritional deficiencies due to inadequate nutrient intake. In this context, karonda fruits and their value-added products can help address these nutritional deficiencies. To identify suitable selections of karonda for pickling purposes, we collected and evaluated various karonda selections from different areas of the Western Ghats in Karnataka and Maharashtra at the Regional Horticultural Research and Extension Center in Dharwad from 2014 to 2023. The study revealed that among the several selections, KAR1 exhibited the highest fruit weight (5.95g), pulp weight (5.29g), seed weight (0.67g), pulp to seed ratio (8.16), number of seeds per fruit (2.92), the greatest number of fruits per plant (112.80), yield per plant (0.63 kg), and yield per hectare (1620kg) compared to the Konkan Bold variety used as the standard check. Quality parameters, such as TSS (11.14%), were also found suitable for pickling. KAR1 berries are green in color, round, large, and highly productive. They are exceptionally well-suited for pickling due to their high pectin and mineral content. In conclusion, KAR1 demonstrates promising performance and suitability for pickling compared to other selections, including the standard Konkan Bold variety. Additionally, sensory evaluation is crucial in determining food acceptability. A semi-trained panel of ten members conducted organoleptic evaluations (using a 9-point hedonic scale) on KAR1 pickles. The results indicated that KAR1 received the highest scores for overall acceptability (8.40 out of 9) across various parameters, including color and appearance, texture, mouthfeel, flavor, and taste, making it an excellent choice for consumers.

Keywords: Karonda, pickle, pectin, sensory evaluation

PHMN/OP – 8

Experiments on debittering pummelo juice (*Citrus maxima* Merr.)

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ABSTRACT

Pummelo (*Citrus maxima* Merr.) is the largest fruit in the citrus group and belongs to the *Rutaceae* family. It is native to Malaysia and Polynesia and is grown in various parts of India. Despite its health and nutritional benefits, it has not gained commercial importance. The lack of suitable varieties and poor marketing has relegated it to an underutilized crop, although some regions like Devanhalli pomelo in Karnataka have received GI protection. ICAR-CHES, Chettalli maintains a diverse pummelo collection, including promising lines with good taste, color, and fewer seeds. Currently, pummelo is mainly used as a table fruit and in Chhat Puja, a festival in Bihar, both consumed as fresh fruit. Pummelo fruits vary from sweet to bitter and moderately juicy. The development of delayed bitterness in pomelo juice, a common issue in citrus juices, hinders its use as a fruit drink. India has two types of pummelo: white pulp and red or pink pulp. The red, segmented variety has potential for large-scale processing and juice extraction. To remove bitterness from Selection 6-2 Kallar pummelo with pink arils, several treatments were applied, including resins (activated charcoal, Amberlite XAD7HP, Amberlite XAD16, cellulose acetate butyrate, and β-cyclodextrin, all at 1% w/v), pH adjustment to 4.5, and incubation with naringinase enzyme (produced from Aspergillus niger NBL, inoculated at 1.25 IU/10 ml pomelo juice, at 45 °C). Physicochemical properties (flavonoids, terpenes, nutrient content, antioxidant activity, pH, acidity, TSS) of treated and control pomelo juice were monitored at various intervals. Debittering of pummelo juice was achieved by reducing naringin and limonin through naringinase enzyme treatment, Amberlite XAD7HP resin, and pH adjustment to 4.5. Retention of reducing sugars was higher in the naringinase treatment due to enzymatic hydrolysis of sucrose and polysaccharides, while total and non-reducing sugars were higher in juice treated with Amberlite XAD7HP, Amberlite XAD16, and β-cyclodextrin resins. The most effective treatments for retaining vitamin C, phenolics, and antioxidant activity were pH adjustment to 4.5 and the use of resins. In conclusion, debittering pomelo juice can be achieved through a combination of strategies, including naringinase enzyme treatment, pH adjustment to 4.5, and the use of Amberlite resins

Keywords: Pummelo, debittering, naringinase enzyme, Amberlite resins

PHMN/OP – 9

Evaluation of bioactive constituents of *Garcinia indica* (kokum) as a potential source of hydroxycitric acid, anthocyanin, and phenolic compounds

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ABSTRACT

The exploration of indigenous fruits and vegetables as potential natural raw materials for the food and pharmaceutical industries has gained increasing attention among researchers. One such promising but underutilized tree species is *Garcinia indica*, native to the Western Ghats in India. The primary objective of this study was to comprehensively characterize kokam fruits, emphasizing their potential applications as a source of hydroxycitric acid, anthocyanin (a natural colorant), and phenolic compounds. To achieve this, liquid chromatography-mass spectrometry (LC-MS) was employed to analyze the metabolite composition in the ripe fruit rind of Garcinia indica. The results of this analysis revealed that these fruits are notably rich in hydroxycitric acid, ranging from 15.60% to 22.92% concentration, rendering them suitable candidates for the development of weight-loss supplements. Additionally, it exhibited a substantial content of anthocyanin (ranging from 4.47 to 7.08 mg g−1), surpassing the levels found in most other fruits and vegetables. This high anthocyanin content positions the fruit as a valuable natural source of food coloring agents. Furthermore, the fruit's phenolic compound content underscores its potential as a rich source of antioxidants. The study identified a total of 38 anthocyanin compounds, several of which were reported for the first time, with major anthocyanins including cyanidin-3-sambubioside, peonidin-3-arabinoside, and pelargonidin-3-glucoside. Among the 30 individual phenolic compounds identified, ortho/para-coumaric acid, naringenin, and apigenin stood out due to their abundance and diverse industrial applications. By utilizing two-way hierarchical clustering and a heat map, the study successfully identified the most suitable accessions of *Garcinia indica* for different bioactive compounds. Overall, the present study highlights *Garcinia indica* as a rich, new, and sustainable source of bioactive substances with food, pharmaceutical, and other industrial applications.

Keywords: *G. indica,* bioactive compounds, anthocyanin, industrial applications

PHMN/OP – 10

Mineral nutrients profile of indigenous and exotic underutilized fruits in seasonally dry tropical savanna climate

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ABSTRACT

The indigenous and exotic underutilized fruits are very good source of vitamins, minerals and dietary-fiber all of which are essential for good health. It is well known that seasonal and locally available underutilized fruits play an important role in nutritional-security but very limited information is available on mineral nutrients profile of indigenous and exotic underutilized fruits. The experiment was performed at ICAR-Indian Institute of Horticultural Research for three years (2000-21, 2021-22 and 2022-23).The aim of this research was to assess the amounts of macro- (N, P, K, Ca, Mg and S) and micro-elements (Fe, Mn, Cu and Zn) accumulated in the indigenous and exotic underutilized fruits. The trees were planted in 2006. Eighteen underutilized fruits *viz.,*Bael, Wood-apple, Rose-apple, Mountain-Sweet-Thorn, Loquat, Egg-fruit, Rough-lemon, Pumello, Surinam-cherry, West-Indian-cherry, Amla, Soursop, Milk-fruit, Rough-lemon, Tree-tomato, Jackfruit, Cylone-Olive and Strawberry-Guava were used. Data analyses revealed significant differences among the indigenous and exotic underutilized fruits for all the mineral nutrients under study. Fruits were richer in K, N, Ca and Mg, and had relatively low S and P. In the case of micro-elements, the most abundant one was Fe and less abundant was Cu. The largest amounts of N (>1.0%) was accumulated in Wood-apple and Bael fruits. The P content of the fruit was highest in Loquat (0.52%). More K in fruit was accumulated in Sour-sop P-1 (4.8%), R2P10 Bael (4.6%) and R2P9 -P1 Bael (4.4%) and Amla R1P30 (4.4%). Bael-P1 and Sour-sop fruits were exceptionally rich in Ca (> 4.0%). Higher Mg (>0.80%) was found in Bael-P1 and Cylone-Olive fruits. Bael, Wood-apple and Strawberry-Guava fruits had relatively higher S (>0.20%). The indigenous and exotic underutilized fruits are enriched with nutritional value and incorporation of these fruits in the daily diet can help eradicating food and nutritional insecurity.

Keywords: Mineral nutrients, underutilized fruits, exotic fruits.

PHMN/OP – 11

Extension of shelf life and quality of minimally processed jackfruit (*Artocarpus\ heterophyllus* Lam.) through postharvest treatment and packaging

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ABSTRACT

A study was conducted to improve postharvest management of jackfruit. The research, carried out in 2020-2021, focused on postharvest treatments and packaging to enhance the shelf life and quality of minimally processed jackfruit under refrigeration. Nine treatments were tested, involving the use of ascorbic acid (0.5% and 1.0%), calcium chloride (0.5% and 1.0%), and combinations, in addition to a control group. The jackfruit flakes were then stored in either polyethylene bags or PET jars with silicon membrane windows. Assessments were conducted every three days. The most effective treatment involved a combination of 1.0% ascorbic acid and 1.0% calcium chloride, along with PET jar packaging and a silicon membrane window. This treatment minimized weight loss (4.10%), maintained firmness (40.44 N), reduced color change ($\Delta E = 2.45$), lowered electrolyte leakage (15.47%), and preserved key nutritional components. Organoleptic assessments confirmed the improved taste and overall quality of treated flakes. This approach extended the shelf life to about 15.5 days, while untreated flakes stored in polyethylene bags lasted only 10.5 days. Additionally, the treatment significantly reduced bacterial counts. Overall, this research demonstrated a successful method for enhancing the postharvest quality and shelf life of minimally processed jackfruit flakes

Keywords: Jackfruit, shelf life, postharvest quality

PHMN/OP – 12

Exploring and understanding the biochemical nutritional and biochemical diversity of *Artocarpus* species

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ABSTRACT

Artocarpus genus, belonging to the mulberry family *Moraceae*, have about 70 species widely distributed across the south eastern Asia and pacific region. Among the species, *A. heterophyllus*, commonly called as jackfruit, is the most exploited and commercially cultivated in several countries. Apart from jackfruit, other species like *A. lakoocha, A. hirsutus, A. camansi*, *A. altilis, and A. integer* also produce edible fruits. Even though the fruits of some *Artocarpus* species are considered as nutritionally dense, in recent times raw unripened fruits are getting attracted due to various health promoting biochemical constituents. In order to ascertain the nutritional value of unripen raw *Artocarpus* species, present study was carried to study the nutritional and biochemical composition of different jackfruit species which included *A. heterophyllus, A. lakoocha, A. hirsutus,* and *A. camansi*. The edible part of the species was used for the study and the results are expressed in fresh weight basis. Results showed that significant differences among the species studied. Among parameters studied, vitamin C, dietary fibre, total protein, titratable acidity, polyphenolic compounds and antioxidant activity showed more variability than other constituents. *A. lakoocha* recorded highest vitamin C content (88 mg/100 g), *A. heterophyllus* recorded highest dietary fibre (10.3 %), polyphenolics (773 mg) and antioxidant potential (8.15 Mm TE as measured by FRAP method). The protein content was high in *A. heterophyllus* (2.14 g) followed by *A. camansi* (1.31 g). among the species studied *A. lakoocha* recorded highest titratable acidity (1.97%), while other species recorded about 0.3% acidity. All the species studied contained considerable amount of both macro (potassium, calcium, phosphorus and magnesium) and micro minerals (copper, iron, zinc and manganese). From the study, it is evident that some of the *Artocarpus* species contained considerable amount of nutritional and biochemical compounds, which can be further exploited and promoted for edible purpose.

Keywords: *Artocarpus* genus, nutritional, biochemical, dietary fibre

PHMN/OP – 13

Response of *Exacum bicolor* Roxb. seeds towards priming and heat scarification

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ABSTRACT

Exacum bicolor Roxb. is a beautiful herbaceous perennial endemic to peninsular India, belonging to the family Gentianaceae.Severe habitat destruction and *en masse* uprooting of plants for ornamental and medicinal purposes that are happening since the past five to eight decades have endangered the plant species. This marks an urgent demand for the standardization of the *ex-situ* conservation strategies of the species. Natural seed germination is less than five per cent. Therefore, the present study was formulated to assess the ways to improve seed germination and seedling survival by seed priming with certain chemicals and heat scarification. Seeds of the species aretiny and takes minimum of two weeks for germination and seedlings possesses long nursery period of six months for transplanting. From chemical seed treatment, significantly maximum seed germination at 45 days after sowing (75.17 %) and seedling survival percent at 75 days after sowing (62.83 %) was observed for 750 ppm gibberellic acid (GA_3) treatment for 24 hours whereas maximum shoot length (21.71 mm) was found at 500 ppm gibberellic acid treatment and root length, vigour index I & II for GA_3 at 750 ppm. Heat scarification involves subjecting seeds to controlled temperature regimes to stimulate physiological changes that can positively influence germination and subsequent growth. From the heat scarification experiment, maximum seed germination (73.93%) at 45 days after sowing and percent survival (67.86) at 75 days after sowing was observed for the treatment of 120^0 C for 15 minutes.Heat scarification at 80^0 C for 15 minutes significantly improved shoot length and root length over control.Therefore, seed treatment with GA_3 at 750 ppm concentration for 24 hrs or heat scarification at 120^0 C for 15 minutes can be suggested for improved seed germination and seedling survival.

Keywords: *Exacum bicolor*, seed priming, heat scarification

PHMN/OP – 14

Enhancing the vase life of *Hydrangea macrophylla* Thunb. with different readily available preservative solutions

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ABSTRACT

Hydrangea macrophylla Thunb**.** is a popular shrub used in landscape gardening in Northern India. Although the plant is highly used for bouquet making in Europe and Northern America, it is currently gaining popularity in India as cut flower. Keeping this view in mind the present investigation was planned to study the post harvest life of cut stems of hydrangeas under various holding solutions combinations that are easily available to marginal florists including sucrose, citric acid, acetic acid, sodium and calcium hypochlorite. The cut stems were subjected to various treatment combinations comprising T1: 2 percent sucrose +citric acid (100mg/L)+ 1 percent calcium hypochlorite (5mL/L);T2: 2 percent sucrose + citric acid (200mg/L) + 1 percent calcium hypochlorite (5mL/L);T3: 2 percent sucrose + citric acid (100mg/L) + 5 percent sodium hypochlorite (5mL/L);T4: 2 percent sucrose + acetic acid (100mg/L) + 1 percent calcium hypochlorite (5mL/L) solutions; T5: Control (Distilled water).According to the results, significant increase in vase life (4.67 days), higher solution uptake (41 mL) with respect to control was observed in treatment T2. However, minimum loss of weight (12.61 percent) was observed in T2 which was at par with treatment combination of T3 followed by T1 solution having percent weight loss of 15.96 percent and 20.48 percent, respectively. It was also observed that treatment having in T1 had bacterial contamination. From the present study, it can be concluded thatcombination of T1 could be used to increase vase life of *Hydrangea macrophylla*cut stems due to optimum energy supplementation, pH balance and antimicrobial activity of the solution.

Keywords: *Hydrangea macrophylla*, vase life, preservative solutions

PHMN/OP – 15

Determining the quality changes in Indian bay leaf (*Cinnamomum tamala*) as affected by drying methods

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ABSTRACT

Indian Bay leaf or tejpat is an important spice popular in both household and commercial cuisines. However, systematic cultivation of this underutilized spice has not been taken up so far. The leaves are largely harvested from the trees grown in backyards and dried under the sun in most of the growing areas. In the present study, six drying methods *viz*. vacuum drying, sun drying, air drying, oven drying (45˚C, 50˚C and 55˚C) were compared to know their effect on quality parameters of tejpat. Moisture content in the fresh samples was 49.89%, which was reduced to 4.54% (sun drying) to 6.78% (air drying). The drying recovery was found to be the highest in oven drying at 50˚C, which remained on par with air drying. Oleoresin content was highest in sun drying method. Chlorophyll a, chlorophyll b and total chlorophyll content were found to be the highest in air dried samples, which remained on par with vacuum drying. The total carotenoids content was highest in case of vacuum drying and remained on par withoven drying at 50˚C. RHS colour chart codes exhibited variations among the dried produce. Considering the better drying recovery, better retention of chlorophyll content and ease of operation, air drying could be recommended for commercial scale drying of Indian Bay leaf produce.

Keywords: Chlorophyll, moisture content, oleoresin, tejpat

PHMN/OP – 16

Anti-cancer properties of *Nigella sativa* L. seed extract and isolated thymoquinone against K652 cell line

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ABSTRACT

Nigella (*Nigella sativa* L.) is an annual herbaceous plant from the *Ranunculaceae* family and the seeds have been used for thousands of years as an important nutritional flavouring agent. Seeds are the source of health remedies in folk medicine for the treatment of numerous disorders in ancient systems of Unani, Ayurveda, Chinese, and Arabic medicine. The seed and seed extracts have anti-inflammatory and antioxidant properties, and are used by patients to suppress coughs, dissolve renal calculi etc. Majority of the pharmacological properties of nigella seeds or seed extracts are attributedto its active metabolite thymoquinone. The *in vitro* anticancer activity of methanol seed extract and isolated thymoquinone were assessed against human myelogenous leukaemia (K652) cellsusing MTT assay by exposing 0.25-1.25 mg ml^{-1} and 5-100 µM ml^{-1} of methanol seed extract and isolatedthymoquinone respectively for 24, 48, and 78 hours duration.The methanolic seed extract at 0.25 mg ml^{-1} recorded 65%cytotoxicity and it resulted in moderate anticancer activity at 24 hour duration treatment against K652 cancer cell lines. The isolated thymoquinonetreated for 24 hour duration at 5 µM ml^{-1}, 25 µM $ml^{-1}$and 50 µM ml^{-1} caused 50%, 63% and 72% cell death respectively and indicated moderate reaction against cancer cell lines. The results of the study reveal that Nigella seed extract and isolated thymoquinone have potential anticancer activity by influencing the death of cancer-causing cell lines in a concentration- and time-dependent manner, highlighting the crop's importance in pharmacology and its potential use in the pharmaceutical sector for the treatment of cancer disease.

Keywords: Anticancer, cell line, leukaemia, metabolite and pharmaceutical preparation.

PHMN/OP – 17

Effects of drying methods and storage duration on nutraceutical compounds in Hibiscus tea

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ABSTRACT

*Hibiscus rosa sinensis*is an ornamental plant belonging to the family *Malvaceae* and genus *Hibiscus* contains about 275 species,which are native to tropical and south Asia and are widely distributed in different regions of world. In India it is popular shrub grown in almost every household. In recent decade hibiscus cultivation got impetus for loose flowers production as well as for value addition purpose. Hibiscus is largely under explored for its nutraceutical and medicinal properties. Therefore efforts were made to develop Herbal tea asherbal teas and beverage are getting acceptance in world markets due to increased awareness and changing lifestyle. The protocol for preparation of hibiscus petal tea infusions was standardized and found that maximum total phenols content, total flavonoid content, total anthocyanins and antioxidant activity when drying temperature ranged between 60ºC to 70ºC, quantity used was 1.5 to 2.0 g and dipping duration ranged between 120 to 180 seconds. Drying temperature of 70ºC was found significantly superior over the rest of treatments at zero and 45 days of storage with maximum antioxidant activity (0.41 µmol TE/g, 0.33 µmol TE/g, respectively. The petals dried at 70ºC retained significant amount of anthocynins (97.80 mg/l, 90.88 mg/l, 69.69 mg/l) for zero, 45 days and 90 daysof storage. Drying of 1.5 g of petals at 70ºCand dipping in hot water for 90 seconds was found to be best recording highest total phenol content (112.20 mg GAE/g). The maximum flavonoid content was recorded when petals were dried at70ºC and dipped for 180 seconds (80.27 mg/g catechin).

Keywords: Hibiscus tea, drying methods, storage duration, nutraceutical compounds

PHMN/OP – 18

Comparative evaluation of essential oils extracted from *Eucalyptus pulverulenta* using hydro distillation and microwave assisted extraction method

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ABSTRACT

Two methods of essential oil extraction namely conventional hydro distillation (HD) and microwave assisted hydro distillation (MAHD) were employed to extract essential oil from the leaves of *Eucalyptus pulverulenta* and were compared, both quantitatively and qualitatively. The results of the essential oil recovery from MAHD method was analysed statistically and found that 600 W of microwave power, 60 minutes of extraction time and 2:1 ratio of water to herbage ratio were the optimum set of factors for the maximum yield of quality essential oil (2.21%) from *Eucalyptus pulverulenta,* which was higher than that of HD method (2.00%). Chemical composition of the essential oils obtained using two methods were analysed using GC-MS method and the results revealed the chemical composition was not adversely affected by the use of microwaves. Antioxidant potentials of the extracted essential oils were tested using three assays namely, DPPH assay and ABTS assay, from which it was found that the essential oil extracted using MAHD method had a higher antioxidant activity compared to the one obtained using the conventional method. Similar results were obtained in the antimicrobial activity analysis of the essential oils tested against *Alternaria sp*., a plant pathogenic fungus. Physical properties of essential oil like specific gravity, refractive index and the appearance of the essential oil didn't vary much between these two methods of essential oil extraction. SEM analysis of the leaves before and after the essential oil extraction process revealed that the complete degradation and rupture of the cells occurred in the sample taken from MAHD method. MAHD method has consumed lesser amount of energy (0.07 kWh/ml of essential oil) than the conventional method (0.07kWh/ml of essential oil) and thereby contributing lesser to the carbon emission.

Keywords: Hydro distillation, essential oil, microwaves, *Eucalyptus pulverulenta*

PHMN/OP – 19

Effect of thermal and non-thermal treatments on enzymatic and non-enzymatic antioxidants of tree bean

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ABSTRACT

Understanding the significant of functional element and change in active composition during processing is needed to develop augmented approaches for food preservation and develop activity and bio-availability of antioxidants in metabolic system. Tree bean (*Parkia roxburghii* G. Don) was given non-thermal treatment with gamma irradiation (0.25 – 1.0 kGy) and thermal treatment by traditional cooking and microwave cooking. The changes inenzymatic (SOD, CAT, GPX, APX, MDAR, DHAR, and GR), non-enzymatic antioxidants (ascorbic acid, carotenoid, total flavonoids, total phenolics), and free radical scavenging activitieswere evaluated. Results showed better retention of anti-oxidants in lower doses of gamma irradiation (0.25-0.5 kGy). Both increased irradiation and thermal treatment led to gradual decline in the antioxidant properties like total phenolics, total flavonoid, but ascorbate content was maximum at 0.25-0.5 kGy. Antioxidative enzymes were decreased under γ-irradiation while compared with control with an exception in SOD activities, which showed enhancement. A reduction in the SOD, CAT, GPX, DHAR and GR activities of tree bean was observed under thermal treatment. However, MDAR activity was found to be lower in cooked tree bean seeds but, that of pulp inclined when cooked conventionally. Radical scavenging activities (%) in tree bean seed decreased with increase in γ-irradiation and showed variation with thermal treatment. This investigation has revealed a variable information on the anti-oxidative changes occurring in tree bean under thermal and non-thermal processing, and a clear potential post-harvest management with minimal nutritional loss.

Keywords: Tree bean, gamma irradiation, thermal treatment, antioxidant, free radical scavenging

PHMN/OP – 20

Effect of polyamines on post harvest physiology and vase life of cut gerbera

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ABSTRACT

Polyamines (PAs) are small aliphatic amines that are ubiquitous in all plant cells and known for their anti-senescence effects during ageing sequence of plant tissue by retarding ethylene synthesis by inhibiting ACC synthesis. The study was conducted at College of Horticulture, SKLTSHU, Rajendranagar, Hyderabadduring 2016-17. Significantly highest relative water content (74.22%) and carotenoid content (5.58 mg) were recorded in spermine 1.0 mM compared to spermidine 1.5 mM and putrescine 3.0 mM. The impact of spermine in increasing the petal carotenoid content might be delaying carotenoid degradation via their enzymatic oxidation in the chromoplasts and prevent the breakdown of flavonoids to make the flower fresh by improving water absorption. While control recorded the highest optical density (0.091) of vase solution could be attributed to high turbidity of vase solution due to high concentration of bacteria developed in cut gerbera. An increase in membrane stability index (55.87%) as indicated by ion leakage was found to be delayed or reduced (25.93%) by the use of spermine 1 mM. While the control was at highest (38.58%) and prolonged flower longevity compared with untreated flowers. Spermine 1.0 mM was found to be more effective in maintaining higher levels of TSS (10.37^{o} Brix) and soluble sugars are involved in membrane stability and reduce the flower wilting.

Keywords: Gerbera, polyamines, spermine, TSS, vase life

PHMN/OP – 21

Enhancing phytoconstituents and yield in medicinal crops through plant breeding

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ABSTRACT

India with its rich and diverse biodiversity and varied agroclimatic conditions is treasure cove for 18,000 plants, of which 6,000-7,000 known to have medicinal properties. It also has a rich heritage of traditional medicine comprising Ayurveda, *Unani, Siddha, Sowa-Rigpa* and homeopathy. The use of herbal medicines is on rise and it is estimated that the Indian trade in medicinal plants to reach Rs. 14 billion (US$ 188.6 million) by 2026. With increased demand for natural medicines, there is a huge gap between the supply and demand of medicinal plants as ~80% medicinal plants are still sourced from wild causing over exploitation and a large scale decline in the availability of herbs in wild. Bringing medicinal plants under cultivation is a way to conserve the resources and greatly improve consistent supply of quality raw material to the industry. Research work at ICAR- Indian Institute of Horticulture focuses on genetic improvement in medicinal crops and to breed varieties with enhanced the phytoconstituents to facilitate their commercial cultivation. ICAR-IIHR holds rich genetic material base of medicinal plant species and documented the genetic diversityof different crop species. Basic information generated on phenotypic and genetic variability, correlation between yield and yield attributes guides the selection of lines with higher productivity. Elite varieties of medicinal crops are developed using selection methods, intraspecific hybridization, polyploidy. Conventional breeding methods such as individual and individual-family selection have given successful results, as most of these species were introduced into cultivation recently and hold a high degree of polymorphism. Breeding for superior varieties is focused on both increasing the economic yield of raw plant materials (root/fruit/seed/biomass etc) and the active ingredient content. Medicinal crop breeding research resulted in six superior genotypes (Arka Dhanvanatri, Arka Shubra, Arka Daksha , Arka Shukla, Arka Charaka and Arka Aswini) in velvet bean (*Mucuna pruriens* var. *utilis*.) with increased L Dopa and seed yield , Arka Bhringaraj in Bhringaraj (*Eclipta alba* L. Hassk) with higher biomass and wedelolactone content, Arka Aswagandha in Aswagandha (*Withania somnifera*) with higher root yield and total withanaloide content, Arka Divya and Arka Prabhavi in Mandukaparni (*Centella asiatica*) with greater biomass and asiaticoside content and Arka Sanjeevini in Khasi kateri (*Solanum kahsianum*) with higher berry yield and solasodine content.The technological interventions like improved varieties, efficient and safe production technologies adopted in Cultivation and production of quality herbal raw material of medicinal crops ensures authenticity, quality and traceability in turn increases the acceptability in global markets ushering economic prosperity.

Keywords: Phytoconstituents, yield, medicinal crops, plant breeding

PHMN/OP – 22

Collection, formulation and evaluation of a new product of underutilized vegetable crop *Momordica cymbalaria.* for antidiabetic property

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ABSTRACT

Among the underutilized vegetable crops *Momordica cymbalaria* is one among the underutilized crops. It is a highly nutritious vegetable belongs to family cucurbitaceae. It is available in only few states which are known for tropical conditions. It is commonly known by the names Karchikayi, Atahalakai, Kasarkayi and Kakrol. Fruits are similar to miniature bittergourd of 2 to 3 cm in length, Dark green in colour with 3 to 4 seeds in it. These fruits have medicinal properties viz, Cardioprotective, Nephroprotetive and Antidiabetic property. Antidiabetic property is due to the presence of insulin mimic mcymprotein. In the present investigation tubers were collected from different regions of Karnataka and fruit powder were evaluated for antidiabetic property by rat studies. Rats were injected with stretozotocin to induce diabetes in healthy rats. Daily dose of 30 mg/kg of body weight was given as treatment along with normal diet for 21 days. For every fourth day blood sugar level, triglycerides and cholesterol was checked. After one week blood sugar level was assessed and reported reduced sugar level in induced diabetic rats. Results reported that bold sugar level was reduced to less than 200, within a one week of treating the diabetic rats with *Momordica cymbalaria* fruit powder. Study was continued upto one month and histopathological studies also proved that fruit powder of Karchikai can reduce the blood sugar level, which can be consumed as an edible vaccine to combat the diabetes problem.

Keywords : Karchikayi, atahalakai, kasarkayi, kakrol, edible vaccine.

PHMN/OP – 23

From neglect to nourishment: tubers reimagined for nutrition & livelihoods

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ABSTRACT

Tubers are one of the lesser explored underutilized crops but a powerhouse of energy source. Kerala is blessed with a huge diversity of tubers from wild edibles to cultivated ones. In fact, a significant population of Wayanad district of Kerala, especially tribal community is dependent on tubers for their staple food and livelihood source. Most tuber crops are nutritious, low-input intensive and also climate resilient therefore, can be used to combat food insecurity in the face of climate change. Therefore, it becomes important to understand the existing wealth of tuber diversity in the district and also the prospects in value addition. Through comprehensive field surveys and ethnobotanical interviews, the study documented wild and cultivated tubers across Wayanad, market networks and existing valueadded products. The study revealed 19 varieties of cultivated *Dioscorea*spp. (*Dioscorea alata*-16, *Dioscorea esculenta*-2 & *Dioscorea bulbifera*-1), 16 varieties of wild edible *Dioscorea* spp followed by 11 varieties of Elephant ears (*Xanthosoma sagittifolium*-1, *Colocasia esculenta*-10) and Elephant foot yam, Chinese potato, Sweetpotato and Tapioca. The research revealed 71 major tuber traders and 22 value added products across the district. Studies exploring the prospects in value addition can help refocus attention on tuber crops and improve their utilization.

Keywords : Tubers, value addition, agrobiodiversity, neglected and underutilized crops

PHMN/OP – 24

Drying techniques of waterleaf *(Talinum triangulare L) cv Divya*on the convergence of quality attributes

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ABSTRACT

Waterleaf (*Talinum triangulare* L.) is an underutilized and unexploited green leafy vegetable of Asia and Africa with rich vitamin A content besides vitamin C and minerals to combat global malnutrition as a candidate crop. In Africa, its leaves are consumed to safeguard against induced poison by the enemy before or after food intake. Aiming to examine the impact of sun drying and oven drying at three distinct temperatures (60°C, 70°C, and 80°C) on the physicochemical and sensory attributes of waterleaf cv. Divya, 2 kg of freshly harvested leaves were collected, sorted, powdered, and divided into five equal portions of 0.4kg each. One portion was allocated for initial analysis, while the remaining four portions underwent sun drying and oven drying at 60°C, 70°C, and 80°C, respectively. The results of the proximate composition analysis exhibited that: moisture content ranged from 86.14% to 92.53%, ash content from 11.26 % to 23.19%; crude fat, 4.13% to 4.69%; crude fiber 4.68% to 7.36%; and crude protein, 22.21% to 34.02%.Vitamin A ranged from 8158 IU to 9165 IU/100g and Ascorbic acid content ranged from 23.00 mg/100g to 26.19 mg/100g. Regarding minerals, the results showed that Phosphorus content ranged from 192.68 mg/100 g to 245.12 mg/100 g; Iron content, 3.45 mg/100 g to 4.63 mg/100 g: Ca content, 69.67 mg/100 g to 78.87 mg/100 g; Zn content, 3.56 mg/100 g to 6.12 mg/100 g and potassium content, 92.54 mg/100 g to 118.26 mg/100 g. The sensory evaluation results clearly demonstrated a notable preference for oven-dried waterleaf samples at 60°C compared to alternative methods. Therefore, it can be firmly concluded that the optimal approach for preserving both the nutritional and sensory attributes of waterleaf during drying is the utilization of an oven drying process at 60°C.

Keywords: Water leaf, sensory attributes, alternative methods, overdried

PHMN/OP – 25

Characterization and comparison of the biochemical composition of a novel variety of hull-less (PMK-1) and hulled (PCK-1) genotypes of pumpkin seeds.

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ABSTRACT

Pumpkin (*Cucurbita* sp.) is a fruit vegetable and belongs to the genus *Cucurbita* and family *Cucurbitaceae*. The use and consumption of pumpkin in the form of vegetable or other cuisines is known among all masses around the globe, while the nutritional and medicinal properties of their seeds remain unveiled across a large section of the world's population. Pumpkin seeds draw their disadvantage owing to their thick seed coat (hull) which subjects them to the process of decortication, increasing the farmers' expense as well as limiting their utilization as oilseeds. In this pursuit, PAU has developed a novel cultivar of hull-less seeded genotype PAU Magaz Kadoo-1 (PMK-1). We characterized the biochemical composition of the hulled (Punjab Chappan Kadoo-1 abbreviated as PCK-1) and hull-less (PAU Magaz Kadoo-1 abbreviated as PMK-1) genotypes of pumpkin seeds to assess the nutritional differences and their efficient application, and found that hulled genotype of pumpkin seeds possess higher content of total soluble proteins (79.62 mg/100 g), total free amino acids (3.48 g/100 g), moisture (6.74%), fibre content (21.1 g/100 g), antioxidant potential (26.15%), polyamines (19.2 mg/100 g), sterols (387.1 mg/100 g), and specific enzymatic activity of Acetyl CoA Carboxylase whereas the hull-less genotype was observed to possess a higher amount of minerals (4.57 g/100 g), tocopherols (15.76 mg/100 g), and oil content (36%) respectively. The biomolecular composition is comparable in two genotypes except for total free amino acids and fibre, which are nearly four times and three times higher in hulled seeds relative to naked seeds respectively. The two genotypes of seeds do not compete, rather do complement each other in biochemical and nutritional composition, competent to be categorized as functional foods. The rich biochemical profile of seeds makes them subjective for further research and their innovative applications in nutraceutical, pharmaceutical, agricultural, food and other industries.

Keywords: Pumpkin seeds, protein, oil, polyunsaturated fatty acids, polyamines, nutraceuticals

PHMN/OP – 26

Potential of selected underutilized leafy vegetables against ccl4 induced oxidative stress on wistar rats

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ABSTRACT

Nutritional immunology might become even more important in prevention of disease. Underutilized leafy vegetables are the richest source of many bioactive compounds especially phenolic compounds with excellent antioxidant properties. Increased consumption of diets containing leafy vegetables may give positive results to human health. The underutilized leafy vegetables which include Indian pennywort, Sessile joyweed, Redamaranth, Red spinach, Asiatic day flower, Indian sorrel, Roselle leaves are quantified for its phenols, flavonoids and vitamins contents by HPLC-LC MS method. The phenols, flavonoids and vitamins ranged from 0.186 – 12014 µg/g, 0.018 – 785.25 µg/g and 0.361 – 18466.56 ng/g in the underutilized leafy vegetables. Based on the bioactive compounds present, herbal preparations are developed and evaluated for hepatoprotective property against CCL4 induced intoxication in wistar rat model. Biochemical estimation in blood serum (AST/SGOT, ALT/SGPT, ALP, Total bilirubin) and antioxidant enzyme estimation in liver homogenate (SOD, GOD, LPO) showed positive results to reduce hepatotoxicity in CCL4 intoxicated wistar rat model. This exploration can helps in addressing importance of bioactive components present in underutilized leafy vegetables in combating various degenerative diseases and also proved the nutraceutical potential of leafy vegetables. Further which can be used for development of functional foods with the present pre-clinical data.

Keywords: Underutilized leafy vegetables, nutraceutical potential, hepatoprotective

PHMN/OP – 27

Utilization of watermelon withspecial reference to citrulline and its product valorization

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ABSTRACT

Watermelon (*Citrullus lanatus*) belongs to the family Cucubitaceae. Cultivated watermelon is an annual species grown in tropical and subtropical climates worldwide. Watermelon fruit is a rich source of nutrients such as fat, carbohydrates, fiber, protein, minerals, water and bioactive compounds. It is also a natural rich source of the amino acid called citrulline, which was first isolated from *Citrullus lanatus* (watermelon) and hence the name citrulline. Citrulline can be found both in pulp and rind, but the proportion being higher in the latter. Citrulline possesses numerous pharmaceutical benefits ranging from cardiovascular disease, hypertension, heart failure, atherosclerosis, arterial stiffness, muscle soreness to serving as energy booster for athletes. In this study, citrulline contents were estimated in fresh pulp and rind of watermelon. Watermelon pulp and rind were found to contain 3.09 mg/g and 2.27 mg/g of citrulline respectively. Watermelon based citrulline drinks were developed by blending water melon pulp and rind (fresh and dried) in different proportions. Drinks of fresh watermelon pulp and fresh rind developed by blending in the ratio of 90:10(T_1), 80:20(T_2) and 70:30 (T_3) % formed the first variation. In second variation, fresh pulp (ml) and dried rind powder (g) were blended in the ration of 98:2 (T_1), 96:4 (T_2) and 94:6 (T_3) to develop the drink. Third variation was RTS from watermelon alone. The RTS from watermelon alone registered citrulline content of 3.2 mg/g. Among the first variations, the highest citrulline was found in T_1 (3.01 mg/g) followed by T_2 (2.90 mg/g)and T_3 (2.6 mg/g). The highest citrulline content of 7.80 mg/g among the second variations was recorded in T_1 followed by 6.01 mg/g in $T_2$and 4.21 mg/g T_3. Organoleptic evaluation revealed that the drink $T_2$of first variation (80% fresh watermelon pulp and 20% fresh rind) obtained the highest score (8.00) on hedonic scale among all three variations. It can be concluded that citrulline from the fresh rind up to 20% in the drink was more acceptable than RTS from watermelon alone. The addition of fresh rind pulp (20%) in the drink (T_2) improved the nutritional quality without affecting the sensory value.

Keywords: Nutritional quality, watermelon, sensory value, organoleptic, citrulline.

PHMN/OP – 28

Processing techniques determine bioactive constituents and antioxidant activity of functional beverage from moringa (*Moringa oleifera* Lam.)

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ABSTRACT

The economy of people in India has become better than in past decades and the role of technology in every industry is boundless, but the status of our health conditions does not seem to have improved. People are becoming more conscious of their health and are focusing on healthier food habits. Functional foods derived from fruits and vegetables can modify physiological functions in human being to a great extent. In this experiment, an attempt was made to develop a functional beverage by blending nutrient rich moringa leaf extract with one of the most important spices, ginger. The beverage was prepared from three types of moringa leaf extract; extract from fresh moringa leaves, dried leaves and blanched leaves. These extracts were mixed with ginger extract at a concentration of 2.0 %, followed by addition of 0.6 % rock salt and subsequently stored for three months. Highest ascorbic acid (13.11 $mg100g^{-1}$) content and total carotenoids (0.111 $mg100g^{-1}$) were recorded in the beverage prepared using dried leaf extract. Total phenolics were highest (35 $mg100g^{-1}$) in the beverage developed using blanched leaves. Antioxidant activity of the beverage revealed contrasting results in DPPH and FRAP assays. The maximum antioxidant potential of IC_{50} value of 8.42 μgmL^{-1} (DPPH assay) and 76.62 μgmL^{-1} (FRAP assay) was seen in the beverage prepared using dried and blanched leaves respectively. The various processing techniques significantly influenced the bioactive constituents and antioxidant activity of the prepared functional beverage.

Keywords: Functional beverage, moringa, antioxidant activity

PHMN/OP – 29

Evaluation and identification of elite lines for processing in Arrowroot – an emerging and underutilized starch reserve tuber crop

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ABSTRACT

Maranta arundinacea L., commonly called as Arrowroot or West Indian Arrowroot is an underexploited promising industrial tropical tuber crop, grown as a rainfed crop in Kerala, Tamil Nadu, Uttar Pradesh, Bihar, Orissa, West Bengal and Assam. It has perennial fibrous starchy rhizomes widely used for the extraction of high value, fine and easily digestible starch having medicinal properties. As a sustainable crop, it has resilience against pests and diseases with adaptability to varying climatic conditions. Being sterile, the genetic variability is very less in the crop and hence released varieties are not available at present. Hence, experiments were conducted at the ICAR-Central Tuber Crops Research Institute during 2015-2023. The arrowroot germplasm comprising of 20 accessions conserved in the field gene bank were characterized and seven elite genotypes selected were evaluated during 2016-2021 followed by on farm trials in 2021-2023. In addition to yield, biochemical characterisation of the genotypes were also carried out. M-3 recorded the highest average tuber yield (30.04 t ha^{-1}) with a potential yield of 49.0 t ha^{-1}. It recorded a starch yield of 5.95 t ha^{-1} and has the lowest fibre content (0.84%) also. The mean dry matter content was highest in M-3 (36.84%) with a fat content of 0.04% and crude protein content of 6.10%. Plant height was highest in the genotype M-1 (143.33 cm) while M-3 recorded 136.7 cm. The number of tillers per plant was highest in M-1 and M-6 (13) while M-3 recorded 11. The number of tuber per plant was highest in M-1 (22) while M-3 recorded 18. Molecular characterisation also revealed that M-3 is genotypically different from the local check (M-7) grown in Kerala. Hence M-3 was identified as the best variety for processing in Arrowroot and this will help in augmenting commercial cultivation and utilization of this underutilized tuber crop in future.

Keywords: Arrowroot, tuber crop, genotypes, underutilized, evaluation, yield, starch

PHMN/OP – 30

Underutilized vegetable crops: nutri-dense super food for humans

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ABSTRACT

Among the several issues that Indian Agriculture is facing, ensuring food security to the growing populations, mitigating the impacts of climate change and degradation of natural resources have emerged as major challenge. About 7,000 plant species are found useful in agriculture, only 150 species among them are largely used and less than 30 plant species meet about 90 per cent of world's food requirement, thus the shrinking species content in the food basket is a matter of concern. Such untapped treasure of germplasm lost in domestication have earned collective names such as neglected /underutilized/ minor crops. Many of these species are an important component of local crop diversity, tradition and act as self-identity of local communities in specific locations. Naga chilli, swamp taro, jagli karela of north eastern India and Bengal arum, punarnaba of west Bengal are some such examples.Indigenous underutilized vegetable crops and their principle health promoting factors *viz.,Agathi* (vit. A, Ca, fibre), portulaca (β-carotene, folic acid, vit. C), *sambar cheera* (water leaf) (carotenoids, lutein, zeaxanthin), *kalmi* (water spinach) (Fe,fibre), *madhurakeera* (*Chekurmanis*) (protein, minerals, vit. A, B, C), *kaasarakaya* (wild *Momordica*) (protein: 3.26%, edible fibre: 5.63%),nymphaea seeds (proteins:10.6-14.8%), clove bean (fibre, vitamin C, K, Ca), tree tomato (vit.C, carotenoids, lycopene). Others include grain amaranths, chenopodium, asparagus,moringa, kundru, broad bean, oriental pickling melon, long melon, snap melon, spine gourd, teasel gourd, sweet gourd, sword bean, lima bean, jack bean, rice bean, velvet bean, celery, gudrisag, Indian sorrel, water chestnut. Apart from enormous nutritional components many minor vegetables possess bioactive compounds (antioxidants, kaempferol, anthocyanins, phytoene, nasunin, prebiotics, lipoic acid, glucosinolates, polyphenols, flavonoids, *etc.*), several of these crop's nutraceutical properties have been popular among the locals from time immemorial. Development of processing and marketing facilities of these crops will play pivotal role in promotion of these crops and for reaping their highest potentials.

Keywords: Underutilised crops, minor crops, indigenous vegetables

PHMN/OP – 31

Bottle gourd seed oil: A new source of omega-3 and omega- 6 fatty acids

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ABSTRACT

Bottle gourd, [*Lagenaria siceraria* (Mol.) Standl.] is a widely cultivated cucurbitaceous vegetable in India and various parts of Asia. In the year 2021-22, India produced 3742.71 (000 MT) of bottle gourd over an area of 1.58 million hectares. In India, Karnataka, stands in the 18th position with a production of 17.60 (000 MT). The economically valuable part of this crop is its fruit. Beyond the fruit, the seeds are also gaining attention for their nutritional benefits and have been recognized as a good source of edible oil due to their favourable oil characteristics. In this regard at ICAR-IIHR Bengaluru, the estimated bottle gourd seed oil content was observed to be 25.2 per cent. The extracted oil found to be rich in polyunsaturated fatty acids (PUFA), such as omega-3 (6.63 %), omega-6 (69.74 %) and others (0.17 %) which play a major role in, cardiovascular health, anti-inflammatory, anti-allergic and cancer benefit, etc. It also consists of saturated fatty acids *viz*., palmitic acid (9.78%), stearic acid (4.45 %) and others (0.97 %) along with mono unsaturated fatty acids (MUFA) (5.99 %) without oleic acid (omega-9). Due to increased demand for speciality edible oil in both domestic and industrial purpose, it has become necessary to exploit the potential of bottle gourd seeds as novel source of edible oil. Being a rich source of omega-6 and omega-3 fatty acid, which lacks in omega-9 which is known for oxidative stability required for storage and cooking, it can be commercialised as cooking oil through blending it with edible oil rich in oleic acid or can also be supplied as omega-6 rich capsule as a food supplement in future.

Keywords: Bottle gourd, seed oil, polyunsaturated fatty acids, omega-3, omega-6, oleic acid

PHMN/OP – 32

Assessment of nutritional composition in wild edible *Solanum* plants from Northeast India

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ABSTRACT

The research was conducted with eleven wild edible *Solanum* species collected from northeast region of India to evaluate some of the minor nutritional composition following the bio chemical analysis through recommended standard methods. The outcome of the study indicates that, the maximal vitamin A contain was recorded from *S. villosum*(11.69±0.08µg/g) while minimal was observed from *S. mammosum* (3.30±0.09µg/g). Contradictorily, highest amount of vitamin E was obtained from white berry of *S. gilo* (15.82±0.58µg/g) whereas lowest amount was acquired from *S. nigrum* (7.67±0.30µg/g). For vitamin C, *S. ferox* obtained the best amount at 1.06±0.061 mg/g and *S. spirale* recorded the maximum quantity of vitamin B^1 at 0.17±0.007 mg/g whereas the minimum amount of vitamin C was obtained from *S. spirale* (0.03±0.004 mg/g). The highest amount of free amino acid (3.57±0.03 mg/g) and methionine (2.32±0.004 mg/g) were obtained from *S. macrocarpon* while maximal amount of proline was obtained from *S. nigrum* (294.81±2.66µmole/g). The above study elaborated, the wild edible *Solanum* species consumed by the local people are nutritious and suitable for health benefit.

Keywords: Northeast India, vitamins, nutritional, solanaceous

PHMN/OP – 33

Multivariate analysis for seed related traits in *Moringa* for diversified exploitation in food industry

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ABSTRACT

The consumption of plant-based milk substitutes has spread rapidly around the world due to its numerous positive health effects on the human body. Individuals with cow's milk allergy, lactose intolerance, and hypocholesterolemia prefer these beverages. Presently, several oil seed, nuts, rice, hemp and coconuts are preferred by people who suffer from an allergy to cow's milk. Plant-based milk substitutes have positive effects because of rich antioxidant activity and fatty acid, which reduce the risk of cardiovascular diseases, cancer, atherosclerosis, and diabetes. Alternately, plant-based milk substitute products also have various negative health effects including lack of protein content, low bioavailability of minerals and vitamins, and oral health problems. Both young and old consumers value plant-based milk substitutes as a result, consumption has recently risen 60–70%. Retail market sales of plant-based milk substitutes were estimated to be approximately $6 billion in 2017 and in the USA retail market is estimated to rise to $28 billion by 2021. Moringa is one such crop to be exploited as the fresh beans after roasting to taste like peanuts and rich in protein. Hence, 92 moringa accessions belonging both *M. oleifera* and *M. conconansis* characterized morphologically for 12 traits using multivariate analysis. The results showed the first five principal components had Eigen values with >1 by contributing 82.10% of the variability amongst accessions. Considering the major contributing PCs, characters with maximum values in PC_1 were 100 seed weight (0.490), 100 kernel weight (0.432) and seed girth (0.401), PC_2 comprised of seed length (0.472) and pod length (0.438), PC_3 constituted with kernel to seed ratio (0.633), PC_4 possessed with 100 seed kernel weight (0.388) and PC_5 had wing length (0.570). From this finding the superior performing accessions of *M. oleifera* (KS/RS-12, KS/RS-24, KS/RS-72, KS/RS-92) and *M. concanensis* (KS/RS-6) can be commercially exploited of seed related industry confirming their surface hydrophobicity and foaming properties.

Keywords: Hydrophobicity, foaming property, commercially exploited, kernel to seed ratio.

PHMN/OP – 34

Development of low-calorie nutraceutical beverage from snapmelon and gac fruit containing stevia glycosides

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ABSTRACT

Fruits and vegetables are essential components for providing a balanced diet due to their protective and nutritive constituents. Nutraceutical beverages are produced from plants can offer health benefits, in addition to providing positive physiological benefits by combating several degenerative diseases. Snap melon (*Cucumis melo* L. var. *momordica* (Roxb.), is an under-utilized cucurbit with a characteristic tendency to split when ripe. Since snap melon fruits are highly perishable, leading to huge postharvest losses, processing it into value added products is need of the hour. Gac fruit (*Momordica cochinchinensis* Spreng.), is an exotic fruit introduced from Vietnam to India,and is relished for its flesh around the seeds(aril) due to its high levels of carotenoids i.e. β-carotene and lycopene. Snap melon and gac fruit aril along with acid lime (*Citrus aurantifolia*) juice, were utilized to develop a nutraceutical beverage having enhanced nutrition and improved flavour, addition of extract of stevia glycosides to beverage was attempted with the objective of reducing glucose intolerance and weight gain. The nutraceutical beverage consisted of four different levels of juice from snap melon and gac fruit aril (100, 75:25, 50:50, 25:75), incorporated with stevia extracted a concentration of 10%. Nutraceutical beverage consisting of snap melon and gac fruit aril in 75:25 ratio had the highest organoleptic score. The bioactive constituents of the beverage included total phenolics (80mg$100g^{-1}$), ascorbic acid (14 mg$100g^{-1}$), β-carotene (0.029mg$100g^{-1}$) and lycopene (0.019mg$100g^{-1}$). The antioxidant activity (IC_{50} value) of the beverage determined by DPPH assay was 4.66μgmL^{-1}. Blending snap melon juice with gac fruit aril yielded a nutraceutical beverage with superior flavour attributes as well as enriched the bioactive constituents.

Keywords: Snapmelon, gac fruit, stevia, nutraceutical, low-calorie

PHMN/OP – 35

Development of ready-to-use kachri curry powder

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ABSTRACT

Kachri is one of the drought hardy underexploited vegetable growing abundantly in the arid and semi-arid regions particularly in the Thar Desert of Rajasthan. Mature fruits are generally used in various culinary preparations, pickles, chutneys and as garnishing vegetables/ salad. Mature kachri fruits are often dehydrated for off-season use. This fruit also has great significance in the socio, cultural and religious occasions of desert inhabitants. Mature fruits are traditionally peeled and dried as such or after making into slices that can be stored for longer periods. The dehydrated fruits have greater potential for commercial exploitation either as such or in powdered form due to their nutritional significance. Also, this kachri powder is used as a souring agent in various traditional cuisines of north-west India. Hence, an attempt was made to develop ready-to-use Kachri based curry powder using various nutritive ingredients. The dehydrated kachri fruits with highest recovery percentage were used for the preparation of ready-to-use cooking powder. The base material used for making this product is kachri powder. Other ingredients used in the preparation of this product are moringa leaf powder, curry leaf powder, Snapmelon fruit (Khelra) powder, Coriander, cumin, Fenugreek, Ajowain, Fennel, Blackpepper, Mustard, and Cinaamon. The proportion of these components to be used for making this product has been standardised and sensory studies indicated greater acceptability of this powder over the commercially available masala powders.

Keywords: Kachri, curry powder, ready-to-use

PHMN/OP – 36

Baking, physico-chemical and sensory properties of *Pouteria forte* muffins

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ABSTRACT

Pouteria campechiana, an underutilized fruit crop with rich bioactive constituents, is often overlooked by consumers due to its distinct flavor and taste. This study aimed to explore the potential of incorporating Pouteria fruit into baked snacks, specifically muffins, to enhance their nutritional value. Muffins, a popular snack/breakfast option, are often lacking in nutrients.Various formulations of muffin batter were developed by incorporating fresh Pouteria pulp (at 5%, 10%, 15%, 20%, and 25%) and Pouteria fruit powder (at 5%, 7.5%, 10%, 12.5%, and 15%), replacing all-purpose flour. The study optimized the Pouteria pulp and powder content in the batter by evaluating the physico-chemical characteristics of the resulting muffins. The muffins with 5% Pouteria fruit powder were found to have a higher moisture content (42.89%) and experienced greater baking loss (6.66%) but were less firm (1.97N). In terms of appearance, the most appealing crust and crumb color were observed in muffins with 5% Pouteria pulp, followed by muffins with 5% Pouteria powder (crust L=41.3, 32.2, and crumb L=42.7, 34.7, respectively). Chemical properties in the muffins increased as the proportion of Pouteria pulp and powder in the batter formulations increased. Notably, carotene content saw a significant increase in the powder-based muffins compared to other chemical substances. A taste panel consisting of 16 semi-trained individuals (aged 25-60) evaluated the muffins, with the 15% powder-based muffins receiving the highest taste and overall scores, making them the most preferred option among the panelists. Regarding storage, microbial growth in the muffins was not observed for up to 4 days, regardless of the formulations. However, distinct crust color changes were noted in the powder-based muffins, especially those with 12.5% and 15% fruit powder, during storage.

Keywords: Pouteria, baked snack, minerals, textural properties, shelf-life

PHMN/OP – 37

Development of biodegradable trays from wood apple shell waste

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ABSTRACT

Wood apple shell constitutes around 55% of the whole fruit. After removal of the wood apple pulp, the shell goes as waste. Disposal of large amount of shells in uncontrolled way causes environmental pollution. Wood Apple shell can be used as raw material for making eco friendly, biodegradable products such as trays, cups, and spoons. The wood apple shell was dried in cabinet drier. The dried shell were powdered in pulveriser. The wood apple shell powder was mixed with paddy straw powder and dried floral waste powder. Wood apple trays with these treatment combinations were moulded into trays by hot pressing. The thickness and density of wood apple shell based biodegradable trays were 0.95mm and 0.56g/cm^3 respectively. The compression strength and cobb value of wood apple shell based biodegradable trays were 31.68MPa and 0.03g/cm^2 respectively. From the studies it was found that wood apple shell trays had good strength characteristics and can be used as packaging material as an alternative to single use plastics.

Keywords: Wood apple, shell powder, cobb value

PHMN/OP – 38

Application of impregnation technique for value addition as well as utilization of underutilised fruits

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ABSTRACT

Application of impregnation techniques for infusion of bioactive components into solid matrix of underutilized fruits is a novel approach of value addition. Many underutilized fruits such as aonla, kokum, karonda, Malayan apple are nutritious with medicinal properties. However, these fruits are not very convenient for fresh consumption. These nutritionally rich fruits with unique flavour profiles, hold great potential for value addition for their economic benefits. Impregnation techniques, such as osmotic dehydration and vacuum impregnation, have emerged as effective tools for enhancing the value and utility of these fruits. Underutilized fruits offer an opportunity to diversify the fruit processing industry and reduce food waste. Kokum (*Garcinia indica*) dried rind is traditionally used as a culinary spice to impart sour taste to food and is also widely used for preparation of beverages. Kokum fruit contains hydroxycitric acid (HCA) which is organic acid, a potential anti-obesity agent and widely used in anti-obesity medicines.Impregnation techniques enable the incorporation of bioactive compounds, such as vitamins, antioxidants, and natural flavours, into the fruit matrix without altering its fundamental characteristics. This results in value-added products with improved nutritional content and extended shelf life. The application of impregnation techniques has been shown to preserve the sensory attributes, texture, and colour of aonla, making them more appealing to consumers. It has also shown potential for use in karonda and Malayan apple by impregnation of kokum juice with improved sensory qualities. In conclusion, the application of impregnation techniques represents a promising avenue for the value addition of underutilized fruits. This approach not only reduces food waste but also promotes the production of nutritious and appealing fruit-based products, contributing to a more diverse and sustainable food industry. Impregnation with Kokum extract is a suitable method to replace the losses in antimicrobial activity of aonla during osmo-dehydration process. Vacuum impregnation (VI) in combination with osmotic dehydration (OD) could be a feasible technology for impregnation of bioactive compounds for product development by improvement in the micro-strucre of fruit matrix.In order to address these constraints, application of "partial vacuum" or vacuum impregnation (VI) to a porous tissue surrounded by a solution containing bioactive compounds where mass transfer in this process occurs due to mechanically induced differences in pressure. It facilitates the removal of liquids and gases contained within the capillary system and helps in introduction of the demanded solution based on diffusion. Anthocyanin content in vacuum impregnated samples ranged from 19.21-38.94 mg/100g when the osmotic medium was sucrose. After six months of storage in kokum infused aonla samples values were ascorbic acid (185.71mg/100g), Total phenolic (1503.45 mg GAE/100g) and anti-oxidant activity (1820.35 mg AAE/100g The anthocyanin impregnated aonla segments had improved physico-chemical, sensory &anti microbial properties. The rate and extent of impregnation of anthocyanin was enhanced by application of vacuum. Kokum- aonla osmo-dried technology have also been commercialized.

Keywords: Kokum, aonla, anthocyanin, ascorbic acid

PHMN/OP – 39

Effect of postharvest management on the shelf-life and quality of amlaunderutilised fruits

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ABSTRACT

This study aimed to identify the most effective treatment for extending the shelf-life of amla (Emblica officinalis Geartn.), using various edible coatings, packaging and storage conditions. The study contained guar gum coating, followed by shrink wrapping and storage under different conditions. In this experiment, among the 6 treatments, 1% Guar gum coating, followed by shrink wrapping and room stored (GT2RT) fruits were found to be the best treatment for shelf-life extension of amla for 56 days. The identified best treatment showed minimum of physiological loss in weight and loss in firmness, increase in TSS and gave the maximum shelf- life. Overall, this research emphasizes the significance of edible coating and appropriate storage condition in enhancing shelf-life of amla. This finding have practical implications for the fruit industry, offering valuable insights in improving fruit preservation methods, reducing postharvest loss and ensuring longer shelf-life of amla, to be enjoyed by the consumers.

Keywords: Amla, storage, shelf life, postharvest

Theme – 4
Post Harvest Management and Nutraceuticals Poster Presentations

PHMN/PP – 1

Innovative approaches to prolong the shelf life of phalsa (G*rewia subinaequalis* l.) fruit: a review

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ABSTRACT

Phalsa (*Grewia subinaequalis* L.) is a significant indigenous and underutilized minor fruit crop with great potential, yet its marketability faces challenges due to its high perishability, resulting in substantial postharvest losses. To tackle this issue, various innovative techniques and strategies have been explored to extend the shelf life of phalsa fruit. Carrying materials like polyethylene bags, paper bags, bamboo baskets, and consumer and transport packaging materials such as plastic punnets, corrugated fiberboard boxes, and cushioning materials like newspaper cuttings and green leaves have proven effective in prolonging the shelf life during handling and transportation. Refrigeration and deep freezing are suitable storage conditions for extending the postharvest shelf life of phalsa fruit. Chemical elicitors like sodium benzoate, salicylic acid, and calcium chloride have shown promise in improving shelf life as an alternative preservation approach. Additionally, optimizing an edible-coating formulation comprising Soy Protein Isolate (SPI), Olive oil, Potassium Sorbate, etc., has proven effective for preserving phalsa fruit. The role of plant growth regulators like NAA, GA3, Kinetin, and Ethrel, as well as micronutrients (Fe, Zn, Bo, and Cu), has been extensively studied in extending phalsa fruit's shelf life. In summary, this review highlights advancements in phalsa fruit preservation, offering valuable insights for researchers, growers, and stakeholders in the fruit industry seeking to reduce postharvest losses and enhance marketability.

Keywords: Phalsa, shelf life, edible coating

PHMN/PP – 2

A successful commercial model of processing and value addition of underutilized fruits in the tribal belt of Rajasthan

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ABSTRACT

Before the development of the model proposed in this study, there was minimal processing or value addition to local fruits like custard apple and jamun in Rajasthan. Tribal farmers collected these fruits from forest areas and sold them at low prices either by the roadside or in nearby markets. Recognizing the need to enhance the livelihoods of Rajasthan's tribal communities and those in other regions, it became essential to establish suitable technology for post-harvest processing and value addition of custard apple and jamun. A pilot study involving 500 tribal farmers from 30 villages in Udaipur, Sirohi, and Pali districts of Rajasthan was conducted to underscore the importance of creating a value chain for these farmers. To ensure better prices for their products, the intervention included adding value to the fruit before market sale. This initiative encompassed the establishment of fruit collection centers at the village level, a processing unit, a storage facility, and a marketing network to promote the sale of the produce. Tribal women received training in grading, sorting, weighing, and documentation, marking a significant opportunity for them to engage in such activities and earn a livelihood for themselves and their families. This model has empowered thousands of tribal women in Rajasthan and is now being replicated in other tribal-dominated areas across the country.

Keywords: Rajasthan, value addition, underutilized fruits, tribal

PHMN/PP – 3

From flavours to function: fruits and frugivores shaping ecosystems

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ABSTRACT

The intricate interactions between fruits and frugivores are of profound significance in shaping ecosystems globally. Fruits have evolved a remarkable array of characteristics, including diverse forms, colors, and flavors, to entice frugivores. They serve as crucial components in plant reproduction, while frugivores play an indispensable role in seed dispersal, ensuring plant propagation and fostering genetic diversity. Exploring fruit characteristics and their relationships with seed dispersers contributes to a deeper understanding of ecosystem functioning, evolution, and biodiversity. A fundamental assumption underlying this hypothesis is the adaptive role of secondary metabolites in the interactions between fruits and various frugivore communities, encompassing vertebrates, invertebrates, or microbes. As fruits mature, those reliant on animals for dispersal must attract mutually beneficial partners capable of efficiently carrying their seeds away from the parent plant. Essentially, if the diversity of interactions influences the diversity of phytochemicals, then fruit interactions likely constitute a crucial, yet historically underestimated, force in the evolution of plant chemical traits. The ripe pulp of animal-dispersed fruits can contain an array of metabolites that influence disperser foraging behavior or physiology. Compounds affecting foraging behavior may include volatiles serving as olfactory cues or pigments functioning as visual signals. These cues can enhance associative learning or serve as honest indicators of nutritional rewards. Beyond initial selection cues, other metabolites can intricately alter foraging and feeding behavior, such as deterring excessive removal through dose-dependent toxicity. For example, amides have been observed to reduce the gut retention time of seeds in bat guts, highlighting their impact on dispersal mechanisms. In conclusion, the evolutionary adaptations of fruits that attract frugivores are vital for plant reproduction and genetic diversity. The study of fruit traits and their interactions deepens our understanding of ecosystem dynamics, evolution, and biodiversity, with secondary metabolites playing a pivotal role in these processes.

Keywords: Fruits, frugivores, interactions, ecosystems, evolutionary modifications

PHMN/PP – 4

Non-thermal processing of dragon fruit juice - present status and scope for future

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ABSTRACT

Dragon fruit, often referred to as the "wondrous fruit of the 21st century," is an exotic fruit known for its rich bioactive compounds and numerous health benefits. While whole fruits are enjoyed by consumers, juices are preferred for their easy digestibility. Dragon fruit juice contains major antioxidants such as betalains and polyphenolic compounds. Extracting juice from dragon fruit is challenging due to the slimy pectinaceous pulp. Novel technologies, including the use of enzymes and ultrasound, have demonstrated their potential for improved juice extraction while retaining high levels of bioactive compounds. Pasteurization is a critical step in juice processing to ensure safety and extend shelf life. However, traditional thermal pasteurization can degrade the quality of the juice, particularly the heat-sensitive betalains, which are major antioxidant pigments. To preserve the quality of dragon fruit juice, there is a growing need for alternative non-thermal processing technologies. This paper provides insights into recent research efforts conducted by various researchers worldwide to explore non-thermal processing methods for dragon fruit juice, addressing the challenges associated with maintaining its nutritional and sensory properties while ensuring safety and shelf stability.

Keywords: Dragon fruit, processing, non-thermal preservation, pasteurization, value addition

PHMN/PP – 5

Effect of different storage temperatures on antioxidant activity and total phenolic content in avocado (*Persea americana* Mill.) during storage

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ABSTRACT

Avocado (*Persea americana* Mill.) is an important tropical fruit and having more nutraceutical values. Aim of this study was to see the effect of different storage temperatures (5^{o}C, 9 ^{o}C, 12 ^{o}C and Room Temperature) on antioxidant activity and total phenolic content (TPC) of two different avocado accessions (CHES−HA−I/I and CHES−HA−VII/I) which are grown at IIHR-CHES, Hirehalli. Matured avocado fruits were harvest and stored for 7 and 21 days at room temperature (RT) and low temperatures (LT), respectively. The result showed that, higher antioxidant activity was found in fruits stored at 9 ^{o}C in both the accessions. At 5 ^{o}C, fruits were not ripened due to chilling injury and had lower antioxidants activity. Significantly higher phenolic content was found in fruits stored at RT (76.07 mg GAE/100g and 45.70 mg GAE/100g in CHES−HA−I/I and CHES−HA−VII/I accessions, respectively). It was observed that both antioxidants and phenolic content of avocado fruits increased irrespective of storage temperatures however rapid increase was found at RT than LT storage. It is concluded that, ripe avocado fruits has more antioxidants activity than matured or over ripe fruits. Storage at 9 ^{o}C helped in retention of antioxidants for longer time (21 days) by slowing ripening process. As fruits advanced ripening, TPC went on increasing however it found highest in RT than LT at the end of storage.

Keywords: Avocado, antioxidant activity, total phenol, room temperature, low temperature

PHMN/PP – 6

Development of nutritional premix product using spray dried jamun juice powder

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ABSTRACT

Jamun (*Syzygium cumini* Skeels.) is an underutilized fruit crop. Due to increased production of the fruits, of late, has resulted in farmers' selling the fruits at low price. To mitigate the price, processing is one of the tool. An objective of the study was to develop a nutritional jamun premix powder incorporated with spray dried jamun powder (0, 2, 4 and 6 %). Other ingredients *viz.,* soy protein isolate (20%), skimmed milk powder (13%), fructose oligosaccharide (5%), pea protein (8%), MCT oil powder (7%), fructose (5%), minerals (3%), vanilla flavor powder (2%), chocolate flavor powder (5%), vitamins (0.17%), maltodextrin (35.83, 33.83, 31.83, 29.83%). The product was packed in aluminum laminated pouches to study the various physico-chemical parameters *viz.,* moisture content, water activity, colour (*L*a*b**) values, TSS, titratable acidity, carbohydrates, total sugars, fat, protein and mineral content. The treatmentthat consists of encapsulated jamun powder (6%) + MD (29.83%) + chocolate flavor (5%) was considered more acceptable and also found microbiologically safe upt to three months storage at ambient condition. The premix also showed good nutritional levels at higher levels of 6 per cent. The study suggests the alternate use of jamun into commercially viable product in a more convenient form.

Keywords: Jamun, nutritional premix, products

PHMN/PP – 7

Fortification of quinoa seeds for the development of jamun (*Syzygium cumini* Skeels) fruit bar

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ABSTRACT

Jamun (*Syzygium cumini* Skeels), Indian blackberry, is an indigenous underutilized fruit with several health benefits. Processed products of jamun fruits are gaining popularity due to nutritional benefits. Fruit bar is one of the dehydrated products made from fruit pulp with added ingredients. Fortification is a simple process where an extra ingredient is added to improve the nutritional benefits in the existing product. The protein of quinoa seeds is rich in essential amino acids, particularly methionine, threonine and lysine. Fruits are generally low in protein hence the research was carried out to with an aim to fortify the jamun bar with quinoa seeds. Jamun fruit bar was prepared by mixing jamun pulp with an appropriate level of sugar, pectin and quinoa seeds and dried at 55 for 6h using cabinet tray drier. Sensory evaluation of the fruit bar prepared with 10, 1 and 2 per cent sugar, pectin and quinoa seeds, respectively had recorded maximum score. The fruit bar with the same composition registered minimum moisture content of 14.8%, water activity of 0.53, maximum ascorbic acid of 10.13 mg 100 g^{-1}, total protein of 0.95 g 100 g^{-1}, total anthocyanin content of 110.46 mg 100 g^{-1} and total antioxidant activity of 85 mg 100 g^{-1}. The fortified fruit bar was micro-biologically safe during 90 days of storage.

Keywords: Fortification, quinoa seeds, jamun fruit bar

PHMN/PP – 8

Flacourtia inermis: An exotic fruit having climate resilience, nutritional, therapeutic uses and processing value

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ABSTRACT

The *Flacourtiaceae* family includes the Lovi-Lovi (*Flacourtia inermis* Roxb.), which is commonly known as thornless '*rukam*' or Governor's plum. Dr. Roberto E. Coronel imported it from Sumatra, Indonesia in 1987. It grows naturally in Sri Lanka up to 1300 m altitude and has decorative appeal due to its gorgeous leaves and vivid red fruits. Mature, Lovi fruit is spherical, cherry-sized, and brilliant red, with a sour and astringent flavour. Chutney, pickles, sauces, syrup, jam, and jellies are made from it. However, its therapeutic benefits are still unknown in Ayurveda and the other traditional medical systems. This fruit contains several phytochemicals such as polyphenols, anthocyanins and flavonoids, which have a wide range of health advantages such as lowering the risk of cardio-vascular diseases, cancer, stroke, and type 2 diabetes. Diabetics are controlled by carbohydrate hydrolyzing enzyme inhibitors (CHEI) such as alpha glycosidase and alpha amylase inhibitors found in its fruit juice. Obesity and hyperlipidemia are also treated with pancreatic lipase enzyme inhibitors (PLEI). The derivatives of chlorogenic acids having high anti-oxidant activities and include guinic acid, malic acid, caffeoyquinic acid *etc*. While 2,3-dihydroxybenzoic acid (2,3-DHBA) has antimicrobial and anti-fungal properties against human opportunistic diseases, it also has anti-protozoal activity against free living endo-commensal protozoa. This fruit is grown in Eastern and Southern states and need to be popularised owing to its climate resilience nature and having immense nutraceautical properties having huge scope in NE states.

Keywords: Governor's plum, phytochemicals, antioxidant activity

PHMN/PP – 9

Exotic fruits that are rich in nutraceutical properties and therapeutic uses

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ABSTRACT

The term "Exotic fruits" is used commonly in developed countries, referring mostly to some tropical/sub-tropical fruits that are unknown to the consumers. These fruits are now grown in many countries other than the place of their origin, *i.e.* non-traditional areas. Exotic fruits have various bioactive components such as (polyphenols, flavonoids, flavanols, tannins, ascorbic acid, anthocyanins, volatile compounds, minerals and organic acids) with potential health benefits, including anti-diabetic, anti-obese, anti-oxidant andanti-inflammatory. Many of these constituents have been proven to be useful in managing various chronic diseases such as cancer and cardio-vascular diseases. Individually or together, a combination of these health beneficial effects rendered by different exotic fruits is very important to prevent the development of complex patho-physiology of anti-adipocity (litchi, durian, jackfruit, mangosteen, acai, goji, persimmon), anti-ageing (blueberry, avocado, pomegranate, strawberry, kiwi, cherries, berries, fig, apple, papaya), anti-carcinogenic (grapefruit, grape, tangerines, fortunella, dragon fruit, custard apple, walnut, berries), anti-inflammatory (pomegranate, litchi, jackfruit, mangosteen, avocado, persimmon), anti-oxidant rich (berries, grapes, apple, nuts, apricot, avocado, cherries, pomegranate, persimmon, lichi, durian), anti- obesity (pomegranate, avocado, grapefruit, berries, durian, kiwi, garcinia and oranges), anti-diabetes (papaya, berries, plum, peaches, pineapple), anti-hepatitis (kiwi, litchi, longan nut, durian, dragon fruit, persimmon), anti- hypergycemia (litchi, durian, jackfruit, acai, pomegranate, avocado, persimmon), anti-nephrological disorders (papaya, banana, strawberry, crane berry, pineapple, blue berry, plum, peaches, kiwi), hair and skin ailments (grapes, almond, pear, strawberry, apple) and other metabolic syndromes (bananas, dates, orange, grapefruit, papaya, banana, apples, apricots, papayas, and pears walnuts, almonds). A thorough knowledge about the nutritional profile of fruits can be an effective way of practicing healthy eating and ailment free life.

Keywords: Exotic fruits, bioactive components, anti diabetic

PHMN/PP – 10

The potential of mulberries as a functional food

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ABSTRACT

Mulberry (*Morus* spp), native to China and widely distributed between 28°N and 55°N latitudes, serves multiple purposes and is a prominent crop in both China and India. Its applications extend beyond sericulture, encompassing culinary uses such as its delicious fruits in Europe and leaves for tea in Japan. Mulberry, a deciduous tree with diverse species like Morus alba, M. nigra, and M. rubra, each with unique traits, offers fruits rich in carbohydrates, lipids, proteins, vitamins, minerals, fibers, and bioactive compounds like anthocyanins and flavonoids. These compounds confer high antioxidant value, potentially elevating its status to "superfood." Mulberry is also renowned for its traditional use in Unani, Ayurvedic, and Chinese medicine, boasting anti-cancer, anti-inflammatory, and therapeutic properties. Beyond its nutritional and medicinal aspects, mulberry fruits are versatile and can be consumed fresh, dried, or incorporated into various recipes. Moreover, mulberry extracts find applications in cosmetics and dermatological products due to their potent antioxidant properties. In summary, mulberry stands as a globally significant plant with a rich nutritional profile, diverse applications, and numerous health benefits, making it a cherished resource in agriculture, food, and traditional medicine.

Keywords: Antioxidants, bioactive compounds, edible berries, phytochemicals, traditional medicine

PHMN/PP – 11

Fig candy: a potential product for fig fruit based agri-startups

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ABSTRACT

Figs are a rich source of minerals, vitamins, polyphenols, and dietary fiber, making them a healthy choice as they are free of fat and cholesterol and possess high antioxidant activity. However, their sensitive skin and high perishability make finding fresh figs challenging. To enable long-distance transport and distribution, fruit processing and value addition are essential. One popular processed fig product is dried or dehydrated figs. The evolving consumer trends demand new and healthier products, leading to the creation of fig fruit candy. Various shapes and pre-treatments were explored, with the best results achieved by fig candy with a quarter shape, pre-treated with 1% salt + 1% alum dipping for 24 hours + 5 minutes blanching + 0.20% KMS + 1.00% citric acid. This combination exhibited superior physico-chemical properties, including high TSS content (50.30°B), an optimal instrumental color value (L* value of 45.23), and sensory qualities, resulting in maximum recovery (59.30%) and solid gain (375.31%). Fig candy presents a potential opportunity for agri-startups to profit during market surpluses, and if exported, it holds the potential to earn substantial foreign exchange due to its favorable physico-chemical properties and consumer acceptance.

Keywords: Fig candy, physico-chemical, shapes and pretreatments

PHMN/PP – 12

Processing potenial of jamun (*Syzygium cuminii*) in providing livelihood and nutritional security

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ABSTRACT

Jamun (*Syzygium cuminii*) is a valuable but underutilized minor fruit, sourced from an evergreen tree. These fruits are not only delicious but also rich in iron, calcium, antioxidants, minerals, sugars, and proteins. Every part of the tree has utility, with seeds being used to treat various ailments, particularly diabetes mellitus. Jamun's diverse components have demonstrated numerous beneficial properties, including antioxidant, anti-inflammatory, anti-microbial, anti-HIV, anti-leishmanial, antifungal, anti-diarrheal, anorexia-genic, gastro-protective, diuretic, free radical scavenging, and radio-protective attributes. Despite its considerable medicinal and nutritional significance, jamun remains underutilized commercially, particularly in tribal areas with abundant biodiversity. The rich genetic resources within jamun could potentially revolutionize dietary habits, enhance health, and improve livelihoods. The fruit pulp offers substantial potential for processing into jelly, jam, juice, squash, powder, vinegar, and high-quality wine, which can be exported to generate foreign exchange. However, jamun's highly perishable nature and limited availability, mainly in July, result in significant wastage and underutilization. Therefore, establishing a value chain that involves pre- and post-harvest activities, as well as fruit and pulp processing, especially by tribal women, can augment their family incomes. To fully leverage the potential of this valuable minor fruit, concerted efforts are needed to collect, conserve, and document jamun germplasm while conducting studies for its optimal utilization.

Keywords: Jamun, underutilized, fruit-pulp, processing & value-chain.

PHMN/PP – 13

Development of protocol for preparation of wood apple fruit powder

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ABSTRACT

An investigation was conducted at KRC College of Horticulture in Arabhavi, Karnataka, to develop a protocol for preparing wood apple fruit powder. Various pre-treatments were employed, including KMS at 250, 500, and 750 ppm, as well as sulphuring at 2, 4, and 6g/kg of pulp. The resulting wood apple powder was dried at a constant temperature of 60°C, and several parameters were evaluated. Among the parameters analyzed, factors like powder recovery, hygroscopicity, swelling capacity, acidity, pH, total carbohydrates, sugars, ash content, and organoleptic properties such as taste, texture, and overall acceptability were not significantly influenced by the different pre-treatments. However, the pre-treatments had a significant impact on moisture content, water activity, particle size, polydispersity, bulk density, water absorption capacity, TSS (Total Soluble Solids), ascorbic acid content, protein content, fat content, and color and appearance, as well as flavor, in sensory evaluations. The values for these parameters ranged from 6.76% to 6.93% for moisture content, 0.281 to 0.351 for water activity, 755.70 to 1102.00 nm for particle size, 0.514 to 0.799 for polydispersity, 0.96 to 1.25 g/cm3 for bulk density, 2.63 to 3.25 g/g for water absorption capacity, 17.43 to 17.23 °Brix for TSS, 3.39 to 3.92 mg/100 g for ascorbic acid, 8.45% to 8.57% for protein content, and 4.81% to 4.88% for fat content, and 59.73 to 68.88, 9.73 to 13.06, and 19.32 to 21.89 for L*, a*, and b* values, respectively. In terms of sensory attributes, the evaluations for color and appearance ranged from 6.17 to 8.58, and for flavor, they ranged from 7.08 to 8.17. Among the various parameters and pre-treatments, the wood apple powder pre-treated with KMS at 250 ppm was found to be the most favorable in terms of overall quality.

Keywords: Wood apple, fruit powder, value addition

PHMN/PP – 14

Enhancing global nutrition: The role of biofortification in fruit crops

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ABSTRACT

The most significant challenges facing numerous nations worldwide include population growth, insufficient access to food and proper nutrition, persistent hunger, and the prevalence of malnutrition, particularly concerning essential vitamins and micronutrients. Biofortification refers to the method of improving the nutritional quality of crops to enhance their suitability for human consumption. This entails elevating the concentrations of crucial vitamins, minerals, and other essential nutrients in food crops, encompassing those within the realm of fruit cultivation. Biofortification in fruit crops is a method to enhance their nutritional value, focusing on increasing vitamins, minerals, and nutrients. This can be achieved through traditional breeding or genetic modification, aiming to combat malnutrition and improve public health. Biofortified fruits often contain higher levels of essential nutrients like vitamin A, C, iron, zinc, and calcium. To succeed, nutrient stability, taste, and appearance must be maintained. Notable examples include iron-fortified bananas, vitamin C-rich citrus fruits, calcium-enriched apples: Certain citrus fruits are bred to have higher levels of vitamin C. Global initiatives like HarvestPlus promote biofortified crops, including fruit, to combat nutrient deficiencies in regions with limited access to diverse diets. They aim to bridge the gap between dietary requirements and access to nutritious foods. Regulatory agencies typically oversee the safety and labeling of biofortified crops to ensure they meet quality and safety standards as ensuring safety, regulatory compliance, and environmental sustainability are also crucial. Biofortification in fruit crops has the potential to make a significant impact on global nutrition, but it requires addressing various scientific, agricultural, and social challenges for successful implementation.

Keywords: Biofortification, nutrition, diet, fruits

PHMN/PP – 15

Use of *Aloe vera* gel coating on storage life extension and quality conservation of Custard apple cv. Balanagar

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ABSTRACT

Aloe vera (ALV) with its unique nutritional profile is being used for food, health, and nutraceutical industries globally. Due to its organic nature, ALV gel coating has created lot of interest for exploring its potential in extending the shelf and storage life of fresh produce. An experiment was performed on the effect of aloe vera gel coating with varied concentrations (control, 25%, 50%, 75% and 100%) on the shelf life and conservation of fruit quality in custard apple cv. Balanagar. All the samples were analyzed for physico-chemical at 4 and 8 DAS and PLW at 2, 4, 6, 8 DAS along with shelf life. Among the varied concentrations of gel coating applied, the lower TSS (19.70 and 22.70 ^{0}B), higher acidity (0.240 and 0.207%), lower conversion of reducing (12.18 and 14.59%) and total sugars of 16.75 and 18.52% was found in 100% Aloe vera gel coating at 4 and 8 DAS, respectively. In respect to physiological loss in weight, irrespective of days after storage, the lowest PLW (1.88, 6.56, 11.19 and 16.15% at 2, 4, 6 and 8 DAS, respectively) was registered in 100% Aloe vera gel coating while the untreated control registered deteriorating results in fruit quality and decreased shelf life from 8.75 to 5.00 days. It was concluded that aloe vera coating retards moisture loss, slows weight loss, softening and retain the quality and extends the shelf life of custard apple fruits during storage at ambient conditions. Overall, Aloe vera gel coating shown great potential as a food safe and eco-friendly coating for maintaining the quality of fruits over extended period and reducing postharvest losses.

Keywords: Aloe vera, shelf life, physiological loss in weight, custard apple, Balanagar

PHMN/PP – 16

Preservation and valorization of hog plum (S*pondias mombin*): a comprehensive review of pickling methods, economic potential, and research prospects

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ABSTRACT

Spondias mombin is a tropical delicacy known for its seasonal exotic allure, medicinal properties and underutilized fruit, currently faces considerable post-harvest losses. The incorporation of hog-plum into various applications still lacks organization and remains in a primitive state.The endeavor to add value to this fruit seeks to optimize its utilization, unlock its economic potential, and counteract the significant post-harvest losses that plague its cultivation. To minimize fruit wastage and ensure fair pricing for producers, preservation becomes imperative. Consequently, pickling emerges as pragmatic and convenient methods for processing. In the pickling process such as salt, vinegar, and spices are commonly combined to complement each other. The duration for which pickles remain viable is generally in the range of 4 to 5 months. Mold and yeast are commonly recognized as the predominant spoilage microorganisms for fruit products. This review can be a valuable resource for researchers embarking on additional experiments concerning the processing of Hog plum (*S. mombin*). Its comprehensive coverage of the subject matter, along with insights into potential avenues and challenges, can offer a strong foundation and guidance for future research endeavors in this field.

Keywords: Hog plum, underutilized fruit, value addition, pickling and spoilage microorganisms

PHMN/PP – 17

Processing and novel product blended jam from dragon fruit and guava

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ABSTRACT

Now day's dragon fruit is worldwide famous fruit. There are three type of dragon fruit, red pulp with red peel (*Hylocereus polyrhizus*), white pulp with red peel (*Hylocereus undatus*) and white pulp with yellow peel (*Selenicereus megalnthus*). Red dragon fruit is one of famous and easy to available, among the spices. Red dragon fruit is a rich source of vitamin A, C, E, and other types of mineralssuch as calcium and phosphorus and also contain phenolic compounds and betacyanin that are contributed to antioxidant activity. Thus, dragon fruit has enormous health benefits. Guava (*Psidium guajava*) is now cultivated in all parts of India. Guava is rich source of pectin, vitamin C and have more flavour and aroma. To extend the shelf life of dragon fruit and guava can be done by making jam. There are different types of fruit jam like mixed fruit jam, pineapple jam, apple jam, strawberry jam, mango jam. Jam is famous product because at this time the demand for jam is increasing due to breakfast using bread has become a public habit. Jam is prepared from 45% fruit pulp and 55 % sugar, pectin and sodium benzoate are used as preservative by continuous boiling. We maintain 0.6% acidity by addition of citric and judging end point by further cooking up to 105°C or 68-70 % TSS. The advantage of processing beside red dragon fruit and guava jam has good economic value and nutritious delicious taste.

Keywords: Novel product, blended jam, dragon fruit, guava

PHMN/PP – 18

Nutritional enhancement in fruit crops: selenium biofortification

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ABSTRACT

Human health predominantly depends on the amount and kind of nutrients taken. There are essential nutrients which are not synthesized in human body but plays a major role in overall metabolism of the body. Selenium is one among those which deeply connects to several metabolic and physiological processes. The intake of this nutrient is very low or seldom nil. Plants are the comestible source of this nutrient. Selenium serves as an antioxidant and low Se levels <20 µg/day is associated with increased risk of cancers, Alzheimer's or Parkinson's disease, male infertility, and thyroidal dysfunctions. So biofortification of Se in various fruit crops is way to incorporate this nutrient in human diet and thereby improving human health. Various experiments have been conducted for biofortification of Se, out of which foliar application was found to give better results. Different concentrations of sprays are applied on certain fruit crops like *Olea europaea* L. (100 mg of Se L^{-1}), *Vitis vinifera* L.(100 mg of Se L^{-1}), *Malus domestica* (0, 0.5, 1, and 1.5 mg of Se L^{-1}), *Prunus persica* L. and*Pyrus communis* L. (0.1 and 1.0 mg of Se L^{-1}), *Punica granatum* L. (1µM) *etc*., and have found to improve selenium content in their oil, wine, fruits *etc*.However, the time and dosage of application is very important to avoiddamage to the photosynthetic pathway and primary metabolism of the plant and to maximize the protection from environmental stresses and to maintain product quality.

Keywords: Biofortification, selenium, fruit crops, foliar application, nutraceuticals

PHMN/PP – 19

Novel food processing technologies

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ABSTRACT

Novel food processing technologies arose as a result of consumers to obtain safe, tasty, fresh and mild processed food products with a long shelf life and maintained quality. Since ancient times, the approach of the food industry was to provide safe foods with long shelf life; however, now a days, it is not enough to simply produce safer foods as consumers demand products with a significant nutritional value, bioactive compounds, and good sensory properties. The important food quality traits, such as taste, texture, appearance and nutritional value are strongly dependent on the way food is processed. Microorganisms are the main target organisms for food spoilage therefore they are targeted by different food preservation methods. Food processing methods used in industry are based on either microbial inactivation or inhibition of microbial growth. Conventional heat-dependent pathogen reduction methods such as thermalization, pasteurization and in container sterilization can adversely affect taste, nutritional value and appearance. The novel food processing methods, viz. HPP, PEF, Irradiation, ultrasonication and cold plasma which influence on consumer's health have been the major innovations in the field of processing technology. These novel techniques act by extending the shelf life, enhancing or maintaining the quality and to regulate freshness of food product. Additionally, food products processed through these innovative techniques contribute to global food security by extending shelf life.

Keywords: Processing, spoilage, innovative, shelf life

PHMN/PP – 20

Studies on preparation of value-added pineapple cheese blended with guava (*Ananas comosus – Pisidium gujava*)

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ABSTRACT

Value addition has become a prevalent strategy in the agricultural industry, involving a series of processing steps that enhance the value of farm-produced goods for direct consumer utilization. An effort was made to create pineapple cheese by combining different ratios of pineapple pulp and guava pulp. The combination of 60% pineapple pulp and 40% guava pulp received the highest sensory acceptability for the pineapple cheese. This particular ratio excelled in terms of organoleptic properties, including color and appearance, flavor, taste, texture, and overall acceptability. The pineapple cheese, prepared under optimal conditions, maintained good sensory acceptability even after six months of storage at room temperature, as assessed through sensory and observational parameters.

Keywords: Pineapple, guava, pineapple cheese, different pulp ratio, value addition product

PHMN/PP – 21

Development of burger patties using tender jackfruit and its nutrient analysis

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ABSTRACT

Tender jackfruit is a versatile vegetable rich in fiber, vitamins, minerals, and with a low glycemic index, making it an excellent choice for special dietary products. Given the growing concerns about lifestyle diseases like cardiovascular disease, hypertension, diabetes, hypercholesterolemia, and cancer, the food industry is exploring alternatives to meat. Tender jackfruit's neutral taste and texture, along with its ability to absorb flavors, have made it popular as a meat substitute in plant-based foods. In this study, the aim was to develop a recipe and process for creating tender jackfruit-based patties that mimic meat patties in terms of sensory quality. During preliminary trials, the recipe was standardized based on the best organoleptic score. Among six different ingredient combinations tested, the patties coated with bread crumbs (T1) received the highest sensory score, with an overall acceptability rating of 8.53 out of 9 on a 9-point Hedonic scale. Subsequent studies focused on this recipe as the control (T1), patties shallow-fried before frozen storage (T2), and partial moisture removal before breadcrumb coating (T3). Samples from these treatments were analyzed for nutritional content before deep frying, and sensory quality was assessed post-frying. The results showed that the water activity ranged from 0.80 to 0.84, crude fiber content ranged from 2.13 to 2.42%, crude protein ranged from 4.97 to 8.77%, fat content ranged from 1.20 to 3.3%, antioxidants varied from 60 to 196 mgKOH/100g, and energy content ranged from 581 to 894 kJ/100g. In terms of minerals, the patties had high iron (51.9 to 77 ppm), zinc (18.8 to 21 ppm), calcium (0.565 to 0.820%), and magnesium (0.164 to 0.325%) content. Sensory scores were highest in both T1 and T3, each receiving a score of 8.6. This study suggests that tender jackfruit has the potential to be used in burger patties due to its high sensory acceptability, nutritional value, and mineral content, making it a promising option for plant-based food products.

Keywords: Tender jackfruit, plant meat based, antioxidant activity and burger patties.

PHMN/PP – 22

Pharmaceutical potential of *Baccaurea ramiflora* (lour.): unveiling therapeutic applications and drug development prospects

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ABSTRACT

Medicinal plants and natural remedies represent an abundant source of bioactive compounds with the potential to facilitate the discovery of novel therapeutic agents for the treatment of a wide spectrum of diseases. Among these valuable resources, *Baccaurea ramiflora* (Lour.), a member of the Euphorbiaceae family, stands out as a versatile plant with numerous applications.This slow-growing evergreen tree produces small fruit (1-2″ in diameter) that ranges in color from yellow to red. Native to Southeast Asia, this fruit tree can be found growing in the wild in various regions including South China, Indo-China, India, Nepal, Myanmar, the Andaman Islands, Thailand, and Peninsular Malaysia.The various components of this plant, including its leaves, fruits, stem, bark, and seeds, have long been integral ingredients in numerous herbal remedies. These traditional formulations have been employed to address a wide range of health issues, such as jaundice, constipation, indigestion, cellulitis, and even as an antidote for snake venom. A comprehensive analysis has revealed its diverse array of medicinal properties, encompassing analgesic, anthelmintic, antioxidant, anti-diarrheal, anti-inflammatory, cytotoxic, haemolytic, hypoglycemic, hypolipidemic, insecticidal, neuropharmacological, thrombocytic, anti-fungal, and antimicrobial activities. This wealth of chemical constituents underscores the multifaceted therapeutic potential of the tree's various components.This growing awareness of the plant's benefits is expected to significantly expand its reach and presence beyond its conventional domains.

Keywords: Health issues; herbal remedies; medicinal properties; therapeutic agents

PHMN/PP – 23

Biofortification in fruit crops: a recent process to reduce micronutrient malnutrition

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ABSTRACT

The global challenges of increasing population, inadequate nutrition, and hunger have led to a widespread deficiency of essential vitamins and minerals, posing significant public health concerns and contributing to various health issues and physical disorders. To address this, biofortification in fruit crops has emerged as a sustainable solution to provide nutritional supplements and combat societal malnutrition. Biofortification involves increasing the nutrient content of fruit crops using agronomic practices, conventional breeding, and transgenic methods. While conventional farming practices can enhance the nutritional content of plant foods to some extent, biofortification offers a more comprehensive and long-term approach to addressing nutrient deficiencies. It has been applied to various fruit crops, including bananas and oranges, with some traditional and transgenic varieties already released, and many more in development. Biofortification presents a practical and realistic method for reaching malnourished individuals in rural and isolated areas. Additionally, these biofortified plants are environmentally friendly, as they require fewer herbicides and pesticides due to their natural resistance to parasites, weeds, and diseases. This makes biofortification an eco-friendly approach to improving nutrition and public health.

Keywords: Biofortification, transgenic, malnutrition, fruit, micronutrients

PHMN/PP – 24

Unlocking the potential of underutilized fruits for nutrition

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ABSTRACT

Underutilized fruits refer to fruit species or varieties that are not widely cultivated or consumed compared to more common fruits like apples, bananas, and oranges despite their potential nutritional, economic, and ecological benefits. These fruits often remain relatively unknown or underappreciated due to factors such as limited research, lack of commercial demand, or cultural preferences. However, many of these underutilized fruits like bael, paw-paw, jamun, karonda, soursop, medlar, quice, chironji, ker, surinam cherry, mahua and lasoda etc., have unique flavors, nutritional profiles, and adaptability to various climates. Promoting the cultivation and consumption of underutilized fruit crops can diversify diets, enhance food security, and contribute to agricultural sustainability. Promoting the cultivation and utilization of underexploited fruit crops can help address food security challenges, increase agricultural biodiversity, and create opportunities for sustainable farming practices. In addition to their nutritional benefits, underutilized horticultural crops hold particular significance due to their medicinal properties and are renowned for their therapeutic value in ayurvedic medicine. Most individuals are acquainted with the healing attributes of these crops cultivated in their local regions. Promoting the cultivation and consumption of underutilized fruit crops can diversify diets, enhance food security, and contribute to agricultural sustainability.

Keywords: underutilized, nutrition, medicinal, food security

PHMN/PP – 25

Annona muricata: A wonder fruit for health benefits

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ABSTRACT

Annona muricata also called as soursop, guanabana, and graviola, belongs to the Annonaceae family. Graviola is evergreen plant and majorly distributed in subtropical and tropical regions of the world. The flowers of soursop are yellow and large in size compared to other Annona species. The fruits are large with short spines on the skin, and also heart or oval shaped and dark green in colour. The fruits of soursop are widely used to prepare candies, syrups, beverages, shakes, and ice creams. Many major different minerals such as Ca, Na, Fe, Mg and Cu, are present in soursop, regular consumption of this fruit will help to provide beneficial nutrients and elements required to the human body. Soursop is more used in phytotherapy to combat many diseases. Local communities of South America and Tropical Africa widely use the extract of different plant parts of soursop to treat many diseases including cancer. Many studies have reported that soursophas very high medicinal properties including anticancer, antiparasitic, antimalarial, anti-arthritic, anti-inflammatory, antidiabetic, hepatoprotective, and have immunity enhancing effects. Phytochemical studies discovered that more than 200 annonaceous acetogenins have been extracted from seeds, leaves,barks, and roots of *A. muricata*. The medicinal properties present in soursop is due to presence of different types of annonaceous acetogenins, flavonoids, sterols, and alkaloids. Dietary phytochemicals have many natural advantages compared to synthetic compounds due to their proven low cost, safety, and oral bioavailability, hence *A. muricata*is an important source for the indigenous medicinal industry and food industry.

Keywords: *Annona muricata*, soursop, anticancer, phytochemicals

PHMN/PP – 26

Jamun: The powerhouse of nutraceutical components

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ABSTRACT

Jamun (*Syzygium cumini*) commonly known as Indian blackberry is an important fruit of Indian subcontinent and belongs to *Myrtaceae* family. Every part of the Jamun tree has very high medicinal value right from its fruit to its seed and bark to the leaves. It is an important fruit crop of Indian subcontinent, under-exploited and widely grown successfully due to its wider adaptability and nutraceutical properties. Fruits contain various types of antioxidants, flavonoids, phenolics, carotenoids and vitamins, which are all beneficial to human health. Jamun has also anti-diabetic, anticancer, antiviral, antibacterial and anti-hyper lipidemic properties. Fruits of Indian black berry are effective in blood purification. Seeds are effectively in anti-diabetic and leaves are effectively in strengthening the teeth. Jamun fruit is rich in antioxidants which can boost immune system, aid in digestion, relieve stomach pain, reduce flatulence and prevent infections. The present abstract has been made to access several bioactive compounds and health benefits of Jamun. It is popularly known as the Indian black berry. The plants are widely distributed throughout tropic and sub-tropic regions of India. Jamun is harvested prior to monsoon season and its harvesting time is short and limits for 30 – 40 days. It is a seasonal fruit and is highly nutritious; seeds have a great significance in treatment like Unani and Ayurvedic medicines. The fruit is rich in proteins, sugars and carbohydrates. The pericarp of the fruit appears blackish or dark purplish in colour and has a distinct sweet and sour taste. It is called the powerhouse of various nutritional components which acts as an immunity booster. The ripened fruits are eaten as fresh and also processing into health drinks, squashes, jam, wine and pickles. The seeds have a good source of secondary metabolites and its powder is highly used for curing the diabetes. The fruit of Jamun are very rich in antioxidant and also a good general tonic. The Jamun leaf paste is used to subside the burning sensation of the body. Jamun have successfully been introduced into various other tropical countries like California, West Indies, Algeria and Israel. It is also grown in various countries like Thailand, Phillippines, Sri Lanka, Malaysia and Madagascar. The Jamun can easily be grown in marshy areas. The deep loam and well drained soils for high yield potential and also good plant growth are needed. Leaves are opposite, simple, elliptic, pinnately veined with the lateral veins close together. At the time of flowering the plant requires dry weather for better development. The February month is the peak period for panicle emergence while flowering and fruit set is observed in the month of March-April.

Keywords: Nutraceutical, anti-diabetic, antioxidants, under-exploited, powerhouse.

PHMN/PP – 27

Nutraceutical evaluation of Veldt grape (*Cissus quadrangularis* Linn) ecotypes

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ABSTRACT

Veldt grape, also known as adamant creeper, is a nutritionally dense plant whose potential as a vegetable crop is still unexplored. It is generally used by people with bone fractures and is great for the treatment of osteoporosis and other menstruation issues. Furthermore, it is found to be effective against anorexia, helminthiasis, colic, dyspepsia, flatulence, skin disorders, leprosy, hemorrhage, epilepsy, convulsions, hemoptysis, tumors, chronic ulcers, and swellings.*Cissus quadrangularis* contains phosphorus, calcium, vitamin C, ketosterols, flavonoids, triterpenoids, stilbene derivatives, and other phytonutrients, which contribute to its therapeutic effects. The breeding effort is limited by a paucity of genetic knowledge on the variability factors of this crop. Hence, the variability in nine biochemical parameters among the ecotypes collected from ten different places in Tamil Nadu, Kerala and Karnataka were analyzed. Ecotypes were evaluated for antioxidants (total phenols, tannins, ascorbic acid and Vitamin A), mineral contents (calcium, phosphorous and iron), anti-nutritional factor (oxalate content) and crude fibre. The ecotypes showcased significant difference for all the nine biochemical traits. Among the antioxidants, the total phenol content ranged from 2.72 -6.49mg g^{-1}, tannin from 0.17 - 0.66mg g^{-1}, ascorbic acid from 304.76 - 417.60 mg $100g^{-1}$ while Vitamin A content ranged from 0.417- 0.470 µg g^{-1}. The calcium, phosphorous and iron content ranged from 2.47 - 4.77 g $100g^{-1}$, 0.13 - 0.29 mg $100g^{-1}$and 0.13- 1.37 mg $100g^{-1}$ respectively. The ecotypes differed in oxalate content as1.30- 9.39mg g^{-1} whereas crude fibre content ranged from 18.29 - 36.17%. The result obtained can be used for selecting suitable genotypes for further crop improvement programmes.

Keywords: Creeper, phytonutrients, antioxidants, oxalate

PHMN/PP – 28

Physiochemical properties of freshly harvested dragon fruit (*Hylocereus costaricensis*) grown in Telangana conditions.

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ABSTRACT

Dragon fruit, a promising tropical epiphytic cactus, has gained global recognition as a fruit crop, and its cultivation is well-suited for Telangana. An investigation was conducted at the College of Horticulture, Rajendranagar, Telangana, to evaluate dragon fruit's physiochemical and post-harvest qualities. The dragon fruits used for the research were procured from Deccan Exotics Dragon Fruit Farm, located at 17°34'29" N latitude and 78°0'58" E longitude, with an elevation of 520m mean sea level, in Sangareddy, Telangana. Dragon fruit preserves high water content due to its exocarp thickness, scales and high mucilage content in the mesocarp, causing water loss during storage. This affects the fresh weight, firmness and appearance of the fruit as well as the market price. Concerning physical parameters like Weight (320-380g), Pulp to peel ratio (6.71), Firmness (5.5 kg/cm^2), Length (8- 9cm), Width (6-7 cm) and Shelf life (6-7 days). Quality and chemical parameters, Moisture (82-88%), Ash(0.90%), Protein(5.48%), Crude fat(0.48 %), Crude fiber (15.68%), Carbohydrates (12.30 gm/100gm), Calcium (465.65 mg/kg), Magnesium (533.96 mg/kg), Copper (3.65 mg/kg), Lycopene (1.17), TSS (16 °B), pH (4.4), Titratable acidity (0.20-0.30%), Ascorbic acid (9-10mg/100g), Total sugars (10-12 %), Reducing sugars (3.65%), Phenols (40-60 mg GAE), flavonoids (10-20 mg CE), antioxidant activity (240-380 µg/100 g). Major postharvest problems in dragon fruit are shrivelling, decaying and low shelf life. Being newly cultivated crop in Telangana, studies are needed to increase the production of dragon fruit by improving postharvest quality and shelf life through different technologies and storage temperatures.

Keywords: Dragon fruit, physio-chemical properties, postharvest analysis.

PHMN/PP – 29

Unlocking the potential of underutilized fruit crops: A path towards food security and biodiversity conservation

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ABSTRACT

Underutilized fruit crops represent a largely untapped resource in the world of agriculture, holding immense potential for addressing global food security challenges, promoting biodiversity conservation, and enhancing the livelihoods of marginalized communities. This abstract explores the significance of underutilized fruit crops, their unique attributes, and the opportunities and challenges associated with their cultivation and utilization. Underutilized fruit crops, often overlooked in favor of high-yield and commercially dominant varieties, possess numerous qualities that make them promising candidates for sustainable agriculture. These crops are typically adapted to diverse ecosystems, exhibiting resilience in the face of changing environmental conditions. Moreover, they often require fewer chemical inputs and have a reduced environmental footprint, making them environmentally sustainable options. The biodiversity of underutilized fruit crops contributes to their appeal. These crops represent a reservoir of genetic diversity that can be vital for breeding programs and adapting agriculture to climate change. By promoting the cultivation and consumption of underutilized fruit crops, we can help safeguard genetic resources that might otherwise be lost, ensuring food security for future generations. Despite their potential, underutilized fruit crops face several challenges. Limited research and development, lack of awareness and market access, and cultural biases against these crops hinder their adoption. Investment in research, breeding, and agronomic practices tailored to these crops is essential to unlock their potential fully. The utilization of underutilized fruit crops can also enhance the economic prospects of rural communities, particularly in developing regions. By promoting these crops, we can diversify income sources for small-scale farmers and reduce their dependence on a limited range of staple crops. This, in turn, can improve food security and economic resilience at the community level. In conclusion, underutilized fruit crops hold great promise for addressing pressing global challenges, including food security, biodiversity conservation, and sustainable agriculture. However, realizing their potential requires concerted efforts from researchers, policymakers, and the agricultural community. Investment in research, promotion, and market development can help unlock the rich benefits these crops offer contributing to a more sustainable and resilient agricultural landscape while safeguarding our planet's genetic resources for future generations.

Keywords: Crop diversification, economical, small farmers

PHMN/PP – 30

Karonda: An underutilized arid fruit with nutritional, medicinal properties and value added processing products

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ABSTRACT

The highly acidic and astringent qualities of karonda fruits prevent people from eating them fresh, hence it is not a common table fruit. But in processed forms, it has a lot of potential for value added products. Fruits are rich source of vitamin C, protein, carbohydrates, fat, fiber, bioactive compounds and minerals like potassium, phosphorous and calcium. It is also an excellent source of iron and its intake in daily diet can benefit the anaemic patients especially growing children and pregnant ladies. The fruits are traditionally used for medicinal treatments of malaria, epilepsy, nerve disorder, relieve of pain and headache, fever, blood purifier, itches and leprosy. The major bioactive constituents, which impart medicinal value to the herb, are alkaloids, flavonoids, saponins and large amounts of cardiac glycosides, triterpenoids, phenolic compounds and tannins. Fruits have been reported to contain carisol, β-caryophyllene, carissone, carissic acid, carindone, carinol, ascorbic acid, lupeol, and β-sitosterol. These chemicals are very effective in the treatment of scabies, intestinal worms, pruritus, biliousness and also used as antiscorbutic, anthelmintic. Because of its fragile flesh and high moisture content result in an extremely limited preservation life. It can be kept at 13 °C with 95% relative humidity for a week. Under the changing world trade scenario, the fruit can be exploited on a commercial scale in the processing industries. Food processing companies have recently begun producing value-added commercial preparations for consumption at home and abroad. Karonda has a lot of potential for value creation, and both ripe and unripe fruits can be used to create a variety of value-added products which include pickles, candy, chutney, jam, RTS, nectar, squash, canned fruits, syrup, beverage, ice cream, karonda flavored milk, fruit powder and osmo-air dried karonda. However, maintaining their usefulness and high commercial value, it is now considered as a valuable source of several unique products. Karonda is relatively a new item yet to explore the full potential and a fruit that needs promotion and publicity in the international markets.

Keywords: Arid fruit, nutritional, medicinal properties, value addition

PHMN/PP – 31

Role of underutilized fruits in nutritional and economic security

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ABSTRACT

India is origin of many fruit crops and the most of crops is limited to its growing region only. Inspite of their high nutritional and medicinal properties their commercial cultivation is lacking. Nutrient-rich fruits are in high demand nowadays to support nutritional wellness in people. Most of underutilized fruits are in the core recipes of many ayurvedic formulations. Underutilized fruit crops refer to plant species traditionally utilized for food, fodder, fibre, oil, and medicinal purposes. These species possess untapped potential to enhance food security, nutrition, health, income generation, and environmental benefits. While major fruit crops like Mango, Banana, Papaya, Litchi, and Guava are commercially cultivated, wild edible fruits remain largely uncultivated and unexplored. Many indigenous underutilized fruit crops hold medicinal significance and feature prominently in traditional medicine systems. To unlock their potential, focused efforts are required to develop value-added products that can access national and international markets. Notable underutilized fruits in India include bael, jamun, karonda, ber, lasoda, phalsa, aonla, wood apple, chironji and Manilla tamarind. These fruits also include a wealth of dietary, nutritional, and therapeutic benefits. If appropriately targeted, the value-added products of these fruits have been predicted to capture the national and worldwide markets.

Keywords**:** Nutritional security, economic security, climate resilient, arid zone fruits.

PHMN/PP – 32

Nutraceutical, medicinal and therapeutic potentials of underutilized citrus fruits

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ABSTRACT

Fruits rich in phytochemicals are growing in popularity everywhere as people become more aware of their potential as nutraceuticals. Due to their crucial function in the prevention of several diseases, consumers like such fruits for their good health. Some citrus fruit species, such as pummelo, grapefruit, citron, Kachai lemon, galgal, sweet lime, *C. bergamia*, *C. japonica*, and *C. hystrix*, etc., are only consumed locally, have received little attention, and are unknown to people elsewhere; as a result, they are underutilized and/or remain unexplored despite having plenty of nutritional and health benefits due to their richness in phytochemicals. These citrus fruits have the ability to adapt to changing climates while maintaining their nutraceutical, therapeutic, and medicinal properties in the present and future. The nutritional value of the underutilized citrus fruit has been found to be excellent, with various key components. They contain a wealth of compounds that are good for human health, including dietary fiber, vitamins, minerals, phenolic acid, flavonoids, antioxidants, carotenoids, essential oils, acridone, alkaloids, coumarins, benzenoids, steroids, limonoids, citric acid, etc. Minor citrus fruits are valued for their medicinal, pharmacological, ethnobotanical, and phytochemical properties in addition to their nutritional value. It has been scientifically confirmed to have therapeutic potential and is safe for human use. These fruits have proven to possess antioxidant, anti-hyperlipidemic, antimicrobial, antiviral, anti-atherosclerosis, anti-osteoporosis, anti-endothelial, and anti-toxic properties and are used to treat diseases like diabetes, cancer, cardiovascular, mental disorders, asthma, leprosy, hiccups, cough, epilepsy, etc. Underutilized citrus fruits have several uses in the culinary, pharmaceutical, and nutraceutical sectors as either fresh produce or processed in a variety of ways. Their leftovers, such as peel, pomace, and seed, are also fantastic sources of nutritional fiber and bioactive substances.

Keywords: Medicinal, therapeutic, nutraceutical, human health, phytochemicals

PHMN/PP – 33

Spondias mombin: A eco-friendly fruit,rich in antioxidant and vitamins for good health

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ABSTRACT

Spondias mombin is a flowering tree belongs to family *Anacardiaceae.* The fruits are commonly known as yellow mombin or hog plum. It is originated from tropical America, then spread to South Asia by the Portuguese during 17th century. The deciduous tree blooms from January to May on terminal panicles and flowers are small white with sweet-scent. These trees were used as living fences in farmlands. Fruits appear during July to September and are 4 cm long, ovoid yellow, and wrinkled when dried. The edible fruits are somewhat acidic taste with a spiny kernel surrounded by flesh. Fruit is rich source of carotenoids like, β-cryptoxanthin, lutein, zeaxanthin, α and β carotene, β-cryptoxanthin with high level of pro-vitamin A, 100 g pulp can provide more than 37% of the RDA of vitamin A. The pulp is either eaten fresh or processed into juice, concentrate, jellies, wine, ice cream and sherbets. In traditional medicine, fruits were used as anti-inflammatory, antiviral, antibacterial, and anthelmintic. Similarly bark extract is used to cure diarrhea, haemorrhoids, gonorrhoea, and leukorrhea. The flowers and leaves are used to make a tea, which helps to cure stomach ache, biliousness, urethritis, and cystitis. The fuel extracted from mombin leaves are environmental friendly. This eco-friendly crop is having lot of pharmacological properties which can be applicable in medical industry for drug preparations. This underutilized crop as wide scope in India as it performs well in tropical and subtropical region.

Keywords: Hog plum, carotenoids, medicinal, bark

PHMN/PP – 34

Unlocking the potential of exotic fruits: A comparative analysis of nutritional and medicinal benefits

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ABSTRACT

Exotic fruits, known for their unique flavors, vibrant colors, and often remarkable nutritional profiles, have garnered increased attention in recent years for their potential health benefits. This comparative analysis explores the nutritional and medicinal properties of exotic fruits, including acai berries, mangosteen, and durian, shedding light on their diverse phytochemical constituents and potential therapeutic applications. Each exotic fruit possesses distinct nutritional attributes. Acai berries, originating from the Amazon rainforest, are celebrated for their exceptionally high levels of antioxidants, particularly anthocyanins, which may contribute to their reputed anti-inflammatory and cardio protective effects. Mangosteen, revered as the "queen of fruits," offers a rich source of xanthones, natural compounds with antioxidant and anti-inflammatory properties, potentially supporting immune health and chronic disease prevention. Durian, with its unpleasant smell it is nutritionally dense, providing essential vitamins and minerals, and has been associated with improved digestion, enhanced bone health, and enhanced cardiovascular health. Moreover, these exotic fruits have been traditionally employed for various medicinal purposes in their native regions. Acai berries have a history of use in Amazonian folk medicine for their potential to boost energy levels, support digestion, and enhance skin health. Mangosteen has been used in traditional Southeast Asian medicine to alleviate diarrhea, inflammation, and skin conditions, among other ailments. Durian, in addition to its nutritional content, has been utilized in traditional medicine for its potential to alleviate fever, reduce blood pressure, and enhance overall vitality.

Keywords: Mangosteen, durian, nutritional attributes, medicinal

PHMN/PP – 35

Soursop (*Annona muricata* L.): A promising underutilized future fruit for nutritional security

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ABSTRACT

Soursop (*Annona muricata* L.) cultivation is expanding quickly in India due to its numerous health benefits, multiple uses, and market potential. Due to the lack of systematic breeding programmes in soursop, there are currently no released varieties in India with known fruit quality and yield. The investigation has been done at the Indian Institute of Horticultural Research in Bengaluru on the morphological, physio-chemical, and biochemical characteristics of soursop genotypes. The fruit observation studies revealed that the fruits are large (600 g–4.0 kg), heart to oval shaped, dark green with woody fruit stalk (3-8 cm long) and soft spines (0.3- 0.5 cm apart). The pulp is juicy creamy white with a cottony texture and contains many black flat round seeds. The pulp is sweetish acidic with high TSS (13^{o}B), moderate acidity (1%) and high pulp recovery (>90%). The fruit pulp is a good source of ascorbic acid (>15 mg/100g pulp) and antioxidants. Five-year-old plants produced an average yield of (28 kg). An average yield of (28 kg) was produced by five-year-old plants. Because of high yield and its nutritional advantages, it can be a promising crop for increasing farmer's income and ensuring their nutritional security.

Keywords: Soursop, underutilized fruit, evaluation, varieties

PHMN/PP – 36

Study on proximate analysis of sweet and sour carambola (*Averrhoa carambola* L.)

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ABSTRACT

Carambola (*Averrhoa carambola* L.), known for its distinctive star shape and golden color, belongs to the Oxalidaceae family. It is a versatile, drought-resistant evergreen tree with significant therapeutic potential. This study aimed to analyze the morphological and biochemical properties of sweet and sour carambola fruits. Morphological parameters, including fruit weight, fruit length, fruit width, rib length, rib thickness, rib width, pedicel length, pedicel thickness, number of seeds per fruit, leaf length, and leaf thickness, were measured. Biochemical properties such as acidity, Total Soluble Solids (TSS), ascorbic acid content, and fruit color were also recorded. The findings revealed that sweet carambola fruits had higher TSS levels (9.0-10.2 °Brix) compared to sour carambola fruits (5.0-6.4 °Brix). Conversely, the sweet type had lower ascorbic acid levels (10.40 mg per 100ml of juice) than the sour type (15.4 mg per 100ml of juice). These differences between sweet and sour carambola fruits suggest the potential for maximizing nutritional benefits through selective cultivation and further crop improvement programs.

Keywords: Carambola, sweet type, sour type, quality

PHMN/PP – 37

The thekera *(Garcinia* spp.) and its traditional and therapeutic uses in Assam

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ABSTRACT

North Eastern region of India is abundant in natural sources of nutritional flora in its wild habitats. One of the very popular among these florae is the genus Garcinia (Family: *Guttiferae*) comprising of around 30 species that are indigenous to India. The two very commonly observed species found in Assam are *Garcinia pedunculata* (Borthekera) and *Garcinia cowa* (Kujithekera) that are being grown in the traditional homestead garden systems of many of the households and are often used for culinary purposes as well as to treat many ailments. The matured acidic fruits are sliced, sundried and stored in non-metal jars (preferably glass jars) for future use. It is believed that these dried slices become even more medicinal with their age of preservation. It is traditionally used in Assamese community for treatment of diarrhoea, blood dysentery, irritable bowel syndrome, chronic dysentery, constipation, stomach ache, lowering of high blood pressure, cholesterol and blood sugar, common cold, fever, reducing obesity, jaundice and for controlling urine related ailments such as burning sensation, excessive urinating and some of the contagious urinary diseases *etc*. Studies have confirmed presence of many small and complex molecules in various parts of species of *Garcinia which include* xanthones and its derivatives that are having many biological and pharmacological characteristics such as antioxidant, cytotoxic, antitumour-promoting and antimicrobial activities. These highly valuable and therapeutic fruits found in the rural households of Assam are in real need of conservation and hence the traditional uses and probable line of future investigation in this relation needs better understanding for utilizing the goodness of these natural resources.

Keywords: North East India, Assam, *Garcinia*, traditional, therapeutic, xanthones, antioxidant

PHMN/PP – 38

Noni (*Morinda citrifolia* L.): Its nutrition, health benefits and value added products

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ABSTRACT

Noni (*Morinda citrifolia* L.) commonly known as Indian mulberry, is a tropical fruit-bearing plant that has gained attention for its potential nutritional value and health benefits. While noni is not particularly rich in nutrients, it contains vitamins, minerals, and phytochemicals. It is often consumed in various forms, including noni juice, capsules, powders, and skincare products, for its potential health benefits. Noni is recognized for its antioxidant properties, which can help to combat oxidative stress and reduce the risk of chronic diseases. Moreover, noni has been explored for its potential anti-cancer properties and its ability to alleviate pain and inflammation conditions like arthritis. Traditional medicine has utilized noni for pain relief, wound healing, and digestive health. Some studies suggest it may support immune system and contribute to cardiovascular health by positively affecting blood pressure and cholesterol levels. Noni's value-added products, including noni juice, capsules, teas, and skincare items, offer convenient ways to incorporate it into one's diet and wellness routine. However, it is essential to consult a healthcare professional before using noni products, especially if you have underlying health conditions or are taking medications, as more research is needed to fully substantiate its health claims. Overall, noni presents a potentially promising addition to the realm of natural health supplements and wellness products.

Keywords: Noni, medicinal, health supplement

PHMN/PP – 39

Development of protocol for preparation and preservation of wood apple toffee

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ABSTRACT

Investigation on "Development of protocol for preparation and preservation of wood apple toffee" was carried out at KRC College of Horticulture, Arabhavi, Karnataka, to develop the protocol for preparation of wood apple toffee and also to evaluate storage stability. The wood apple toffee was prepared by using 8 recipes which consists of two levels of cane sugar, caramel sugar, liquid glucose, milk powder and constant amount of wood apple pulp , hydrogenated fat, pectin, citric acid and salt. Significant differences were observed concerning to phyisco-chemical parameters between the recipes. The chemical constituents *viz.*, TSS, total sugars, reducing sugars and pH were found to increase marginally from 75.82 to 75.92^{o}B, 59.00 to 59.22 per cent, 20.06 to 20.36 per cent and 3.60 to 3.63, respectively whereas, moisture (14.51 to 14.15%), ascorbic acid (1.55 to 1.27 mg/100 g), titratable acidity (2.18 to 2.12%), non-reducing sugars (37.00 to 36.92%), calcium (21.28 to 21.22 mg/100 g), phosphorus (30.53 to 30.46 mg/100 g) and iron (3.84 to 3.79 mg/100 g) content were decreased during the storage period of 3 months. The mean organoleptic score decreased significantly from an initial value of 7.51 to 7.20 for overall acceptability with the increasing storage period. The results of the organoleptic evaluation signify that, the toffees prepared with a recipe containing 700 g sugar + 300 g glucose + 200 g milk powder + 50 g hydrogenated fat + 5 g citric acid + 50 g pectin + 2 g salt, found superiority in their acceptability compared to other recipes throughout the organoleptic study.

Keywords: Wood apple, toffee, nutrients, TSS, acidity

PHMN/PP – 40

Electrospun biocomposites: recent insight in preservation of underutilized fruit crops

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ABSTRACT

Electrospinning (ES) is a process that involves drawing nanofibers from a solution or molten liquid through the application of high voltage (typically 30-50 KV). Several parameters influence the electrospinning process, including solution properties and processing parameters. Solution properties encompass factors such as surface tension, molecular weight, viscosity, solvent choice, and solution conductivity. Processing parameters include voltage, feed rate, collector plate design, needle diameter, tip-to-collector distance, and humidity. Electrospun fibres have a wide range of potential applications, including filtration, wound healing, affinity membranes, protective clothing, energy generation, enzyme immobilization, drug delivery systems, scaffolds for tissue engineering, and biomedical devices. One innovative application of electrospinning is in the creation of edible coatings with functionalized antimicrobial properties for fruit surfaces. This approach can be particularly useful for fruits like rambutan, dragon fruit, fig, phalsa, karonda, longan, jamun, and others with shorter shelf lives and challenging surface characteristics, such as small sizes, irregular shapes, and spiny surfaces. These coatings can extend the shelf life of these underutilized fruit crops, which are often rich in phytochemicals and offer diverse nutritional profiles with potential health benefits. Electrospinning is an efficient and cost-effective technology for generating nanofibers with a high surface area-to-volume ratio, making it a promising tool to enhance the quality and shelf life of such fruits.

Keywords: Electro spun, bio composites, preservation, underutilized fruit crops

PHMN/PP – 41

Development of dragon fruit powder incorporated fortified cookies

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ABSTRACT

Dragon fruit holds a significant position as a crop of great importance. This fruit is renowned for its rich nutritional profile, including ascorbic acid content (7.69 mg/100g), Betalains (128.40mg BCE/100g), total phenols (90.48 mg AAE/100g), and total flavonoids (76.25 mg CE/100g). Among the four prominent dragon fruit species, the red pulp dragon fruit (*Hylocereus polyhrizus*) stands out due to its captivating and vivid magenta colour, which can be employed as a natural food coloring agent. Therefore, dragon fruit powder was produced utilizing cost-effective tray drying technology and additives. In-research, we assessed the suitability of the dragon fruit powder for making cookies. A panel of semi-skilled judges scored the cookies for its sensory quality using a 9-point hedonic scale. The sensory score outcomes demonstrated that cookies derived from dragon fruit powder garnered superior ratings in various aspects, when compared with the control treatment. Further, cookies produced with dragon fruit powder containing 4% additives received higher sensory scores for Color (7.84±0.70), consistency and mouth feel (7.72±0.90), flavor (7.76±0.75), taste (7.86±0.86), and overall acceptability (7.84±0.78), compared to those made with 8% additive inclusion. An analysis of nutritional composition revealed that cookies containing dragon fruit powder with 4% additives exhibited higher nutrient content, including reducing sugars (8.40%), total sugars (24.93%), proteins (0.75%), DPPH (27.50% RSA), FRAP (138.79 mg AAE/100g), phenols (161.12mg GAE/100g), and flavonoids (55.26 mg CE/100g).

Keywords: Dragon fruit powder, cookies and sensory evaluation

PHMN/PP – 42

Novel edible coatings application for enhancing the postharvest quality of passion fruit (*passiflora edulis* sims.)

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ABSTRACT

The postharvest quality of passion fruit deteriorates rapidly because of intense physiological metabolism and serious water loss which leads to shrinkage in passion fruit. In this context, the experiment was carried out to evaluate the effect of edible coatings *Aloe vera* gel (50 %, 75 %), gum arabic (10 %, 15 %), chitosan (1 %, 2 %), sodium alginate (1 %, 2 %) and carboxy methyl cellulose (1 %, 1.5 %) to enhance the postharvest quality of passion fruit under cold storage (8±1 °C) conducted at Horticultural College and Research Institute, Periyakulam, Theni. Results indicated that the passion fruits coated with chitosan 2 % recorded minimum PLW (19.53 %), maximum firmness (15.21 N), high lightness L* value (45.98), low a* value (1.11) and low b* value (4.40) and it recorded the higher pulp recovery (47.97 %), titratable acidity (3.68 %), ascorbic acid (29.81 mg 100 g^{-1}), total carotenoids (12.72 mg 100 g^{-1}), total flavonoids (14.46 mg 100 g^{-1}) and phenol content (29.31 mg 100 g^{-1}). Chitosan 2 % coated fruits had lower TSS (12.41 ºBrix), pH (4.36), total sugars (8.37 %), reducing sugars (3.41 %) and non-reducing sugars (4.95 %). Chitosan coated fruits had lower shrinkage index (41.39 %) and fruit spoilage (45.50 %) and extended the shelf life of about 26.5 days compared to control of about 15.5 days. Consequently, Chitosan (2 %) is effective for extending the shelf life and maintaining the postharvest quality of passion fruit at 8±1°C by regulating water loss and physiological metabolism.

Keywords: Novel edible coatings, postharvest quality, passion fruit

PHMN/PP – 43

Active and intelligent packaging: A smart approach for safe foods

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ABSTRACT

Over the previous few years, food packaging was used to enable marketing of products and to provide passive defence against environmental toxins or factors that shorten the items shelf lives. Customers demand reassurance that food packaging is safeguarding the integrity, quality, freshness, and safety of their food. To provide this assurance and help to improve the performance of the packaging, unlike traditional packaging, which must be totally inert, active packaging is designed to interact with the contents and the surrounding environment for eliminating unwanted components from the package headspace and from the food itself. The active packaging functions as active scavengers and emitters, which includesO_2 scavengers or absorbers, CO_2 absorbers or generators, ethanol emitters, ethylene absorbers and moisture absorbers *etc.* Intelligent packaging can provide information about several factors during transportation and storage and can monitor the state of packaged food or the environment. Active and intelligent packaging in food can be classified as smart packaging that not only improves food protection and shelf-life, but also provides information regarding food safety and quality. Such packaging offers the food sector significant advantages, including increased freshness of produce, less food losses, increased food quality and safety, and monitoring and control of storage conditions from the point of production through final customer consumption.

Keywords: Smart packaging, active packaging, intelligent packaging, Storage.

PHMN/PP – 44

Dragon fruit: An exotic fruit with health advantages, nutritional security and value addition

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ABSTARCT

A delicious and healthy exotic fruit called dragon fruit is grown all over the world's dry regions, particularly in Asian nations. It is a fruit that has just recently entered the Indian market. It is a semi-epiphytic perennial vine that is a member of the Cactaceae family. It was initially employed as a decorative plant but later became a new fruit crop due to its market worth and health advantages. Due to its CAM pathway, it needs relatively little water for growth and development. It is quite lucrative and has good export potential. As a result, it may be a successful fruit crop, especially in areas of the nation with damaged soil, abiotic stress, and rainy climates. It is becoming more well-known as a super fruit due to its high nutritious content and antioxidant capabilities. The fruit has a delectable flavour and an alluring form and colouring. Carotene, calcium, fibre, vitamin B, vitamin C, and phosphorus are among the essential nutritional components that are rich in this food. Due to this fruit's extensive therapeutic characteristics and health advantages, the growing population and those who are concerned about their health are becoming interested in it. It is regarded as the best fruit for diabetes patients since it lowers blood sugar and prevents cardiovascular illnesses. It is essential in the fight against cough, asthma, wound healing, and other conditions. It improves the body's immune system and aids in maintaining a healthy weight. Numerous value-added products are made from the fruit, although thus yet, only small-scale processing enterprises have done so. Along with pulp processing, using byproducts (peel, seed) will help with waste disposal issues and provide value to the final product for use in food and other industrial uses. Furthermore, the procedure overall effectiveness may be improved by extracting and using bioactive substances from fruit waste that are useful for fortifying foods. In addition to having significant potential for use in medicine and industrial production, dragon fruit is a potential source of sustenance for the present and the future.

Keywords: Antioxidants, health benefit, nutritional security, value addition.

PHMN/PP – 45

Carambola: a review on shelf life improvement and value addition

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ABSTRACT

The cultivation of star fruit in India is overlooked due to its perishable nature, high moisture content and marketability issues. Carambola yields 2 crops a year, summer and a winter crop. Winter harvested ones at 70% or 80% maturity, presented a considerably extended shelf life compared to their summer-harvested counterparts, storing at a temperature of 5 to 6 degree was found to extend shelf life. The beneficial effects of fruit include the following: antioxidant, hypoglycemic, hypotensive, hypocholesterolemic, anti-inflammatory and immune-boosting effects. Many products have been developed from this highly nutritious underutilized fruit carambola fruit is processed and utilized in the production of Carambola RTS, Carambola butter, Carambola squash, Carambola toffee, Carambola chutney, and Carambola bars. Value addition efforts for carambola fruits can positively impact consumption patterns among different communities thus increasing the demand for the underutilized fruit minimising the postharvest losses.

Keywords: Star fruit, yield, antioxidant, nutritious

PHMN/PP – 46

Processing red dragon fruit [*Hylocereuspolyrhizus* (Weber) Br.& R] pulp for pigment extraction and drying

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ABSTRACT

Colour plays an important role to enhance the aesthetic appeal of food products. Many food products suffers colour loss due to some food processing procedures. Red dragon fruit is the major commercially exploited anthocyanin rich crop. Furthermore, the fruit has remarkable antioxidant properties. Anthocyanins has the potential to be a natural food colourant and can be used as a substitute for synthetic colours that are better for human health. Due to the effects of heat, pH, light and oxygen during processing and storage, anthocyanins are unstable and readily destroyed. Making anthocyanin stable using encapsulation techniques is a solution to this issue. The aim of the study entitled "Extraction and drying of pigments from red dragon fruit *Hylocereus polyrhizus* (Weber) Br. & R) pulp" was to ascertain how the encapsulants affected the powdered anthocyanin extract from red dragon fruit on its physical and chemical properties. The experiment comprised two factors having solvents; ethanol, acetone and DMSO with 20%, 25% and 30% maltodextrin and encapsulated with their concentrations. The best combination of encapsulated powder of anthocyanin from dragon fruit pulp was found in pigments exctracted with 30 % maltodextrin. The extract was dried using spray drier (t_i:180 and t_o:90^{0}C having flow rate 2 ml/min). The significantly maximum powder yield (91.37 %) and b^* value (7.23) were recorded with the treatment combination of 30% maltodextrin and acetone. However, highest anthocyanin (73.45 mg/100 g), antioxidant activity of powder by DPPH assay (37.08 %), FRAP assay (34.90 %) and a^* value (13.00) were noticed with 20% maltodextrin and DMSO. Whereas 30% maltodextrin and DMSO was found best combination in terms of solubility (95.71 %) and colour L^* value (33.67).

Keywords: Anthocyanin, encapsulation, maltodextrin, pulp, solvent

PHMN/PP – 47

Shrink wrap packaging to extend the shelf life of horticultural produce

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ABSTRACT

Packaging of horticultural produce is needed not only to improve the consumer's preference but also to protect post harvest quality. Fruits & vegetables are highly perishable in nature and they have very short shelf life. To reduce the post-harvest losses like shriveling, moisture losses packaging must be required to extend the keeping quality of produce. Shrink wrap packaging can maintain the firmness of produce as well as sensory characteristics. The result of the study narrated that the Individualshrink-wrapped fruits and vegetables recorded minimum physiological losses in weight as compared to unwrapped fruits and vegetables at the end of refrigerated storage. Both the softening and sensory attributes score was found minimum in unwrapped fruits and vegetables whereas in shrink wrapping, minimum losses offirmness and highest sensory score was observed during storage. It can be concluded that individual shrink-wrappedfruits& vegetables can be stored well with maximum retention of colour, less spoilage, minimum weight and firmness losses and very good sensory quality attributes. The result of the study reported that changes in quality by visual observation, weight loss due to desiccation, change in firmness, titrable acidity, total soluble solids, water activity, decay, colour and sensory test was found minimum in shrink wrap packed produce whereas unwrapped fruits & vegetables were found unacceptable after few days due to undesirable loss in physiological weight, colour and firmness and shriveling of the surface of the fruits& vegetables. The colour and firmness of the wrapped fruits & vegetables remained almost unaltered during the period of storage.

Keyword: Packaging, protection, shelf life, post harvest loss, firmness, sensory attribute

PHMN/PP – 48

Valorization of mango waste by using different extraction techniques"

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ABSTRACT

Due to the increased industrial, agricultural, household and other food sector activities, food waste is rising continuously. Food waste is a multifaceted challenge that requires collaborative efforts from households, food manufacturing industry, food service sector, and the distribution network. Fruits and vegetables represent the simplest form of functional foods as they are rich in several bioactive components like (polyphenols, carotenoids and anthocyanins) have been shown to have high antioxidant activity and diminish the risk of developing certain types of diseases. Mango *(Magnifera indica*) is an important fruit crop cultivated in tropical regions belonging to *Anarcaiaceae* family. Because of 25-40% of seed and peel in mango fruit, a huge amount of waste is generated during industrial processing. Mango is a good source of many beneficial photochemical. Devising appropriate methods of utilization of this waste (mango peel) can help overcome some of the nutrition-security challenges in developing countries such as India, and help combat many diet-related diseases or to overcome malnutrition. There is a clear and increasing interest in the extraction and isolation of natural products such as bio components and their advantageous applications. There specific applications are also conditioning the employed extraction methods, novel stationary phases and mobile phases to be used by different techniques (conventional, MAE, UAE, super critical extraction). It is thus expected that these trends will be maintained in the near future as they are mostly motivated by emerging consumer demands and by safety, environmental and regulatory issues.

Keywords: Extraction techniques, waste, antioxidant activity, functional foods

PHMN/PP – 49

Influence of temperature on antioxidant and free radical scavenging activity of mature avocado (*Persea americana* Mill.) fruit during storage

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ABSTRACT

Avocado (*Persea americana* Mill.) is an important tropical fruit and having more nutraceutical values. Temperature is one of the most important factors affecting antioxidant activity in several fruits. Aim of the present study was to see the effect of different storage temperatures (5°C, 9°C, 12 °C and ambient temperature: 26-32°C) on total antioxidant (FRAP), free radical scavenging activity (DPPH) and total phenolic content (TPC) of two different avocado accessions (CHES−HA−I/I and CHES−HA−VII/I). Mature avocado fruits were harvested and stored for 7 and 21 days at room temperature (RT) and low temperatures (LT), respectively. These parameters were recorded at regular intervals to monitor how the temperature influenced their concentration during storage. The result showed higher antioxidant activity in fruits stored at 9°C in both the accessions. At 5°C, fruits exhibited signs of chilling injury and had lower antioxidants activity. Significantly higher phenolic content was found in fruits stored at RT (76.07 mg GAE/100g and 45.70 mg GAE/100g in CHES−HA−I/I and CHES−HA−VII/I, respectively).It was observed that both antioxidants and total phenolic content of avocado fruits increased irrespective of storage temperatures.However, rapid increase was found at RT storage than LT. It is, therefore, concluded that unlike other tropical fruits, as the ripening progressed avocado fruits exhibited higher total phenolic content as well as antioxidant activity than matured or over ripe fruits.

Keywords: Avocado, antioxidant activity, total phenol, low temperature

PHMN/PP – 50

Male buds of banana- a prospective source of dietary fiber

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ABSTARCT

Banana is a widely cultivated and consumed tropical fruit crop having high dietary fiber content in all of its plant parts. Studies have shown the higher content of dietary fiber in male buds of banana. The male buds of banana cultivars Grand Naine (AAA), Kunnan (AB), Nedunendran (AAB) and Pisanglilin (AA) belonging to different genomic groups were dried, powdered andanalyzed for content of total dietary fiber (TDF) and associated biochemical characteristics. Among the different cultivars, Kunnan recorded the highest TDF content (54.24%) as well as antioxidant activity (0.86 µg/ml), lignin (17.05%) and solubility (15.30%). Moreover, Kunnan male bud recorded the lowest phenol content (0.63 mg/g).The highest cellulose (18.90%) and carbohydrate (20.35%) content was recorded in the male buds of Grand Naine. Thus the powdered male buds of cultivar Kunnan was selected and cookies were prepared by incorporating different concentrations of this powder (10%, 20%, 30%, 40% and 50%) to the banana flour. These cookies were analyzed for biochemical as well as sensory attributes (9-point hedonic scale). The biochemical parameters such as protein, total minerals, calcium, potassium, dietary fibreand fat content increased with the level of incorporation of male bud powder of Kunnan whereas thecarbohydrate, starch, total sugars and energy value decreased with the level of incorporation of Kunnan male bud powder. But, after considering both the biochemical and sensory attributes, the cookies incorporated with 10% male bud powder of Kunnan was adjudged as the best.

Keywords: Dietary fiber, banana, Kunnan, male bud, cookies

PHMN/PP – 51

Aromatherapy: A holistic healing treatment through flowers – A review

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ABSTRACT

Aromatherapy uses aromatic essential oils medicinally to improve the health of the body, mind, and spirit. It enhances both physical and emotional health. This review explores the information available in the literature regarding therapeutic, medical, cosmetic, psychological, olfactory, massage aromatherapy, safety issues and different plants used in aromatherapy. There are various methods by which they are administered in small quantity like inhalation, massage or simple applications on the skin surface and rarely, they are taken internally. Inhalation and the external application of these oils for the treatment of mental and physical balance are the very basics of aromatherapy. Olfactory nerves from nose to the brain are the site of action for these essential oils. There is an increased trend nowadays to use this therapy in the treatment of cancer, reduce post-operative caesarean pain in pregnant women as well as decrease the anxiety level and improve sleep quality in patients having burn injury and dental problems. and sleep disorder. Their organic character and to act in a supportive manner with the body, provide a feeling of well-beingness.

Keywords: Aromatherapy, essential oil, flowers, massage

PHMN/PP – 52

Purslane: An underutilized prospective plant for nutraceuticals- A review

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ABSTRACT

Purslane is the only genus in the family portulacaceae comprising more than 100 species with a wide distribution. It is popularly known as portulaca or little hogweed and most commonly recognized species of portulaca are either herbaceous perennialand annualwhich include *P. oleracea, P. grandiflora, P. umbraticola, P. pilosa, P. molokiniensisand P. amilis*. It is used as an ethnomedical plant rich in phytochemicals and nutritional components with medicinal and pharmacological properties. *P. grandiflora, P. umbraticola*and*P. oleracea*arecommonly grown asornamentals across the world for its showy flowers, extreme diversity in flower colours, drought and heat tolerance. *P. oleraceae* in particular is very important edible plant because of high concentration of omega-3fatty acids especially α-linolenic acid, gamma-linolenic acid and linoleic acid, which are found mostly in fish and not generally synthesized in terrestrial plants. Studies indicate that, it is a rich source of vitamin A (22.2 mg and 130 mg per 100 g of fresh and dry weight of alpha-tocopherol), vitamin C (26.6 mg and 506 mg per 100 g of fresh and dry weight of Ascorbic acid), potassium (494 mg/100 g), magnesium (68 mg/100 g) and calcium (65 mg/100 g) that are vital for human intake. Similarly, *P. grandiflora*is reported to have antioxidant activity which ranged from 0.62-2.14mg/ml, 1.40-4.38 mg gallic acid/g and 7.32-29.21 mg ascorbic acid/g when expressed as IC50, GEAC and AEAC, respectively. Despite of its nutritional and phytochemical potential, the crop remains neglected. Studies focussing on cultivation and genetic regulation of important traits needs to be emphasized in Purslane for sustainable urban food security.

Keywords: Purslane, omega-3 fatty acids, nutraceutical

PHMN/PP – 53

Flowers on platter: Culinary and nutraceutical exploration

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ABSTRACT

Human diets and culinary preparations have traditionally included flowers; this practice dates back to the prehistoric era. The incorporation of delicate flower petals, vibrant color, varied shapes, unique blend of flavors and distinct taste makes the dish novel and appealing. Additionally, there has been a growing trend in the use of flowers in edible form due to growing consumer knowledge of the nutraceutical benefits associated with the intake. Numerous studies have also been carried out to look at the nutritional value, bioactive ingredients, and health advantages of edible flowers. Among the flowers that are popular in India; rose, lotus and hibiscus are more prevalent as edible. There are umpteen number of flower species that can be brought to the platter for its nutraceutical benefits (rich source for anthocyanin, antioxidants, phenols, flavanoids and pleasant aroma profile content). The most common use of flowers is as an herbal drink either by infusion in water or in beverages as a natural food dye and flavoring component. Herbal tea and beverages with blending of flowers such as Rose, Hibiscus, Marigold, Chrysanthemum, Naustertium, Proteas and Honey suckle act as rejuvenating energy drink with healing properties. Garnishing salads with flower petals of rose, marigold, calendula, pansy, lotus, butterfly pea, wild dahlia, spineless yucca to brings in colour and flavour making the boring salad as attractive and demanding platter. Instead of chemical food colour with carcinogenic effect, infusing natural red, purple and orange food colours from Rose, Marigold, Cletoria, Hibiscus, Antirrhinum into cake, deserts, beverages and soups food items will be a much better option for health conscious human beings. Children and youth craving for jams, jellies, cookies and ice-cream can be better served with added Rose, Hibisucs, Butterfly pea, Burans, Purple cone flower and Honey suckle petals that can add nutrition along with satisfying the taste buds. The healing and flavouring properties of underutilised and exotic flowers provides a potential healthy strategy for the future looming with climate change and possible health hazards.

Keywords: Exotic flowers, nutraceutical compounds, food products

PHMN/PP – 54

Embracing underutilized flowers and nourishing neglected blossoms

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ABSTRACT

Flowers have long been a part of aesthetic and cultural celebrations. An increasing trend in the utilization of underutilized and backyard flowers has emerged as a new opportunity for expanding the floral basket. Apart from the popular commercial cut flowers like rose, gerbera, carnation, anthurium, lilies, gladiolus and tuberose, there are several crops like antirrhinum, lisianthus, hydrangea, celosia, dahlia, sunflower and many more that can be brought into the floriculture industry for commercial cultivation. Flowers are always blamed for high investment demanding more water and nutrients. However, there aremultiple hardy species such as hippeastrum, bird of paradise, heliconias, ornamental gingers and many more specialty cut flowers that flourish with the least water requirement and are well adapted to marginal lands. As a loose flower the familiarity of marigold, chrysanthemum, rose and jasmine can be expanded further with Nerium, crepe jasmine, gomphrena, dianthus etc. Flowers are merely popular for their ornamental values but are underutilized for their nutraceutical and phytochemical values. The one that emerged tremendously is the marigold which is expanding in area for cultivation because of its carotenoid content. Similarly rose and hibiscus are getting popular for their contribution in food platter with multiple products. A series of underutilized backyard flowers exists that needs attention to be brought to the front line. Clitoria, a perennial herbaceous plant commonly seen growing in backyard gardens, is rich in anthocyanin, flavonoids and fatty acids and can be used as a vibrant blue food colour. Apart from being aromatic, Champaka flowers have the potential to be used for the preparation of herbal decoctions for fever, colic and postpartum protection. Chamomile, some herb rich in flavonoids, coumarins, terpenoids and cinnamic acid derivatives can be incorporated into food preparation to add a subtle floral and herbal flavor. Moreover, scented geraniums, elder flowers, peonies, pansies, viola, rhubarb, day flowers, jewel orchids, cobra lilies, honeysuckle etc. owing to their rich phytochemical properties can be exploited and brought to the food platter.

Keywords: Backyard flowers, underutilized, nutraceutical, climate resilience

PHMN/PP – 55

Nutrient analysis in bhringaraj accessions (*Eclipta alba* L.)

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ABSTRACT

Eclipta alba (L.) is one of most well-known and valuable medicinal plants in India. It is commonly named as false daisy and Bhringaraj and Karisilakanni. It is an annual herb belongs to the family asteraceae and said to be best drug for the treatment of liver ailments. This medicinal plant has rich ethnomedicinal history. The estimated annual trade is 2000-5000 MT. In the present study thirty Bhringaraj accessions collected from different places of the country were analysed for nutrient status by AAS method (Atomic Absorption Spectrocopy). With regard to the macro nutrients, nitrogen content was ranged from 1.2-3.2 per cent whereas, phosphorus and potassium was ranged 0.2-0.4 and 0.9-2.7 per cent, respectively. Significant variation was observed in mineral composition of Bringaraj accessions. Among micronutrients, iron (Fe) content varied greatly, followed by manganese (Mn), zinc (Zn) and copper (Cu) contents. Variation in Fe contents ranged from 808.3 (accession IIHR 46) to 9299 ppm (accession IIHR 14), Manganese content varied from 91.3 (accession IIHR 7) to 223 ppm (accession IIHR 6). Higher value of zinc was observed in accession IC 210896 (58 ppm) while lowest value was observed in accession IC 632656 (9.62 ppm). Higher copper content was noticed in accession IC 210896 (32.5 ppm) while lower content recoded in accession IC 312245 (7.98 ppm). Further, among secondary macronutrients, calcium concentration varied from 0.5 (accession IC 312245) to 1.5 ppm (accession IIHR 33) whereas magnesium concentration ranged from 0.2 (accession IC 312245) to 0.6 ppm (accession IC 632656). Lastly, higher value of sulphur was exhibited in accession IC 066050 (2 ppm) while lowest value was noticed in accession IC 312245 (0.63 ppm). Since Bhringaraj is rich in nutrients, these accessions could be selected to fulfill nutrient requirement as leafy vegetables. Moreover, iron content of these accessions was found to be superior than that of previous reports.

Keywords: Bhringaraj, accession, concentration, value

PHMN/PP – 56

Nutritional profiling of Brahmi (*Bacopa monnieri* (L.) Wettst.) germplasm

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ABSTRACT

Bacopa monnieri commonly known as Brahmi or water hyssop is a creeping perennial, belonging to the Scrophulariaceae family. From ancient times this plant is used in Ayurveda for memory improvement, in the treatment of epilepsy, to relieve stress and anxiety. Besides its medicinal values, it is also used as a leafy vegetable in different parts of India. Green leafy vegetables are essential food source which are rich in nutrients and phytochemicals. Nutrient analysis is helpful in isolating nutrient dense lines which can be promoted for cultivation as leafy vegetable. In the present study 30 germplasm lines of brahmi,have been analysed for macronutrients such as N, P, K, Ca, Mg, S and micronutrients like Cu, Zn, Mn, Fe were analysed in by AAS method (Atomic Absorption Spectroscopy). The Nitrogen content has ranged from 1.39 to 3.42 per cent, whereas, variation in phosphorus and potassium content ranged from 0.07 to 0.65 per cent and 0.15 to 1.32 per cent, respectively). The micronutrients varied greatly among the lines. Significant variation was recorded in copper (3.82 to 43.21 ppm) Zinc (3.58 to 65.02 ppm) Manganese (7.57 to 88 ppm). High variation among lines was noted for Iron content from 463.96 to 2645.66 ppm. Among the germplasm lines accession JU 20-34 recorded the higher Calcium (0.95 ppm), Magnesium (0.7 ppm), Sulphur (1.15 ppm) copper (43.21ppm). It is also rich in Manganese (88 ppm) and Iron (2645.6 ppm). Similarly Accession IC284992 is rich in all micronutrients i.e iron (1965 ppm) calcium (0.7 ppm), zinc (54.91ppm), copper (30.85ppm),manganese (60.97ppm) and magnesium (0.35ppm). The accessions IC554585 and IC565466 also recorded high Iron content (2645.66; 2428ppm) and Manganese (88; 69.27 ppm), Zinc (54.55;21.96 ppm) and Copper (43.21;21.04 ppm). The promising nutritionally rich accessions JU 20-34, IC284992, IC565466 and IC554585 further evaluated for yield and nutrient status for leafy vegetable purpose.

Keywords: Bacopa, germplasm, nutritional content, leafy vegetable

PHMN/PP – 57

Effective management and sustainable utilization of underutilized flowers in waste management

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ABSTRACT

Floral waste poses a significant environmental concern particularly due to its widespread applications across various industries such as perfumes, cosmetics, food, liquor and textiles. Improper disposal of flowers including their release into rivers and oceans not only contributes to water pollution but also harms aquatic ecosystems. In India alone, a staggering 300 tons of flowers are discarded after single use underscoring the urgency of implementing effective flower waste management strategies. Flower waste management encompasses several crucial steps including collection, segregation and processing for product extraction. From these discarded blossoms valuable resources can be derived including biofuel, bio fertilizer, natural dyes and bio-adsorbents. Furthermore, the conversion of flower waste into consumable herbal products represents a sustainable and innovative approach. This transformation can yield products such as incense sticks, perfumes, interior decorative items, natural dyes for cotton and silk products, composts and bio-gas. Properly managing the disposal of floral waste not only mitigates environmental pollution but also contributes to achieving approximately 60% of the United Nations' sustainable development goals. It’s worth noting that underutilized flowers like crossandra, jasmine, barleria, cockscomb and cape honeysuckle among others can play a pivotal role in generating these valuable products. By tapping into the potential of these often-overlooked floral resources we can address the issue of flower waste while simultaneously promoting sustainable practices and environmental conservation. This holistic approach to flower waste management not only benefits the ecosystem but also offers economic opportunities and contributes to a more sustainable and greener future.

Keywords: Management, sustainable utilization, underutilized flowers, waste management

PHMN/PP – 58

Antioxidant activity in elite selections of brahmi *(Bacopa monnieri* L. Wettst)

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ABSTRACT

Bacopa monnieri (Linn.) commonly known as Brahmi belongs to the family Scrophulariaceae. It is a potent tonic used to improve mental alertness, learning performance, and memory cells and thus referred as "memory booster" or "thinking person's herb". It contains phytochemical constituents such as alkaloids, sterols, glycosides, flavonoids, and characteristic saponins called "bacosides" which are responsible for diverse pharmacological activities like antioxidant, anti-inflammatory, antipyretic, antiulcer, cardioprotective, cooling, laxative and adsorbing effects. Antioxidant compounds have potential to mitigate the effect of free radicals, thereby leading to chain reactions that may damage the cells of organisms and play an important role as a health protecting factor. The present study was carried out to evaluate antioxidative properties of the methanolic extracts of the ten elite selections of Brahmi by DPPH (1, 1-diphenyl-2- picrylhydrazyl) and FRAP (ferric reducing antioxidant power) assay. Ability of plant extract to scavenge DPPH radical was analysed. Free radical scavenging activity showed a variation of 4.90 to 16.90 mg/g AAE (ascorbic acid equivalent) among the elite selections. The highest scavenging activity was recorded in IIHR BMSel 07 (16.90 mg/g AAE) followed by IIHR BM Sel 02 (14.80 mg/g AAE). The FRAP activity among 10 elite selections ranged from 18.23 to 44.80 mg/g AAE. The highest reducing power was observed in IC-343108 (44.80 mg/g AAE) followed by IIHR BM Sel 02 (42.78 mg/g AAE). Further, IIHR BM Sel 02 also recorded higher phenolic and tannin content (36.39 mg/g and 15.32 mg/g gallic acid equivalent, respectively) and higher flavonoid content (20.94 mg/g catechin equivalent). The results show that *Bacopa monnieri* L. plant extract possesses potent antioxidative properties and IIHR BM Sel 02 elite selection has higher antioxidant activity coupled with higher phenol and flavonoid.

Keywords: Brahmi, Antioxidant activity, Elite lines, FRAP, DPPH

PHMN/PP – 59

Nature's forgotten super foods: harnessing health benefits from underutilized vegetables

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ABSTRACT

Underutilized vegetables, often overlooked in favour of more commonly consumed varieties; possess a wealth of health benefits that hold significant potential for enhancing overall human well-being. These vegetables are characterized by their nutrient density, antioxidant properties, dietary fiber content, and unique bioactive compounds This review explains the various health benefits of underutilized vegetables, including spine gourd, sweet gourd, beans, some cole crops, leafy vegetables, etc., and how they help to protect against free radicals, support the digestive system, control blood sugar, maintain cardiovascular health, and support the immune system. The significance of these vegetables for culture and cuisine is also underlined, emphasizing their role in preserving traditional diets and encouraging dietary diversity. As low-calorie options rich in essential nutrients, underutilized vegetables offer a valuable resource for weight management and the prevention of chronic diseases. Moreover, their cultivation and consumption contribute to environmental sustainability by diversifying agricultural systems. By recognizing the health potential of underutilized vegetables and integrating them into dietary guidelines and culinary practices, individuals can harness their myriad benefits to foster a more nourished and resilient population. They've been important in the past and can make our modern meals better too. By telling us about these forgotten vegetables, the study wants us to think more about what we eat. It wants us to try different vegetables to get all kinds of nutrients. This is good for us and can make our society healthier as a whole.

Keywords: Sustainability, diversifying, healthier society, dietary guidelines

PHMN/PP – 60

Mangalore melon – an underutilized potential vegetable for enhancing the shelf life of cantaloupe crops

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ABSTRACT

Mangalore melon (*Cucumis melo* subsp. *agrestis* var. a*cidulus*), popularly known as culinary melon, has been predominant in Karnataka's coastal and Malnad regions since ancient times. It belongs to the family Cucurbitaceae. However, its potential utilization and vegetable values remain largely untapped. This under-utilized vegetable crop is distributed across South Indian states and the Northeast region of India and is mainly sought after for its culinary applications. Mangalore melon is a short-duration vine, producing fruits that can maintain freshness for 8-10 months when stored. An evaluation of 52 selected accessions of South Indian Mangalore melon has revealed an extended shelf life of more than six months. In contrast, the cantaloupe crop (muskmelon) exhibits a poor shelf life of only 10-15 days. Through infraspecific hybridization with Mangalore melon, cantaloupe hybrids have been developed with an extended shelf life of up to 90 days, showcasing a balanced taste profile derived from both parent varieties. Identifying candidate genes responsible for the extended shelf life in Mangalore melon accessions, followed by their integration into muskmelon cultivars through advanced backcross QTL mapping, holds the potential to create new cantaloupe varieties with extended shelf life. This advancement is expected to enhance farmers' income by preserving fruits against fluctuating market prices and facilitating long-distance transportation.

Keywords**:** Underutilized vegetable, shelf life, mangalore melon, cantaloupe

PHMN/PP – 61

Lotus rhizome: A nutritious underutilized vegetable crop

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ABSTRACT

Lotus rhizomatous root is a popular vegetable in South East Asian region, in this region it is often cooked in coconut milk gravy. In India, it is known as *kamalkakdi* and is cooked as a dry curry. Lotus is a perennial aquatic plant that grows beautiful pink-hued or white flowers and lotus root is the edible rhizome (the subterranean stem) of the lotus plant. Lotus plants offer many health benefits, as well. Different parts of this beautiful plant can be used for health and nutrition. The lotus rhizome have less calories, good levels of dietary fiber, low fat and cholesterol with high vitamin C, vitamin B and several minerals, copper andiron, low sodium and high potassium. It also contains several alkaloids and flavonoids. Rhizomes contain high amounts of starch (31.2%) without characteristic taste or odour. The texture is comparable to a raw potato. The binding and disintegration properties of isolated *Nelumbo* starch have been compared with maize and potato starch; *Nelumbo* starch is shown to be superior as an adjuvant in the preparation of tablets. When dried, *N. nucifera* is also used for making of flour, another popular use of this vegetable. As a vegetable and medicinal herb, Lotus can be grown in situations not favoured by other crops. In the southeast, the environmental conditions to grow lotus are the same as those to produce fish in ponds. In Sanskrit, the lotus has many names such as Padma, Kamal and Pankaja.

Keywords: Lotus, rhizome, nutritional properties, aquatic vegetable

PHMN/PP – 62

Cherry tomatoes: a bountiful source of natural nutraceuticals

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ABSTRACT

The cherry tomato is a tiny wild ancestral form of the tomato. Scientifically, *Solanum lycopersicum* var. *ceraciformae*. It is indigenous to the Ecuadorian and Peruvian Andean regions. These are found growing in the wild, in gardens at home, along roadways, or as a cultivated crop. It is a highly valuable berry vegetable that produces tiny, attractive fruits with a distinctive flavour and beneficial nutrients. Along with essential nutrients, it also offers health benefits, which is why it is classified as a functional food. Fruits are packed with vitamins, organic acids, flavonoids, phytonutrients such as carotenoids and lutein, higher phenolics (naringenin and rutin), ascorbic acid and lycopene content in the fruits found to have antioxidant activity, and mineral potassium, which helps to lower blood pressure. The fruit extract, at a concentration of 300 mg/mL, has a preventive and therapeutic effect against human cervical and liver cancer cells. High levels of lycopene and neurosporene in red cherry pulp have been linked to a strong antiproliferative effect against tumour cells. The crude protein content of the cherry tomato powders, ranging from 8.3 to 14.2 g/100 g dry weight, is equivalent to that of cereals such as rice and wheat. In addition, it is a good source of gamma-aminobutyric acid, which is a protein metabolite that acts as a neurotransmitter. The cherry tomato peel powder, at 0.02% concentration, have anti-trichomonad inhibitory activity. By consuming 300 grammes per day of red cherry tomatoes for 4 weeks, significantly improved endothelium functioning, which helps prevent cardiovascular disease. These have aesthetic value also. Consequently, cherry tomatoes offer multiple benefits.

Keywords: Organic acids, cherry tomato, naringenin, neurosporene, aminobutyric acid.

PHMN/PP – 63

Bird's eye Chilli: A potential ethnopharmacological vegetable

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ABSTRACT

Bird's eye Chilli is an important traditional vegetable cum dietary spice crop, botanically known as *Capsicum frutescens*, sharing the family Solanaceae and having the diploid chromosome number 2n=24. It is one of the domesticated species, having originated from the Amazon basin in Brazil and the Mexican city of Tabasco. It is a perennial crop having tiny upright fruits, size ranging between one cm to five cm with a tapering tip. The typical pungency in fruits is due to the pharmaceutical compound capsaicinoids, which help to cure toothache, rheumatism, dyspepsia, hypertension, wounds, reduce bad cholesterol, and blood pressure. They are highly recommended in Ayurvedic medicines for their anticipated health benefits. These are the richest sources of ascorbic acid (159.05 mg/100g), tocopherol, organic acids, and phenolic acids such as coumaric acid, ferulic acid, gallic acid, caffeic acid, and rutin. The fruit powder, at a concentration of 600 mg/kg body weight, inhibits gasto-mucosal injury, which reduces gastric ulcers and acts as a buffer for the gut. Five grammes of capsicum provided 26.6 milligrams of capsaicin content that was associated with a decrease in plasma glucose levels, the maintenance of insulin levels, and helped in the management of type 2 diabetes. The fruits have shown potential antimicrobial and antioxidant effects due to the presence of phenolic, capsaicinoid, and flavonoid substances. The leaves contain a significant amount of phytoconstituents, specifically saponins, tannins, alkaloids, glycosides, and steroids that exhibit anthelmintic activity. As per the research report, higher antioxidant capacity was recorded in mature red fruits compared to the immature green fruits. Along with these, the fruits have also shown anticarcinogenic, anti-inflammatory and antimalarial activity. It indicated that bird's eye chilli has tremendous nutraceutical potential.

Keywords: Nutraceutical potential, antimalarial, saponins, tannins, alkaloids.

PHMN/PP – 64

A potential underutilized leafy vegetable: *Cleome gynandra*

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ABSTRACT

As the world population is expected to reach 8.5 billion by 2030, increasing food demands and rising cases of malnutrition are the major global challenges. WHO estimated that nearly 40 % of children (<5 years age),37 % of pregnant women, 30 % of women (15-50 years age) are linked to under-nutrition and about 1.9 billion adults are obese in the world (WHO,2021). So given the scenario there is a need to focus on improvement and promoting underutilized crops that is not only nutraceutical but also a climate smart crop. One such annual leafy vegetable is *Cleome gynandra* , commonly called as Ajagandha or spider plant widely distributed in semiarid regions of Asia and Africa. The leaves are rich source of vitamin A (6.7-18.9 mg/100g), vitamin C (127-484 mg/100g), Ca (2209.8 mg/100g),Fe(35.7 mg/100g),protein (2.6-6mg/100g) and zinc (Jinazali et al., 2017). Presence of phytochemical compounds such as alkaloids, flavanoids, glucainolates, proanthocyanidins, phenols in plant acts as an antiinflamatory, anticancerous, antioxidant which areknown to reduce diabetes, cancer, cardiovascular diseases(Chand et al., 2022 ,Moyo and Areme,2022).Plant extracts are used in traditional medicine to treat snake bite,food poisoning and severe pain caused by scorpion stings (Al-Asmari et al., 2017).Unlike the other commercial vegetables, the plant is more resistant to pests and diseases. Due to its C4 photosynthetic mechanism, the crop can adapt well in extreme conditions (Raju and Rani, 2016). It can toleratestresses like salt (Kumar et al.,1984) and drought as well (Mabhaudhi et al.,2019).Plant needs full sunshine,high light intensity and thrives best at a temperature of 25 -30 ºC but it is highly susceptible to flooding and low temperature. Seeds enter a physiological dormancy for 4-5 month after harvest and the main constraint in production is its poor seed and yield quality (Abukutsa-Onyango,2007). so improvement works aiming at such parameters are required to ensure optimum sustainable production.

Keyword: Nutraceutical , climate smart crop

PHMN/PP – 65

Kiwano (horned melon): incredible benefitsvigour and vitality

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ABSTRACT

The kiwano belongs to the Cucurbitaceae family. The alien likeexotic fruit has similarities with Passion fruit and Pomegranate in its texture. Its increasing popularity in the health arena is due to the multiple health benefits it possesses. It improves cognitive function, used as a recovery aid for heart stroke; kiwano melon slows the ageing process and even neutralizes the free radicals in the body. Due to the presence of essentialminerals, nutrients and organic compounds in the fruit, it got recognition by WHO, stating kiwano to be an important fruit in fighting againstmalnutrition and illness. The health benefits of the kiwano are in the nutrients it contains including Fe, Kand vitamin C. It also has smaller amounts ofCa, Cu, P, Mg, Znand Na. The seeds contain oleic and linoleic acid. Linoleic acid is an omega fatty acid rich which is required for human health while oleic acid is help to reduce blood pressure. Some of anti-oxidants present in kiwano seeds are α-tocopherol as well as β-tocopherol. Its pulp contains the carotenoid, beta carotene. The beta carotene strengthens the body's defence mechanisms and sustains skin and eye health. It may also help to stop cancer simply by suppressing the growth of free-radicals.

Keywords: Fatty acids, free radicals, illness, malnutrition, minerals, tocopherol

PHMN/PP – 66

Spine gourd: a resilient crop for varied climates

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ABSTRACT

Momordica dioica Roxb, a member of the Cucurbitaceae family, is a wild, perennial, and creeping plant found in tropical and subtropical regions, including Pakistan, China, India, Nepal, and Sri Lanka. It is widely recognized in traditional medicine and as a nutritious vegetable due to its diverse array of nutrients and phytochemicals that possess substantial medicinal value. Various components of the *M. dioica* plant contain a plethora of phytochemicals such as alkaloids, steroids, triterpenoids, flavonoids, glycosides, ursolic acid, vitamins, minerals, and a high fiber content. These constituents exhibit potential in treating conditions like asthma, excessive salivation, and inflammation caused by lizard and snake bites, elephantiasis, fever, mental and digestive disorders, while also contributing to skin health. According to indigenous wisdom, spine gourd plays a pivotal role in alleviating various ailments, including urinary and digestive disorders, and serves as a remedy for bleeding. A comprehensive exploration of *M. dioica* and its phytochemical constituents holds great promise for preserving plant biodiversity and enhancing its medicinal applications.

Keywords: Elephantiasis, phytochemicals, plant biodiversity, inflammation.

PHMN/PP – 67

Cultivating culture: indigenous leafy vegetables

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ABSTRACT

India boasts a rich diversity of leafy vegetables, each possessing tremendous potential, yet the practical information regarding their cultivation and quality remains woefully scarce. These greens are primarily consumed by the communities residing in their native regions, with minimal commercial production. While a select few have garnered global attention from both cultivators and consumers in recent years, the majority of these leafy greens remain overlooked and require dedicated efforts to harness their full potential in ensuring nutritional and health security for all. Leafy vegetables, often found in the wild or as weeds, offer an advantageous combination of ease in cultivation, low production costs, and high yields. They exhibit exceptional resilience to varying climates and stand out as one of the most cost-effective vegetable options in the market. Therefore, they can aptly be labeled as both climate-smart and nutrition-smart crops, deserving global recognition and utilization. India serves as a bountiful repository of various leafy vegetables, including Indian spinach (*Basella alba*), drumstick (*Moringa oleifera*), curry leaf (*Bergera koenigii / Murraya koenigii*), among others, as well as numerous lesser-known leafy greens, which are available seasonally.

Keywords: Leafy vegetables, drumstick, Indian spinach

PHMN/PP – 68

Estimation, quality evaluation and utilisation of dietary fibre from cowpea and okra pods

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ABSTRACT

Vegetables are reported to be rich sources of naturally occurring dietary fibre. Hence, the incorporation of dietary fibre as a functional ingredient for developing fibre-enriched food is gaining importance nowadays. Cowpea and okra are widely cultivated and consumed vegetable crops in Kerala. Their dietary fibre value and utilisation in the human diet remain unexplored. In this context, the present study was undertaken for the evaluation and utilisation of dietary fibre from cowpea and okra pods. The total dietary fibre content (TDF) was estimated by the enzymatic gravimetric method in the varieties Lola (cowpea) and Arka Anamika (okra) and recorded as 53.53 % and 47.94 % respectively. The qualitative evaluation of fibre-rich pods was done on biochemical and functional parameters. The biochemical properties recorded were the content of protein, carbohydrate, cellulose, phenol and antioxidant property (DPPH activity). Variety Lola recorded higher values of carbohydrates, phenol and cellulose content and was observed as 25g/100g, 85mg/100g and 17.37 %. The protein content and antioxidant activity of the variety Arka Anamika was noted as 12.37 % and 37.28 µg/ml. The functional parameters analysed were water -holding capacity (WHC), oil-holding capacity (OHC) and swelling power. The WHC (9.39 %) and swelling power (10.57%) were higher in okra pods whereas OHC in cowpea pods exhibited 2.17 ml/g. The possibility of incorporating dried and powdered pods in cookies was also explored. Cookies prepared by incorporating 20% powder were found to be better in sensory evaluation.

Keywords: Protein, carbohydrate, cellulose, phenol, antioxidants.

PHMN/PP – 69

Athalakkai (*Momordica cymbalaria*) – underutilized vegetable in Virudhunagar district of Tamil Nadu

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ABSTRACT

Athalakkai (*Momordica cymbalaria*) is a perennial herbaceous climber belongs to the *Cucurbitaceae* family. It is widely growing in black soil and available during the monsoon season in Virudhunagar District of Tamil Nadu. Environmental conditions of the district like soil type, temperature, humidity, and rainfall are highly suitable for growing athalakkai in this region. Flowers are monoecious, male flowers are in clusters and female flowers are solitary. Fruits are dark green in colour, fleshy, and robbed, roots are woody, and tuberous perennial. Fruit contains high amounts of carbohydrate, protein, fat, fiber, vitamin A, and B. Fruit has hypoglycaemic, hypolipidemic, cardio-protective, hepatoprotective, nephroprotective, anti-diarrheal, and anti-cancer properties. Seeds are black in color, shiny and are hard, so generally seeds are not used for propagation, because the rate of germination is very less or negligible. The mode of propagation is through an asexual method, as it is generally propagated through tuberous roots. The tubers start germination at 8 -12 days after the onset of monsoon. Planting season for athalakkai tubers is June – July and fruits are available during October to December. The self-life of the fruits is very poor only a few days after harvesting. The best method to make availability of the fruit throughout the year is with the help of processing techniques, especially spray drying techniques to make an athalakkai juice powder.

Keywords: Athalakkai, botany, nutrition, cultivation, processing

PHMN/PP – 70

Kachri (*Cucumis callosus*): A nutrient-rich gem of Southern Rajasthan

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ABSTRACT

Kachri (*Cucumis callosus*) is a unique and lesser-known vegetable of immense importance in the culinary landscape of Southern Rajasthan. This arid region, characterized by its harsh climate and limited agricultural resources, has found *kachri* a valuable nutritional resource that has sustained its inhabitants for generations. This drought-resistant cucumber species thrives in the arid and semi-arid regions, making it a lifeline for the local communities. Its adaptability to the challenging climate conditions of the region has earned it the nickname "desert cucumber." Nutritionally, *kachri* offers a rich array of vitamins, minerals, and dietary fiber, making it a significant addition to the diet. It is a rich source of vitamin C, which is essential for boosting immunity in an area where access to healthcare can be limited. Additionally, *kachri* provides essential minerals like potassium, magnesium, and calcium, contributing to overall health and well-being. It is used to prepare a wide range of dishes. The most popular preparation involves drying the *kachri* fruit, which not only preserves it for extended periods but also intensifies its tangy flavour. The dried *kachri* is grind into a fine powder and used as a souring agent in various curries, pickles, and chutneys, enhancing the taste and aroma of these dishes. Its cultivation and consumption have been passed down through generations, fostering a deep connection between the people and this resilient vegetable. However, it is essential to promote sustainable agricultural practices and conservation efforts to ensure the continued availability of *kachri*, especially in the face of changing climate patterns and urbanization. Its adaptability, nutritional value, and culinary significance make it an indispensable component of the Rajasthan's diet.

Keywords: Inhabitants, culinary, sustainable agricultural

PHMN/PP – 71

Miracle dish with range of health benefits: taro

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ABSTRACT

Taro (*Colocasia esculenta* L.) contains several active compounds anthocyanins, hemagglutinin, protein and tarinlectin which exhibit numerous beneficial properties, including antitumor, antimetastatic, antioxidant and anti-inflammatory. Taro is cultivated as a subsistence crop under small and marginal farms, with low capital endowment generally, far from urban centres with no access to capital markets. The food processing sector can overcome these constraints and enhance taro crop availability and acceptance by urban populations by replacing corn and wheat in processed foods, enhancing raw product commercialization. In addition, this may also lead to attention regarding taro crop as a rich source of remarkable and unique compounds, whose pharmacological activities have been demonstrated. Poi is a traditional food derived from taro. All the part of taro can be consumed and it is considered as one of the crops in providing nutritional security. Documentation of traditional uses and food products from *Colocasia* leaves show its immense potential in functional food product as well as drug development. The consumption of roots and tubers as a source of carbohydrates has been proven to be advantageous for people with celiac disease or other allergic reactions due to their gluten-free nature. Among the various byproducts the tablet formulation is gaining popularity due to its ease in consumption. Studies provide evidence of antidiabetic, antihemorrhagic, antihypertensive, immunoprotective, anticarcinogenic and neuropharmacological properties. Phytochemical compounds like chlorogenic acid, anthraquinones, cinnamic acid derivatives and other phenolics validates these biological properties. Starch has also been used for industrial applications, such as pasta, noddle, bakery, and biodegradable composite filling agents, and in the production of biodegradable plastics. Including taro in our diet becomes essential to address food insecurity as global hunger increases.

Keywords: Colacasia, poi, phenolics, phytochemical

PHMN/PP – 72

Nutraceutical aspects of amaranthus: a comprehensive review

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ABSTRACT

Amaranthus, is a versatile and nutritionally rich underutilized plant belongs to the family *Amarantaceae*. Most of the amaranthus species are originated in India or Indo-China region. Some amaranth species are cultivated as leaf vegetables, pseudocereals,and ornamental plants. Among the leafy types *A. tricolour* L. is the main cultivated species in India. Amaranthus is renowned for its high-quality protein content, comprising essential amino acids, making it an excellent protein source. In addition to protein, it is a rich source of dietary fiber, vitamins (including vitamin A, vitamin C, and various B vitamins), and essential minerals such as calcium, magnesium, iron, and phosphorus. The combination of these nutrients contributes to its multifaceted health-promoting properties.The health benefits of amaranthus consumption encompass heart health, with its ability to reduce cholesterol levels and regulate blood pressure due to its fiber and potassium content. Furthermore, its promotion of digestive health, weight management, and support for a balanced gut micro biome make it an attractive option for those seeking overall well-being.Amaranthus is particularly beneficial for individuals with gluten intolerance or celiac disease, as it is naturally gluten-free. Its contribution to bone health through the provision of calcium, magnesium, and phosphorus is noteworthy, along with its potential to combat anaemia through its iron content. The presence of antioxidants, including vitamin C, vitamin E, and phytochemicals like flavonoids and polyphenols, offers protection against oxidative stress and may mitigate the risk of chronic diseases. Additionally, preliminary research indicates potential anti-inflammatory and anti-cancer properties attributed to amaranthus bioactive compounds. This comprehensive review underscores the significance of amaranthus as a valuable nutraceutical resource, emphasizing the importance of incorporating it into a balanced diet to harness its diverse health benefits. Further investigation is warranted to elucidate its full potential and its role in promoting human health and well-being.

Keywords: Amaranthus, neutraceuticals, phytochemicals and bio-active compounds

PHMN/PP – 73

Multivitamin plant: nature's nutrient power houses

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ABSTRACT

Sauropus androgynous (L.) Merr. Commonly known as multivitamin plant, "Katuk" or"Chekurmani" belonging to the family Phyllanthaceae. It is a leafy green plant native to Southeast Asia, celebrated for its exceptional nutritional value and versatility. This abstract explores the various facets of *Sauropus androgynus*, highlighting its significance as a valuable dietary and horticultural resource.The young leaves of *Sauropus androgynus* are the primary edible part of the plant, renowned for their mild, slightly sweet flavor. They offer a rich source of essential nutrients, including vitamin A, vitamin C, calcium, iron, and potassium, making them a nutritional powerhouse. Katuk leaves have found a place in traditional Southeast Asian cuisine, where they are incorporated into a wide range of dishes, from salads and stir-fries to soups and curries.This plant's easy cultivation and adaptability have made it a popular choice for home gardens and small farms in its native regions. Its resilience and ability to thrive in various climatic conditions contribute to its widespread availability. Beyond its culinary uses, *Sauropus androgynus* has been recognized for its potential medicinal properties. In traditional medicine, it has been employed to address ailments such as coughs, colds, and digestive issues. This abstract underscores the multifaceted significance of *Sauropus androgynus*, both as a nutrient-rich leafy green and as a botanical resource with potential health benefits. It emphasizes the importance of incorporating this versatile plant into diets to enhance nutritional intake and overall well-being, and highlights the need for continued research to explore its full range of potential uses.

Keywords: Multivitamin, katuk and nutritional value

PHMN/PP – 74

Marsilea quadrifolia: emerging species as a source of nutrient

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ABSTRACT

Marsilea quadrifolia L., also known as four-leaf clover, European water clover, water shamrock and pepperwort, comes under family Marsileaceae. It is a deciduous aquatic fern with climbing, fleshy, adventitious roots. This species grows in damp habitats in shallow water. *M. quadrifolia* is widely distributed, throughout central and southern Europe and extending from Eurasia to tropical and temperate regions of eastern Asia and North America. It is native to Eurasia. It can be grown in many tropical and subtropical regions up to 1,500 meters above sea level. It grows best in areas with average day temperatures of 20-28 °C, but can also tolerate temperatures of 14-32 °C. *M. quadrifolia* is an aquatic species with slightly eutrophic roots that tolerate a variety of trophic levels. Its growth peaks in slightly eutrophic waters and is suppressed but persists in high nutrient conditions. *M. Quadrifolia* has been harvested for centuries for its botanical importance and as food source. Young stem and leaves used as food. *M. quadrifolia* has economic value in wetland restoration due to its phytoremediation properties and also its ability to treat wastewater. It has been used in local Ayurvedic medicine in India for thousands of years. They are relatively nutritious and important for food security during droughts and crop failures. This species is rich in vitamins, minerals, trace elements, fiber and protein. Chemical composition and nutritional value change with the seasons. Compostion of this plant includes dry matter 9.2-22.8%, crude protein content 24.5-36.2%, β-carotene content 2.1-2.8 mg/100 g. Sodium 0.7-1.4% (dry weight). Potassium 1.1-2.8%. Additionally, this plant contains higher amounts of thiamine, riboflavin, and vitamin C than other species. This species has been shown to have anti-diabetic, anti-inflammatory, and anti-stress properties and is used as an antioxidant, diuretic, preservative, antipyretic and refrigerant.

Keywords: Antioxidant, diuretic, preservative, antipyretic, refrigerant.

PHMN/PP – 75

Nutraceutical and bio-fortification: An underutilized vegetable crop

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ABSTRACT

Micronutrient deficiency is a major public health burden that spans geopolitical regions and socio-economic strata worldwide. Dietary diversification, food supplements, food fortification, and biofortification of popular food crops are all initiatives to combat this "hidden hunger." Vegetable crops hold considerable promise for meeting nutritional needs because they represent a collection of over a thousand plants found all over the world and are a staple of most people's diets. Although the world's recorded vegetable production in million tonnes, a large number of smaller vegetables also serve as dietary minerals, vitamins and antioxidants in human diet. Biofortification, a long-term technique to increasing crop nutritional content, is critical in increasing the nutritional value of underutilized vegetable crops. Biofortification intends to increase the quantities of critical vitamins, minerals, and phytochemicals in these crops using traditional breeding methods, genetic manipulation, and genomic tools like as CRISPR/Cas9. This procedure enables these crops to be powerful suppliers of health-promoting chemicals. The combination of nutraceuticals and biofortification activities in underutilized vegetable crops has the potential to transform the fight against malnutrition. Finally, the investigation of nutraceuticals and biofortification in underutilized vegetable crops offers a viable option for combating global hunger. We can establish a sustainable, accessible, and inexpensive solution to promote public health and well-being around the world as we continue to uncover the nutritional potential of these diverse crops.

Keywords: Micronutrients, hidden hunger, malnutrition, sustainable

PHMN/PP – 76

Unleashing the hidden potential of winged beans: A case in Uttara Kannada

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ABSTRACT

Winged bean (*Psophocarpus tetragonolobus)* is an underutilized crop with immense potential in Uttara Kannada District, Karnataka, India. This research focuses on conducting a comprehensive market survey to assess the current status and identify opportunities for promoting winged bean as a sustainable and profitable agricultural product in the region. The findings presented in this study aim to inform strategies for market development and support the broader goal of enhancing food security and income generation for local farmers. The research methodology comprises a combination of surveys, interviews, and data analysis involving various stakeholders, including farmers, traders, consumers, and agribusinesses. This interdisciplinary approach provides a holistic understanding of the winged bean market ecosystem, from production to consumption. Our results indicate that winged bean holds significant potential in Uttara Kannada District, primarily due to its nutritional value, adaptability to local agroecological conditions, and potential to reduce the environmental impact of agriculture. Nutritional analysis reveals that winged bean seeds are rich in protein, essential amino acids, vitamins, and minerals, making them an attractive option for addressing malnutrition and promoting diversified diets. Despite its potential, the winged bean market faces several challenges, including limited awareness among consumers and farmers, lack of processing facilities, and underdeveloped marketing channels. To address these challenges, this study explores various strategies, including Promoting Awareness, value addition, providing market linkages, capacity building and policy support. This study contributes valuable insights into the market dynamics of winged bean, highlighting its potential to improve local livelihoods and nutrition while fostering sustainable agricultural practices. By leveraging market opportunities and addressing existing challenges, we can enhance the prominence of winged bean in the local and international markets, ultimately advancing food security and economic prosperity in the region.

Keywords: Food security economic prosperity, diversity, nutritional analysis

PHMN/PP – 77

Nutritional profiling of selected underutilized leafy vegetables for food value

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ABSTRACT

India boasts a number of species of edible leafy vegetables, some of which have no English names and are only recognised by their native names. India is blessed with a range of natural environments, diverse climates and varying seasons. These leafy veggies are consumable and are also known as unconventional greens or underutilised leafy vegetables. Everyday green vegetable preparations are consumed in Indian households. These neglected greens are affordable, simple to prepare and packed with vitamins, minerals, protein, and other nutrients. The presence of poisonous and anti-nutritional principles is the fundamental issue with nutritional exploitation of underused greens. Phytates, nitrate, oxalate, and saponin are frequently found in high concentrations in leafy greens. In the light of the above facts an experiment entitled "Nutritional profiling of selected underutilized leafy vegetables for food value" was executed at the Department of Postharvest Technology, College of Horticulture, University of Horticultural Sciences Campus, GKVK (Post), Bengaluru-65 and Department of Pharmacology, Hanagal Shri Kumareshwar College of Pharmacy, Bagalkot, Karnataka during the year 2019-22. The present study was undertaken to separate, identify and quantify each nutritional components by using standardized analytical methods, which also includes usage of HPLC-LCMS technique, used to separate, identify and quantify each component and Gas Chromatography-Mass Spectrometry (GC-MS) technique. The investigation was carried out for biochemical profiling of underutilized leafy vegetables *viz*., *Centellaasiatica* L., *Alternanthera sessilis* L., *Amaranthus cruentus* L., *Celosia argentea* L., *Commelina communis* L., *Oxalis carniculata* L., *Hibiscus cannabinus* L.Water soluble vitamin profiling in selected underutilized leafy vegetables revealed highest contents of Pantothenicacid, Thiamine, Niacin, Pyridoxin, Riboflavin, Folic acid, Biotic Cyanocobalamine respectively. Analogously, individual fat-soluble vitamin profiling in underutilized leafy vegetables revealed highest contents of Vitamin K2, Vitamin D1, Vitamin D2, Tocopherol, Vitamin K1 respectively. In view of the results obtained, it can be concluded that the selected underutilized leafy vegetables showed good biochemical constituents.

Keywords: Nutritional profiling, underutilized, leafy vegetables , biochemical constituent

PHMN/PP – 78

Effect of freeze and oven drying on physical and chemical properties of watermelon rind powder

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ABSTRACT

Watermelon is composed of pulp (edible part), peel and rind (by-products). The rind that represents 30–40% of total fruit weight is considered an agro-industrial waste.Watermelon rind powder has good potential to be developed as an innovative value-added product. The powder can be used as flour substitute for wheat flour in the preparation of bakery products such as cake, cookies and bread. Its flour is also incorporated in noodles, pasta, berger patties in order to add nutritional and sensory value. Watermelon rind powder is a rich source of bioactive compounds that could be utilized to add value in various products. In this study, the effects of drying methods (oven drying at 60^{o}C and freeze drying) on physical and chemical characteristics of watermelon rind were evaluated. Moisture content, water activity, bulk density, tapped density, solubility, dispersibility, oil absorption capacity and water absorption capacity for freeze dried powder were recorded as 5.8 %,0.48,0.53, 0.8, 5.1 %, 98 %, 3.81 % and 5.5 %, while they were 6.7 %, 0.521, 0.31, 0.44, 10.2 %, 13%, 3.31% and 6.00 % for oven dried powder respectively. Chemical analysis revealed that titratable acidiy, CHO, total protein, Ash, fibre, fat, total phenolic contents, total antioxidant activity and citrulline contents in freeze dried powder were 0.39, 65.2 %, 6.7%, 1.71 %, 28.6%, 0.8%, 3.46 g/100 g, 234.32 g/100 g and 22.23 mg/g, whereas oven dried powder registered the values of 0.29, 57.12 %, 5.7 %, 1.85 %, 16.3 %, 1.94 %, 2.45 g/100 g, 195.23 g/100 g and 16.5 mg/100 g respectively. It can be concluded that freeze dried powder retained better physical and chemical properties compared to oven dried powder.

Keywords: Freeze drying, oven drying, citrulline

PHMN/PP – 79

Post-harvest management of under-exploited vegetable crops: a sustainable approach to food security

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ABSTRACT

The effective post-harvest management of under-exploited vegetable crops holds immense promise in addressing critical global challenges related to sustainability, food security, and nutrition. These often-overlooked vegetable varieties, overshadowed by their mainstream counterparts, offer unique opportunities to diversify diets, enhance agrobiodiversity, and reduce the ecological measure of agriculture. However, realizing their full potential necessitates the implementation of comprehensive post-harvest management practices that minimize losses, extend shelf life, and maintain nutritional quality.Proper harvesting techniques are most important in ensuring the selection of high-quality produce from under-exploited vegetable crops. Timely harvesting, careful handling, and meticulous sorting and grading procedures are essential steps to maximize the yield and quality of these crops. Equally crucial are cleaning and sanitation measures, which play a crucial role in preventing contamination and preserving the edibility of these crops, particularly in resource-limited settings.Storage methods are vital componentsofpost-harvest management, particularly for under-exploited vegetables. Technologies such as cool storage, modified atmosphere packaging, and controlled atmosphere storage are indispensable in extending the shelf life of these crops. By minimizing spoilage and wastage, these methods contribute significantly to reducing post-harvest losses, enhancing food security, and increasing the income of smallholder farmers.Value addition techniques further increase the marketability of under-exploited vegetable crops, especially during periods of excess production. Processes such as drying, blanching, and canning not only prolong shelf life but also retain essential nutrients, thus improving food security and nutritional outcomes.

Keywords: Post-harvest management, under exploited vegetable, food security, storage, control spoilage

PHMN/PP – 80

Potential of underutilized traditional vegetables for food and nutritional security

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ABSTRACT

Food insecurity and malnutrition affect much of the India's as well as world's population. Approximately two billion people, representing every country on earth, are estimated to suffer from micronutrient deficiencies that make them more susceptible to disease, creating a significant obstacle to economic growth. Vegetables are the key component of balanced human diet while underutilized traditional vegetables like Sangari, Kachri, Moringa, Amaranthus, Bathua, Kair, Kakrol, Parwal, Ivy gourd, Gethi (Air potato), Ram karela, Kheksa, Guar (Cluster bean), Sword bean, Winged bean, Snap melon, Mattera, Pahadi palak and Chekurmanis are characterized by a high nutritional value compared with global vegetables like tomato and cabbage. As sources of essential vitamins, micronutrients, protein and other phytonutrients, traditional vegetables have the potential to play a major role in strategies to attain nutritional security. These vegetables are can keep the population healthy and nutritionally secure rather than costly off-season vegetables. Thus, they have the nutritional capacity to prevent and cure diseases like kwashiorkor, marasmus, night blindness, anaemia, diabetes, cancer, hypertension and hidden hunger. Sangri pods are an underutilized traditional vegetable that contains 40-58% CHO, 8-20% protein, 24-28% crude fibre, 3.2-4.1% fat, 5.4% ash content, 0.33% calcium, and 0.44% phosphorus as well as rich in micronutrients like iron (208-639 ppm), copper (13-16 ppm), manganese (22 ppm), and zinc content (13-16 ppm) are also appreciable for human nutrition. Moreover, it contains the high-quality amino acid composition. Most of these crops are tolerant to harsh agroclimatic conditions which will enhance resilience to both biotic and abiotic stress. However, lack of availability of planting material, awareness on nutritional and medicinal importance and information on production techniques are the possible reason for slow development and poor status of these crops. In this context, there is an urgent need to take up programme on genetic resources exploration, management, utilization, significant research, breeding and conversion of existing local landraces into competitive varieties to ensure food and nutritional security for future.

Keywords**:** Underutilized traditional vegetables, food and nutritional security, climate change, crop diversification

PHMN/PP – 81

Value-addition opportunities in exotic vegetables and utilization of their leftovers

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ABSTRACT

Food processing is the set of methods and techniques used to transform raw produce into other economically interesting forms for consumption. Processing minimizes qualitative and quantitative deterioration of any fresh produce after harvest thus satisfies both producers and processors with higher monitory returns and consumers by providing better taste and nutrition. The processing of under-exploited vegetable crops yields unique market opportunities through, thermal processing (purees, pastes of leafy vegetables such as *chekurmanis*, *Agathi*, etc.), canning (globe artichoke, ivy gourd, etc.), fermentation (oriental pickling melon), dehydration (taro and cassava flour/chips/flakes), freezing (Lima bean, board bean etc.). Additionally, minimally processed drumsticks, agathi flowers, bread fruit *etc*. hold a huge scope. The processing techniques vary with the type of products and targeted markets. In canning and manufacturing of vegetable products considerable proportion is discarded as waste. It has been proved that horticultural wastes (*eg*.; seeds, peel *etc*.) are worthy for preparation of by-products. Seeds of minor gourds, *i.e.* spine gourd, sweet gourd, fluted pumpkin, can be used for oil extraction after separation of pulp for paste or puree, while in canning asparagus, approximately 50% is wasted, which render scope for preparation of excellent medium for antibiotic manufacturers. The vines and pods from jack bean/cluster bean can be used as stock feed. Vegetable wastes can be a major source of providing biofuels such as ethanol. Value-addition provides consumer friendly forms of underutilized vegetables that streamline the labour, nutrition, economy and time. On the other hand, provides immense export potential, reduced wastage and improved efficiency thereby forbid the rate of hunger with improved employment opportunities in the processing sectors.

Keywords: Potential value-addition, processing, by-products, underutilised vegetables.

PHMN/PP – 82

Unleashing the potential of underexploited vegetable crops from North Eastern Regions

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ABSTRACT

Horticulture has been be placed under pressure for producing unlimited vegetables in limited space to feed our evergreen population (around 1.4 billion, 2023). Moreover, overexploitation of the major vegetables resulted into genetic erosion. Here, underutilized vegetables come into picture with its immense potential and unique medicinal properties. Being a developing country, India is blessed with a wide range of agro-climatic regions, enhances the diversity richness of the localized minor vegetables. Underutilized vegetables are able to combating "Hidden Hunger" caused by micronutrient deficiencies and fulfil sour balanced diet in absence of major vegetables. For instance, Winged bean or dragon Bean (*Psophocarpus tetragonalobus*)- "One species supermarket" posses with multipurpose use with 35% protein and 18% oil in its dried seeds and the pods are rich in vitamin A. Chekurmanis (*Sauropus androgynous*)- 21st vegetable crops of India are good source of multi-vitamin and multi-mineral. Malabar spinach (*Basellaalba)* having mild flavour and mucilaginous content in leaves and good source of folic acid and dietary fibres. Culantro (*Eryngium foetidum*) is good source of vitamin A and C to strengthen the immune system and also stimulate the digestive tract and bowel movements. As lesser utilized vegetable having ample sources of medicinal and nutritional properties can be used for food security as well as nutritional security. In addition, these species have a definite role in adverse eco-system found in arid, semi-arid lands, mountains and temperate conditions. CGIAR plays a major role in promoting the underutilized vegetable crops to fight against poverty and malnutrition during International workshop. To ensure our nutritional security, it is vital to start an initiative on genetic exploration, management, utilization and enhancement of these underexploited vegetables.

Keywords: Diversity, genetic erosion, hidden hunger, nutritional security, underutilize

PHMN/PP – 83

Exploring phytochemicals and antimicrobial potential of wild edible solanum species of Northeast region of India.

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ABSTRACT

Solanaceous crops are greatly diverse plant families of which Solanum is the largest genera (1700 species) having ample amount of phytochemical and pharmacological properties. In Northeast part of India, several wild Solanum species are consumed favourably as vegetable and utilized as traditional medicine from olden days. To promote more of its importance, the motive of this present investigation is to monitor phytochemicals and anti-microbial potential of wild consumable Solanum species. The outcome of this study shows that total phenols and tannins were observed from *S. gilo* (purple berry) with an amount of 10.93 mg/g ±0.197 and 3.81 mg/g ±0.069 respectively whereas total alkaloids of 15.23 mg/ml ±0.285 was obtained from *S. spirale.* For antimicrobial activities, *S. spirale* exhibited broad spectrum of anti-microbial properties both in bacterial and fungal pathogens viz; *Salmonella typhimurium*, *Bacillus cereus, Candida albicans* and *Cryptococcus neoformans*. However, the largest zone of inhibition (21 mm) was recorded from *S. gilo* (purple) against the pathogen *Salmonella paratyphi* and minimum zone formation (2 mm) was observed from *S. spirale* against the pathogen *Bacillus cereus*. Minimum inhibitory concentration (MIC) was examined over at different concentration of 25 mg/ml, 20 mg/ml, 15 mg/ml, 10 mg/ml and 5 mg/ml. Best MIC value was evident from *S. gilo* (purple) towards *S. paratyphi*and *S. spirale*against *C. albicans* at concentration of 5 mg/ml. All these positive outcomes, confirm that, plant extracts significantly possessed antimicrobial properties and concluded on utilization in the handling of microbial infections.

Keywords: Anti-bacterial, anti-fungal, inhibition zones, MIC, phytoconstituents, solanaceous

PHMN/PP – 84

Medicinal importance of *Alternanthera sessilis* (Sessile Joyweed) as a nutrient - rich vegetable

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ABSTRACT

Sessile Joyweed, also known as *Alternanthera sessilis*, is a multipurpose leafy vegetable that has a long history of usage in both cooking and medicine around the world. This plant, which is a member of the Amaranthaceae family, is well known for its exceptional nutritional value and potential health advantages. The plant is a beneficial complement to a balanced diet because it is packed with important elements like vitamins (A, C, and K), minerals (iron, calcium, and potassium), and dietary fiber. Additionally, it is known that *Alternanthera sessilis* contains a variety of phytochemicals, such as flavonoids, alkaloids, and saponins, which have a number of beneficial properties such as anti-inflammatory, anti-oxidant, and antibacterial properties. According to studies, regularly consuming *Alternanthera sessilis* may bring about a number of health advantages. The high vitamin A content of the vegetable maintains the health of the eyes, while vitamin C strengthens the immune system and encourages the creation of collagen. Dietary fiber helps maintain digestive health by reducing constipation and fostering a healthy balance of the gut bacteria. Additionally, the iron in the plant can aid in preventing anaemia, particularly in people who are iron-deficient. The phytochemicals found in *Alternanthera sessilis* have strong antioxidant capabilities that help fight oxidative stress and lower the risk of developing chronic illnesses like cancer, diabetes, and heart disease. however, joy weed also has long been utilized in a variety of folk medical systems to treat diseases like diabetes, skin conditions, and diarrhoea. Recent studies are shedding light on how its bioactive chemicals might be used therapeutically in contemporary medicine, showing promise in treating ailments like diabetes, obesity, and microbial infections. To completely explore its therapeutic effects and realize its medicinal potential, more study and research with respect to its medicinal value is required.

Keywords: Photochemical, iron deficiency, joyweed, amaranthaceae, dietary fiber

PHMN/PP – 85

Capsicum frutescens: a spicy and medicinal marvel

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ABSTRACT

Capsicum frutescens, also referred to as the bird's eye chili or the African chili, is a tiny yet ferocious pepper type prized for its smoky flavor and a wide range of therapeutic uses. Cayenne pepper a key component in many cuisines around the world, *Capsicum frutescens* gives food a distinct and potent spice. Its key ingredient, capsaicin, which gives dishes their distinctive spiciness, is frequently employed in food preparation. Capsicum frutescens has a long history of usage in traditional medicine in addition to its culinary use. Numerous possible health advantages of capsaicin, the main bioactive component of *Capsicum frutescens*, have been researched. It is frequently used in topical creams and ointments to reduce pain, especially in disorders like neuropathy and arthritis, because it is known to have analgesic qualities. Additionally, through boosting metabolism and lowering hunger, capsaicin has demonstrated potential in the management of weight. Vitamin C, in particular, is abundant in *Capsicum frutescens* and helps to boost the immune system and skin health. It is also rich in vitamin A and other antioxidants that fight free radicals, chili peppers may lower your risk of developing chronic diseases. It has shown antibacterial and anti-inflammatory characteristics, which may help in treating inflammation related illnesses and fighting infections due to its capacity to decrease blood pressure and enhance blood circulation, it is also regarded as a possible option for cardiovascular health. In addition to having medical benefits, *Capsicum frutescens* is also an important crop in agriculture for the breeding disease resistance varieties. It can grow in both tropical and temperate climates and is relatively simple to maintain in different environments. Capsaicin, the plant's main ingredient, has potential for treating pain, promoting weight loss, and improving general health. To fully understand its medicinal applications and qualities, more systematic research has to be needed to fully exploit its nutritionally important traits.

Keywords: Antioxidants, nutritional, neuropathy, capsaicin, culinary.

PHMN/PP – 86

Wild cucurbits as potential source of nutrition

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ABSTRACT

It is well known that numerous important but underutilised Cucurbitaceous crops such sweet gourds, spine gourds, mountain spine gourds, teasel gourds, balsam apples, pointed gourds, solena, ivy gourds, karchikai, melonthria, and mateera are found in diverse agro-ecosystems of India. The majority of these are found in wild, in India's Western Ghats, northern and eastern states. Their potential to be employed as a source of neutraceuticals has been shown by investigation and analysis of the nutrients contained in them. The tribal and local people use the leaves and fruits of these plants for both culinary and medicinal uses. Karchikai is said to treat diabetes and is a rich source of potassium (505.92 mg/100 g), calcium (73.57 mg/100 g), and iron (1.71 mg/100 g). Balsam apples have a good amount of minerals as well. Ivy gourd leaves have the potential to be employed in the treatment of diabetes and ulcers. A resilient type of cucumber melon known as kachri is eaten as a vegetable. Snap melon, which grows in the western Ghats, helps to increase appetite while relieving constipation. Dried and ripe fruits were found to have rich amount of carbohydrates, crude protein, minerals and crude fibre. The fibre content found in most of the wild gourds is useful against constipation and are being used in indiestion. Apart from these, bioactive compounds like tannin, saponin, steroids, glycosides and phenolic compounds are also found in roots and leaves of these vegetables. The antimicrobial properties of these compounds can be exploited in treating health related issues.

Keywords: Cucurbits, gourds, nutrition, wild, diversity

PHMN/PP – 87

Cultivating wellness: unveiling the nutrient-rich profile of moringa

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ABSTRACT

Moringa oleifera, also known as drumstick, is native to India and grows in tropical and subtropical regions of the world, especially South Asia, Africa and South America. Moringa is widely cultivated around the world because it can withstand conditions of both severe drought and mild frost. It is a versatile plant and almost all parts (leaves, fruit, flowers and green pods) are consumed as a vegetable all over the world, especially in India, Pakistan, Philippines, Hawaii and Africa. The leaves contain small amounts of antinutritional factors and are rich in minerals, vitamins and other important bioactive compounds. It is used as a potential antioxidant, anticancer, anti-inflammatory, antidiabetic, and antibacterial agent. The Moringa plant contains over 46 antioxidants and over 36 anti-inflammatory compounds. The more antioxidants you have in your body, the less you age and get sick. In fact, moringa contains 7 times more vitamin C than an orange, 10 times more vitamin A than a carrot, 17 times more calcium than milk, 9 times more protein than yogurt, 15 times more potassium than a banana, and 25 times more iron than delivered by spinach. *M. Oleifera* is rich in Protein (2.5-35.97g), fat (0.1-38.67g), carbohydrates (3.7-41.2g), dietary fiber (0.9-19.2g), calcium (30-2185mg), minerals such as potassium (259-1324mg), zinc (0.16- 3.29 mg), magnesium (24-635 mg), iron (0.85-28.2 mg), copper (0.07-3.1 mg), and vitamins such as vitamin A (6.78- 18.9 mg), vitamin B like thiamine (0.05-2.64 mg), riboflavin (0.05- 21.3 mg) & niacin (0.2- 8.2 mg), vitamin C (4.5-220 mg).), D and E (10.8–751.67 mg). Phytochemicals such as tannins, sterols, terpenoids, flavonoids, saponins, anthraquinones, alkaloids and reducing sugars are present along with anticancer agents such as glucosinolates, isothiocyanates, glycosidic compounds and glycerol 1-9-octadecanoate. The amino acid content of pods, leaves and flowers is 30%, 44% and flowers (31%) respectively. Immature pods and flowers contained similar levels of palmitic, linolenic, linoleic, and oleic acids. Moringa seed oil contains about 76% of PUFAs, making it an ideal substitute for olive oil. The differing nutrient content can be attributed to the fact that plant age, location, climate and environmental factors greatly influence the nutrient content of trees.

Keywords: Moringa, Nutrient rich vegetable, Antioxidant, Minerals

PHMN/PP – 88

From neglect to nourishment: Chekurmanis (*Sauropus androgynus)* role in healthcare and nutrition

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ABSTRACT

Chekurmanis or *Sauropus androgynus*, is a perennial shrub that grows profusely in Southeast Asia and is a member of the Euphorbiaceae family. Chekurmanis leaves are a very rich source of protein and minerals, therefore being specifically nutrient-dense. In this study, the protein and micronutrient contents of chekurmanis leaves at various stages of maturation were assessed. The protein content of leaves did not get affected by the stage of maturity which remained at approximately 22.0g/100g, but in contrast, fully matured leaves contained higher amounts of calcium than those of tender leaves. The iron content of these leaves ranged from 3.89 to 4.50 mg /100 g, while the zinc content of the same was between 1.26 and 1.48 mg/100 g.The tender leaves have significantly elevated iron and zinc bioaccessibility. The tender and partially mature leaves of chekurmanis contained 74 and 69 mg/100 g of niacin, respectively. Chekurmanis leaves were also enriched with β-carotene and vitamin E with an average range of 7400 to 9250 µg/100 g and 17.6 to 15.6 mg/100 g respectively. Chekurmanis leaf, however, is reported to contain the alkaloid papaverine in considerable amounts. Its content was found to be higher in mature leaves (1740 mg/ 100 g) as compared to tender leaves (1439 mg/100 g). Excessive consumption of the leaves especially in raw form has been reported to cause drowsiness and respiratory disorders attributable to this alkaloid. The effect of heat processing on the papaverine content of chekurmanis leaves merits were examined and it was significantly reduced. In view of the widespread micronutrient deficiencies in India, it is desirable to explore natural sources of micronutrients that can be easily grown. This plant can therefore be exploited for use in the development of nutritious food products, at a low cost, after ascertaining its safety.

Keywords: Chekurmanis leaves, nutritional profile, stages of maturity, bioaccessibility of minerals, alkaloid content

PHMN/PP – 89

Studies on the preparation and quality evaluation of jackfruit bar

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ABSTRACT

Fruit bar (thandra) is an age-old traditional fruit product relished by people of all ages. It is a semi-moisturized food that can be safely stored at room temperature for a longer period of time. Sugar concentrations of 16 and 20%, citric acid concentrations of 0.2, 0.3, and 0.4%, and two drying methods (a solar dryer and an electrical dehydrator) were used to standardize the preparation and study the shelf life of the fruit bar utilizing the Palur-1 variety for a period of 90 days. Among the treatments, the bar prepared with 20% sugar and 0.3% citric acid and dried in an electrical dehydrator was nutritionally superior and, according to sensory evaluation, more palatable. It had the maximum TSS, total sugars, reducing sugars, titratable acidity, beta-carotene, ascorbic acid, organoleptic score, and the lowest browning. According to the study, the flavor, taste, and nutritional content of fruit bars created in an electrical dehydrator were good with acceptable color, whereas product prepared in a solar dryer turned brown by the 60th day. Hence it can be concluded that electrical dehydrator is better over solar dryer. The jackfruit bar thus prepared were nutritionally rich, superior in quality attributes and highly acceptable even at three months of storage.

Keywords**:** Fruit bar, drying, shelf life, browning, acceptance

PHMN/PP – 90

Kokum butter – a potential value added product for global market

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ABSTRACT

Kokum (Garcinia indica) is an underutilized and native fruit tree, from which, value added products like dried rind (*sola*), squash, syrup, salted juice (*agal*) *etc* from fruits and fat from dried seeds are produced and consumed by domestic and off-shore population. Experiments were conducted in ICAR-Central coastal Agricultural Research Institute, Goa on certain important aspects on kokum butter. Kokum butter was extracted using different solvents by solvent extraction method and propanol yielded the highest percentage of fat (73.2 %). However, ethanol recorded the rational value of 34 %. Usually, kokum butter is extracted from dried seeds of *Garcinia indica*by traditional method of crushing and boiling. An improved butter extraction method was standardized using fresh fermentation method that gave the highest percentage of fat (39.66%), followed by boiling of dried seeds (33.66%). Butter extracted from wet grinding of sprouted seeds had the least acid and iodine value showing that the quality of butter was good,whereas, control (market sample) had the highest value indicating deteriorating qualityand with highest degree of unsaturation. Buter extracted from dried seed powder had the least saponification value (124.5), whereas market sample had the highest saponification value (294.5) showing the degree of deterioration cum adulteration. In general, kokum butter has high melting point and the samples obtained from different extraction methods showed values in the range of 34-39°C.The butter obtained from different treatments showed variation in colour like cream, yellowish and off-white. Estimation of fatty acid in butter was carried out showing the various percentage of palmitic, stearic, oleic and linolenic acids, indicating the presence of unsaturated and saturated fatty acids in the butter. In Coastal Karnataka, Goa and Maharashtra, vibrant farmers' co-operatives like Kadamba Co-operative, South Kanara co-operative societies, Bagayatdar societies play a vital role in the marketing of value added products of kokum. Nearly 30 tonnes of kokum fat is being exported to United States of America, middle East, Spain, UK, Australia, Argentina, Angola, Bangladesh etc., Among the countries, USA bought the highest (62.5%) of the total Kokum export shipments from India. The crop has appreciable export potential and hence further strengthening of backward and forward linkages is essentially required for enhancing social and livelihood security of the farmers and small scale entrepreneurs of the Konkan region.

Keywords: Kokum-fat-processing-marketing-export

PHMN/PP – 91

Extraction and profiling of anthocyanin from pomace of wine grapes using cold maceration

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ABSTRACT

Grape pomace is a by-product of winery and it is potentially a good source of antioxidants like anthocyanins, phenols and flavanoids. Large quantities of pomace are rejected by wine industry or diverted as cattle feed. The research was carried out at College of Horticulture, UHS campus, Bangalore during 2020-22 to investigate the extraction and profiling of anthocyanin from pomace of wine grapes. The pomace of wine grape varieties *viz.,* Shiraz, Cabernet Sauvignon and Cabernet Franc were used for present study. The anthocyanin extraction of pomace was done by cold maceration at 10 ^{o}C for 3 days. The cold maceration extraction method was statistically analyzed using Completely Randomized Design with three treatments and eight replications. Among all the treatments, Cabernet Franc recorded higher total anthocyanin content (163.09±0.01 mg/100g), total antioxidant activity (679.32±0.90 mg AAE/100g), total phenol content (1837.42±0.45 mg GAE/100g), total flavanoid content (1656.5±0.77 mg QE/100g), total tannin content (3307.36±0.81 mg/100g) but observed lower in pH (3.82±0.00) and TSS (5.89±0.38 ^{o}B) compared to other two varieties and control. Profiling of anthocyanin using Liquid Chromatography-Mass Spectrometry (LC-MS) indicated delphinidin-3-glucoside was the major compound present (1637.76 µg/g) in Cabernet Franc pomace. The results show the presence of anthocyanin pigment in wine grape pomace can be utilized as a natural food colourant in the food industry.

Keywords: Cold maceration, grape pomace, anthocyanin

PHMN/PP – 92

Ker: a precious arid fruit boasting nutritional, medicinal benefits and innovative value-added processing

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ABSTRACT

*Capparis decidua Forsk.*Commonly known as Ker or Kair, plays a vital role in arid regions due to its high economic value. Ker has an acrid and astringent taste renders them unsuitable for fresh consumption and table purposes. However, the immature green fruits of Ker are a rich source of carbohydrates, protein, minerals, and various bioactive compounds. These immature fruits are highly esteemed for their utility in the preparation of vegetables and pickles, both individually and in combination with other ingredients or as dehydrated products for off-season consumption. The various parts of the Ker plant offer diverse chemical constituents. The fruits and flower buds are notably rich in surface wax, while the seeds contain valuable oils. Furthermore, the fruits harbor alkaloids, glycosides, terpenoids, sterols, flavonoids, phenols (with antibacterial properties), and fatty acids. Among these, a major biochemical compound stands out, possessing exceptional nutritional and medicinal value. This compound exhibits pharmacological activities, including hypercholesterolemic, anti-inflammatory, analgesic, anti-diabetic, anti-microbial, anti-plaque, anti-hypertensive, and purgative properties. Chewing tender shoots provide relief from toothaches, while the root bark is employed against intermittent fever. Immersion of Ker fruits in a 5 percent salt solution enhances their shelf life and eliminates astringent, also improving flavor. Soaking fruits in buttermilk for 4-5 days in earthen pots yields similar benefits, imparting a unique tangy taste and extending preservation potential. To facilitate prolonged storage, Ker fruits are subjected to dehydration, reducing their moisture content to 5-7 percent. This is achieved by exposing the fruits to open, sunny conditions, followed by storage in airtight containers. The combination of these processes ensures the availability of Ker fruits beyond their harvesting season. Ker fruits hold a prominent place in traditional dishes, notably 'Kair sangri,' where their distinctive flavor and texture contribute significantly to the dish's appeal. Additionally, dehydrated Ker plays a pivotal role in 'Panchkuta,' a dehydrated mixture featuring sangria, Kair, Kachri, kumat, and mango/kamal kakri, adding flavor complexity to this culinary creation.

Keywords: Ker, Sangria, Medicinal, Anti-microbial, Anti-plaque, Anti-hypertensive, Purgative

PHMN/PP – 93

Standardization of process for making jackfruit & pumpkin seed based crackle (Chikki) and its nutritional quality evaluation

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ABSTRACT

Chikki is one of most popular traditional sweet snack in India. It is made from roasted peanuts (groundnut) and jaggery. Roasted nuts and seeds like almond, cashew, pistachio nut, watermelon seeds, cucumber seeds, pumpkin seeds, *etc.,* with and without salt are gaining popularity due to their nutritional value. In the previous studies at ICAR-IIHR and elsewhere jackfruit seeds were found to have antimicrobial and anti-proliferative activities. Pumpkin seeds were found to be rich in omega 6 & 9 fatty acids and ideal for making snack foods. The objective of present study was to standardize a process for making crackle (chikki) using roasted jackfruit seed powder (JFSP), pumpkin seed kernel (PSK), and osmo-dried aonla (ODA), evaluate its sensory and nutritional quality. Using JFSP, PSK with & without osmo-dried amla segments, six trails with different combinations (T1, T2, T3, T4, T5 and T6) were conducted and subjected to sensory and nutritional quality evaluation. Results revealed that, sensory evaluation score were highest in T2 (roasted jackfruit seed in finely ground form, roasted pumpkin seed in unground form and OD aonla segments) and T6 (roasted jackfruit seed in finely ground form, roasted pumpkin seed in ground form and without OD aonla). Among the nutritional parameters protein (8.11%), antioxidant (49.22 mgAAE/100g) and ascorbic acid value (277.33 mg/100g) of T2 was higher than control peanut Chikki. Fat content in T2 and T6 were less (9.07 & 6.6 % respectively) compared to control peanut chikki (20.73%). The major fatty acids found in the plain JFSP+PSK chikkis were palmitic, oleic and linoleic (omega-6). Among the minerals nitrogen (2.28%), magnesium (0.40%), and sulphur(144 ppm), was highest in T2, while phosphorus (0.28%), calcium (0.54%) and copper (2.32 ppm) was highest in T6. Peanut chikki (control) had highest amounts of iron (175ppm), manganese (32.3ppm), and zinc (15.95ppm). The antioxidant values were highest in the JFSP+PSK chikkis. The total plate count and total yeast count were within the safe limits prescribed by FSSAI, indicating a good process hygiene and safe product. It is, therefore, concluded that process and product standardized (T2 & T6) is excellent complying with the food safety standard norms and nutritionally superior compared to peanut chikki. It is an innovative way of utilizing valuable under-utilized seeds of fruits and vegetables.

Keywords: Jackfruit seed, pumpkin seed, groundnut, chikki, crackle, nutrition

PHMN/PP – 94

Natural plant extracts: an update about novel spraying as an alternative of chemical pesticides to extend the postharvest shelf life of fruits

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ABSTRACT

India has a second largest producer of the fruit in the world.Fresh fruits are the rich source of important vitamins and minerals. Due to post harvestlosses approximately 40 % fruit and vegetables spoilage. To prevent this losses or increase the shelf life, after the green revolution increasing theuse of the chemical pesticides. The Chemical pesticides have found hazardous effects on the environment and Human health. In alternative to natural extract are the more safe and eco friendly to prevent and manage the post harvest losses andit's also improves shelf life of the fruit. The natural extract from the plant has a no harmful effect of the environment and Human. Now the people are more aware from their health. The plant extract like a Alovera, Neem, Lemongrass, *etc*. is used to prevent the post harvest losses and Improve the quality of the fruit.

Keywords: Post harvest loss management, shelf life, natural extract

PHMN/PP – 95

Zero energy cool chamber: anon farm eco friendly storage unit

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ABSTRACT

Fruits and vegetables are highly perishable in nature and storage of them is one of the most demanding problems. Post harvest losses in fruits and vegetables are very high (20-40%).Moreover, they are living entities and carry out the vital activities such as respiration, transpiration and ripening even after harvest. The spoilage of fruits and vegetables can be controlled by reducing the storage temperature in refrigerated cold storage. It is not only energy intensive, expensive and pollutant but alsocapital intensive. Butin this direction, zero energy cool chambers can play very important rolefor the rural farmers to sell their produce after harvest in better price because it is an on-farm and a low cost, environmental friendly rural oriented storage structure which operates on the principle of evaporative cooling. This can be constructed easily anywhere with locally available raw materials such as bricks, sand, bamboo, dry grass, jute, cloth *etc.* The rise in relative humidity (90% or more) and fall in temperature (10-15°C) from the ambient condition could be achieved by watering the chamber twice a day. The major advantage of cool chamber storage is the maintenance of fruit firmness by lowering the physiological loss in weight (PLW) and other metabolic processes. The result of the study revealed that the shelf life of various fruits and vegetables under zero energy cool chamber cane be extended from 3 to 50 days of storage such as leafy vegetables (3days in summer condition), potatoes (97 days in summer condition), orange (30 days in winter condition), okra and bitter gourd (6days in summer condition) and tomatoes (15 days in summer condition) *etc*.

Keywords**:** Evaporative cooling, shelf life, physiological loss in weigh, spoilage, storage

PHMN/PP – 96

Enhancing mango fruit colour and shelf life through preharvest fruit bagging in ratna under UHDP: a comprehensive study

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ABSTRACT

Mango stands as India's foremost fruit crop. Preharvest factors like unfavourable weather conditions and the presence of destructive pests and diseases have high impact on the post-harvest quality of fruit. Once the fruit is harvested, it becomes impossible to enhance fruit quality; our goal is to achieve superior-quality and safer fruits at the time of harvest.A study involving preharvest fruit bagging using different types of bags on mango cultivar Ratna was conducted at Jain Irrigation Systems Limited R&D farms,Udumalpet,Tamil Nadu. After harvesting, a comprehensive assessment was carried out, encompassing fruit size, weight, colour, biochemical attributes, nutritional composition analysed by ICP-MS, and shelf life.Among the various treatments, the double-layered bag (T_2) emerged as the most promising, exhibiting the highest fruit retention, shorter harvest duration, improved fruit size, weight, firmness, and colour. Furthermore, it extended the shelf life of the fruit, resulted in zero fruit fly incidence, showed no pesticide residues, and yielded significant net returns per acre.These results highlight the potential of adopting the double-layered bagging approach to improve both the quality of mangoes and the economic viability of export-focused production systems.

Keywords: Fruit bagging, Shelf life, Fruit colour, Marketability, Fruit weight, Fruit retention, Fruit firmness.

PHMN/PP – 97

Exploring the nutritional and medicinal essence of underutilized fruit crops

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ABSTRACT

Underutilized fruit crops encompass plant species traditionally utilized for various purposes such as food, fodder, fiber, oil, and their extensive medicinal attributes. Despite their multifaceted potential in ensuring food security, nutrition, health, income generation, and ecological benefits, these species remain underexplored. While in contrast commercially cultivated fruits like Mango, Banana, Papaya, Litchi, Guava, Grapes, Pomegranate, Sapota among others, dominate the market, but wild edible fruits being largely uncultivated and undomesticated remain unfamiliar. Many of these underutilized indigenous fruit crops serve as integral components of traditional medicine systems across India since time immemorial. Their value-added products present an opportunity for focused efforts to tap both domestic and international markets. This overview primarily centres on elucidating the food, nutritional and medicinal significance of such unexploited minor fruits. In India, most prevalent underutilized fruits include Bael (*Aegle marmelos*), Jamun (*Syzygium cumini*), Karonda (*Carissa carandas*), Ber (*Ziziphus mauritiana*), Lasora (*Cordia myxa* L), Phalsa (*Grewia subinaequalis*) among others. The present review primarily emphasizes the nutritional, therapeutic, and various other values and usefulness associated with these diverse fruit crops.

Keywords: Blood pressure, Cholesterol level & fats, Vitamins, Minerals, Antioxidants

PHMN/PP – 98

Value addition of exotic vegetables and utilisation of their byproducts

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ABSTRACT

Food processing is the set of methods and techniques used to transform raw produce into other economically interesting forms for consumption. Processing minimizes qualitative and quantitative deterioration of the produce after harvestthussatisfies both producers and processors with higher monitory return and consumers by providingbetter taste and nutrition. The processing of unexploited crops yields unique market opportunities through, thermal processing (purees and pastes of leafy vegetables such as chekurmanis, agathi), canning (Globe artichoke, Ivy gourd), fermentation (oriental pickling melon), dehydration (taro and cassava flour/chips/flakes), freezing (Lima bean, board bean). Additionally, minimally processed drumsticks, agathi flowers, bread fruit holds a huge scope. The processing techniques vary with the type of products and targeted market. In canning and manufacturing of vegetable products considerable proportion is discarded as waste. It has been proved that wastes (eg; seeds, skin) are worthy for preparation of byproducts. Seeds of minor gourds *i.e.*spine gourd, sweet gourd, fluted pumpkin, can be used for oil extraction after separation of pulp for paste or puree, while in canning asparagus, approximately 50% is wasted, the asparagus juice is an excellent medium for antibiotics manufactures in European countries. The vines and pods from Jack bean/cluster beancan be used as stock food. Vegetable wastes are major source of feedstock thus, providing biofuels such as ethanol. Value addition provides consumer friendly form of underutilized vegetables that streamline the labour, nutrition, economy and time. On the other hand,provides immense export potential, reduced wastage and improved efficiency thereby forbid the rate of hunger with improved employment opportunities in the processing sectors.

Keywords: Value addition, processing, byproducts, underutilised

PHMN/PP – 99

Culinary alchemy: exploring the functional transformation of garlic into black gold (*Allium sativum* L.)

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ABSTRACT

Black garlic, or BG, is a valued processed garlic product with a strong traditional presence in Asian culinary traditions, notably in South Korea, Thailand, and Japan. Its creation involves a unique transformation process with heat treatment, humidity, and the Maillard reaction, resulting in its distinctive black color. As black garlic ages, its bioactive compounds increase, and it loses the pungent odor associated with raw garlic, due to the conversion of allicin into water-soluble antioxidants. Black garlic is gaining attention for its potential health benefits, including antioxidative, anti-allergic, anti-diabetic, anti-inflammatory, hypocholesterolemic, hypolipidemic, and anti-carcinogenic effects (Choi *et al*., 2014). Nevertheless, it's noteworthy that Indian garlic cultivars and their suitability for the production of black garlic have not been extensively investigated. In this particular study, the objective was to evaluate the functional quality of 29 diverse Indian garlic genotypes in the context of black garlic production. A comprehensive biochemical analysis was conducted, revealing significant variations across various attributes, including total phenolic content (mg GAE/100g FW), total flavonoid content (mg QE/100g FW), total antioxidant capacity (CUPRAC (µmol Trolox/g FW), FRAP (µmol Trolox/g FW), DPPH assay (µmol Trolox/g FW), allicin content (mg/100g), and pyruvic acid (µMol/ml). The results indicated notably higher total phenolics and antioxidant activity up to the 40th day of aging, which subsequently declined. In contrast, the total flavonoid content continued to increase throughout the aging process. Allicin content exhibited an initial increase followed by a decrease over the aging period. Pyruvic acid content showed a tendency to decrease as the aging process advanced. In summary, black garlic represents a fascinating transformation of a familiar ingredient, offering unique flavor and potential health benefits. This research provides insights into the potential of Indian garlic genotypes with significant degree of variability for producing high-quality black garlic and underscores the need for further exploration in this emerging field.

Keywords: Garlic, DPPH assay, black garlic

PHMN/PP – 100

Effect of edible coating on shelf life and physico-chemical changes in sapota (*Achras sapota* L.) cv Cricket Ball under ambient condition

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ABSTRACT

A research experiment was conducted at Post-harvest Laboratory, Department of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). The experiment was conducted to study the effect of edible coating on Shelf life and Physico-chemical changes in Sapota (Achras sapota L.) under ambient condition. The experiment was conducted in Factorial Completely Randomized Design with three replications. There were two factors i.e., Aloevera Gel and cornstarch each having 4 concentrations i.e., Aloevera gel (0%, 25%. 50% and 75%) and cornstarch (0%, 1%, 2% and 3%). Various physical and chemical parameters were observed for each treatment. Physical parameters like Weight loss (86.00 g), Fruit length (5.28 cm), fruit diameter (5.00 cm), decay percent (0.00%) and surface color values of L*, a* and b* (36.16, 9.36 and 20.44) decreased minimum under Aloevera gel (75%) and cornstarch (2%). Similarly, chemical parameters like Acidity decreased maximum (0.039%), ascorbic acid decreased minimum (8.68 mg/100g), TSS increased maximum (31.50^{0}Brix), Total sugars increased maximum (21.60%), reducing sugar increased maximum (15.25%) and non-reducing increased maximum (6.35%) under Aloevera gel (75%) and cornstarch (2%). As regards the individual the Aloevera gel (75%) and cornstarch (2%) was found superior over other treatments.

Keywords: Alovera gel, Cornstarch, Sapota

PHMN/PP – 101

Effect of stage of maturity and packaging on postharvest quality in manila tamarind var. PKM 1

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ABSTRACT

Manila tamarind (*Pithecellobium dulce* Roxb. Benth) is commonly known as Madras thorn Monkey pod and Jungle jalebi which belongs to the family *Fabaceae.* Fruit has a sweet acidic taste and high content of dietary fibre, protein, Ca, Fe, P, unsaturated fatty acids and antioxidants. It is an acrid eatable organic fruit being utilized for cooking and contains high wholesome esteem and various medical advantages for body. Harvested pods are separated from the twigs and packed in bamboo baskets and wooden basket for marketing. The fruits can not be stored for long time and must be eaten within a few days. The fruit is exceptionally perishable leading to huge waste, since the fruits are generally harvested in fully opened stage and these is no proper packing materials for packaging. Hence to reduce the spoilage percentage and to increase the shelf life of manila tamarind, correct stage of harvest and a good packaging material are required. Taking all these points into consideration an experiment was conducted in Factorial Completely Randomized Block Design (FCRD) with 16 treatment combinations and three replications. The treatments comprised of factor 1 (stage of maturity: S_1 – split pods; S_2- non split pods) and factor 2 (packaging materials) P_1 (Polybag 100 gauge thickness + pinhead hole), P_2 (polybag 100 gauge thickness + 1 % vent) , P_3 (Polybag 200 gauge thickness +Pinhead hole), P_4 (Polybag 200 gauge thickness + 1% vent), P_5 (Polybag 100 gauge thickness + No vent), P_6 (Polybag 200 gauge thickness + No vent) and P_7 (Control). The results of the experiment exhibited that the treatment S_2T_2 (non split pos + polybag 100 gauge thickness + 1 % vent) expressed the lowest value of physiological loss in weight (2.34 %) and highest total soluble solids (8.50^o Brix), total sugars (4.6 %), reducing sugars (1.19 %), %) and ascorbic acid (329 mg 100 g $^{-1}$) with the shelf life of 4 days.

Keywords: Manila tamarind, maturity, stage of harvest, packaging, quality, storage

Theme – 5
Biotic and Abiotic Stress Management
Oral Presentations

BASM/OP – 1

Outbreak of black inch worm, *Hyposidra talaca* (Walker) (Lepidoptera: Geometridae) on jamun (*Syzygium cumini* L.) under subtropical conditions

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ABSTRACT

Jamun is an important underexploited indigenous fruit tree. It is a very common, large, evergreen beautiful tree of the Indian subcontinent. It belongs to the *Myrtaceae* family. Jamun has promising therapeutic value due to its various phyto-constituents such as tannins, alkaloids, steroids, flavonoids, terpenoids, fattyacids, phenols, minerals, carbohydrates and vitamins. Its pharmacological properties like hypoglycaemic, diuretics, analgesic, anti-inflammatory, antiplaque, antimicrobial, antidiarrhoel, antioxidant, gastro-protective and astringency have been proven on animal systems. Diabetes management through use of *Syzygium cuminii* has been demonstrated. Some of the Insect pests affects Jamun production, among them major pests includes leaf eating caterpillar (*Corea subtilis*), white fly (*Dialeurijdes eugenia*), bark eating caterpillar (*Inderbela tetraonis and Inderbela quadrinotata*), jamun leaf miner (*Acrocercops syngramma* and *Acrocercops phaeospora*), jamun leaf roller (*Polychorosis cellifera*), leaf webber (*Argyroploce aprobola* and *Argyroploce mormopa*) and fruit fly. Black inch worm, *Hyposidra talaca* (Walker) was considered as a minor pest. Its outbreak was recorded during the year 2021 in Lucknow conditions. The infestation of the pest was observed during 14th to 23rd SMW. Peak infestation was observed 22nd SMW with 3.85 larvae /shoot. *H. talaca* is a serious threat to Jamun due to its very short life cycle, fast development with about eight generations in a year, rapid multiplication through generations, absence of diapause during winter months and lack of effective natural enemies till date. The caterpillars are polyphagous and can adapt to different alternative host plants. In Jamun, leaf feeding activity of *H. talaca* leads to crop loss, throughout the year by defoliating the young leaves or due to destruction of the mature leaves leading to loss of photosynthetic capacity. Timely management is crucial to avoid the yield loss.

Keywords: Jamun, peak infestation, minor pest, photosynthesis

BASM/OP – 2

Prevalence of key diseases in arid zone fruit crops in Haryana

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ABSTRACT

The survey aimed to document the occurrence of diseases of different arid zone fruits grown in South West Haryana and losses caused by them. A survey of experimental research area at Regional Research Station, Bawal as well as different orchards in South West Haryana was done in aonla (*Emblica offcinalis* Gaertan), ber (*Ziziphus mauritiana* Lamk.), bael (*Aegle marmelos* L.) and lasora (*Cordia myxa*) during the year 2022-23 in fruit growing areas. Survey of aonla orchards revealed rust disease caused by *Ravenalia emblicae* var. fructicolae was the main disease and internal necrosis of aonla fruits caused by deficiency of Boron as major disorder in S-W Haryana. Intensity of aonla rust disease varied with cultivars and locations that was observed up to 24%, 13% & 19% in NA 7, Chakiya and Banarasi respectively indicating different intensity pattern in cultivars. During survey of ber, the disease *viz.*, powdery mildew and black leaf spot were recorded on ber. The disease was prevalent in all popular as well as local cultivars in surveyed areas. Survey revealed that incidence of powdery mildew caused by *Microsphaera alphitoides* sp. Ziziphi occurred up to 38.4 per cent in different districts of S-W Haryana. Whereas incidence of *Isariopsis* leaf spot incited by *Isariopsis indica* and leaf blight incited by *Alternaria alternate* and *Phoma* sp. was noted upto 26.7 per cent in different districts of S-W Haryana. In bael, root rot, Alternaria leaf spot, sooty mold and dieback were observed major disease in surveyed area. During survey, intensity of these diseases ranged from 3-18 per cent, 3.8- 28.4 per cent, 4.2- 14.6 per cent and 2.6- 8.2 per cent in the surveyed areas. Gummosis disease was first time observed in bael orchards ranging 10-18 per cent at farm of RRS Bawal. During survey, the intensity of Alternaria leaf spot and gummosis in lasora was recorded in the ranged from 6.3- 27.4 per cent and 12.60 – 36.80 per cent in surveyed areas.

Keywords: Bael, aonla, lasora, leaf blight, leaf spot, disease incidence

BASM/OP – 3

Studies on seasonal incidence of insect pests and natural enemies in jamun (*Syzygium cumini* L)

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ABSTRACT

The Jamun (*Syzygium cumini* L.) is an important indigenous minor fruit of commercial value. Jamun is popularly known as Ram jamun, Nerale or Jambu nerale (Kannada), Neredu pandu (Telugu), Naaval pazham (Tamil) and Jambul (Marathi) . Jamun is gaining importance because of its hardy nature, multifarious uses and commercial exploitation in wastelands and dry land horticulture. Insect pests are the one of the main constraints in Jamun production, and about 32 species of insect pests are known to attack Jamun. Among them, few are reported as major pests, *viz*. Leaf twisting weevil, Leaf webber, Helmet cater pillar, Hairy cater pillar, Seed borer, Fruit borer, Cow bug, Leaf miner, Gall midges etc., Studies on the seasonal incidence and documentation of pests and natural enemies in jamun was carried out at Horticultural College and Research Institute, Periyakulam during 2022- 2023. The experimental results revealed that the damage of leaf twisting weevil (20.86%), helmet cater pillar (10.71%), whiteflies (35.50/tree) and leaf webber (8.21/tree) was maximum in Andipatti local followed by Goma Priyanka which recorded leaf twisting weevil (19.64%), helmet caterpillar (8.21%), whiteflies (29.57%). The Jamun cultivar, Thuthukudi local was found to be less susceptible for insect pests, which was recorded leaf twisting weevil (8.64%), helmet caterpillar (4.93%), whiteflies (17.79/tree) but hairy caterpillar was 6.36 /tree. On the other hand, the whiteflies (40.79/tree) and cowbug (11.79/tree) were observed as high infestation in Jambo navel, which were high during maximum temperature (0.687) and relative humidity (0.66) respectively whereas, negatively correlated with other weather parameters *viz*, rainfall, wind speed and relative humidity. Spiders were found to be maximum during the minimum temperature and positively correlated with minimum temperature, rainfall and relative humidity but negatively correlated with maximum temperature and wind speed.

Keywords: Jamun, cultivars, weather, infestation

BASM/OP – 4

Emerging insect pests of avocado in India

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ABSTRACT

Avocado, *Persea americana* (Mill.) is a potential exotic and high value fruit crop. It is grown in very limited scale in India, as homestead crop or intercrop in coffee estates. The crop is gaining popularity because of its various nutritional, pharmaceutical properties and industrial requirements. In recent years, there is an increased demand for avocado cultivation and expansion began in a rapid manner in plain lands as monocrop. There is shift in the pest status, occurrence of new pests, expansion of host range and host shift has been realised in many horticultural crops because of changes in the cropping systems, habitat and ecosystems, climate change and introduction of new crops and input intensive high yielding varieties/ hybrids. So far mites, mealy bugs, thrips, and fruit fly were the important insect pests of avocado. In this study we are reporting some of the insect pests on avocado which were hither to either unnoticed or of minor importance. During fixed and roving plot field survey conducted from 2021-2023, several insect pests were recorded for the first time on avocado. They are spiralling whitefly *Aleurodicus disperses;* Tea mosquito bug, *Helopeltis* spp.; Mealybugs, *Pseudococcus longispinus*, leaf miner, *Phyllocnistis* spp., bark/trunk borer *Synanthedon* spp., stem borer *Zeuzera* spp., flower and shoot webber, twig borer, twig splitting bug, shot hole borers such as *Xylothrips flavipes* (Iiliger), *Euplatypus parallelus* (F.), *Xylosandrus crassiusculus* (Motschulsky), *Xyleborus* spp. bagworms, red weevil *Apoderous* sp., flea beetles, defoliating loopers and hairy caterpillars etc. Some of these pests are occurring on avocado crop for the first time in India and in the world. Few of them may have the potential to attain the major pest status. The changing dynamics, pest status and the emerging new pests may become a hindrance to profitable avocado cultivation and will have socioeconomic impact on avocado growing areas.

Key words**:** Avocado, spiraling whitefly, bark borer, stem borer

BASM/OP – 5

Twig and shoot dieback: a new *Colletotrichum* disease of cempedak

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ABSTRACT

Cempedak was grown as intercrop in coconut system in fruits plot of ICAR-CPCRI, Kasaragod. During August 2022, drying and drooping of leaves from the branch tips were initially noticed in cempedak trees of 3 years old cempedak grafts cv. HG-33. In later stages, the drying of leaves extended to the bark portion and dieback of braches occurs. When the infected bark is removed, a brown discoloured patch can be observed underneath. As the disease spreads between the branches, the whole tree leaves dries and withers out leading to wilting and death of the tree. All the 18 grafts planted during 2019 died giving 100% disease incidence. Intermittent rainfall and high relative humidity would have favoured in disease development..Microscopic observation of the pathogen mycelia and spores resembled to *Colletotrichum* spores. In order to confirm the pathogenicity of the organism, Kochs postulates were proved. Molecular characterization using multi gene viz., I*TS, Actin and β-tubulin* confirmed the identity of the pathogen as *Colletotrichum siamense*. This is the first report of *Colletotrichum siamense* causing twig and shoot dieback disease in cempedak so far.

Keywords: Cempedak, Colletotrichum, die back, disease.

BASM/OP – 6

Ants and their eco-friendly management approaches in dragon fruit, *Hylocereus* spp

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ABSTRACT

Dragon fruit, *Hylocereus* spp. also known as Kamalam fruit or Pithaya, is an exotic future crop of India. *Hylocereus* spp is native to Southern Mexico, Guatemala, and Costa Rica.Dragon fruit has been introduced and cultivated in India as a promising remunerative hardy crop.Despite having a reputation for being a hardy crop, dragon fruit is still vulnerable to several insect pests, due to which fruit production quality declines. Scales, ants, mealybugs, fruit flies, and other insect pests are commonly reported. As per reports, ant species belonging to the genera *Atta* and *Solenopsis* have been reported as notorious pests of dragon. Ants are generally not a serious problem in other crops, but they cause significant damage to dragon fruit. Several ant species find themselves drawn to dragon fruits due to thesugar substances discharged by dragon fruit flower buds and flower sepals. Ants bore into matured ripened fruits and feed on them due to the presence of higher levels of total sugars. As a result, the ants cause direct damage and indirectly invite pathogens. Currently, there are no effective management techniques are available for ant control in dragon fruit. In the present study, we have identified the different ant species and their eco-friendly management in dragon fruit crops. The treatments include ant bait traps, ant repellent band, base level spray with botanical (Neem oil 1500 ppm), base level spray with chemical insecticide (Deltamethrin 25% EC) and untreated control. The results revealed that the ant repellent band is significantly superior over other treatments followed by ant bait traps in diverting ants away from dragon fruit plants. The mean ± SE trap catches of ants in ant bait traps are 205± 21.73 per day/trap. Integrated pest management (IPM) can include effective management techniques for ants in dragon fruit.

Keywords: Dragon fruit, ants, ant bait traps, ant repellent band

BASM/OP – 7

Appropriating pest management (PM) strategies from utilized to underutilized fruits

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ABSTRACT

This paper is an outcome of roving observations across India, including Karnataka, and systematic perusal of literature. We found insect incidences in nearly 30 underutilized fruits that may call for pest management interventions. However, research on most of these insect pests are only records, which is useful as they are taxonomically and reliably identified. Interestingly of the nearly 40 insect pests or taxonomic groups recorded on underutilized fruits, more than 70% occur on utilized ((commercial)) fruits. So PM approaches can be appropriated or extrapolated as recommendations for underutilized fruits from commercial fruits. There are also few underutilized fruits that have had major research investigations into PM like fig, jamun, prosopis etc. However in most other crops extrapolation of existing knowledge appropriately into matrices like crop type, phenology, seasonality, agro-zones, ecology and behavior of insects will make relevant PM for underutilized fruits. To illustrate for example, fruit flies *Bactrocera dorsalis,B.zonata, B.correcta* and *Bactrocera* spp occur on *Annona* spp (like bullocks heart, cherimoya),carambola,rambutan, kiwi and durian (both introduced) ficus, passion fruit, etc. Some of these trees are found singly or sparsely. The integrated PM developed for fruit fly by us, can be appropriated relevantly here (without the use of insecticides). The same is true for mites, thrips, tea mosquito bugs, stem/wood borers etc. Drawing from the wide away of commercial biopesticidesavailable, Rashvee International Phytosanitary Research and Services have shortlisted several of these for use in the management of groups of insect pests in underutilized fruits. These strategies will be discussed and a checklist of crops-insects will be appended.

Keywords: Roving observation, fruit fly, TMB, thrips

BASM/OP – 9

Genetic diversity and management of *Phytophthora nicotianae* in Crossandra

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ABSTRACT

Crossandra is an important ornamental flower in Southern India. It is an evergreen perennial shrub bearing flowers with different colours throughout the year, but commercially native variety of crossandra having orange colour flowers are accepted in market which are highly susceptible to many diseases. Of these Phytophthora root rot and Fusarium wilt are the major fungal pathogens. Phytophthora root rot usually occurs after onset of monsoon and causes 50-80 per cent disease incidence. A systematic random survey, conducted in three crossandra growing states, Karnataka, Tamil Nadu and Andhara Pradesh revealed that the disease incidence of Phytophthora root rot was more severe in most of the areas. The disease incidence ranged from 10 to 44% on Crossandra. The highest incidence of *Phytophthora* disease was recorded in Mysuru district of Karnataka (44.13%) followed by Dharmapuri in Tamil Nadu (39.28%) and the lowest in Mandya in Karnataka (07.08%). On the basis of colony growth patterns coupled with other morphological features, the isolates were first grouped into three distinct morphotypes. The total genomic DNA of 23 *Phytophthora* isolates was amplified by PCR using universal ITS region specific primers. The sequence analysis showed that 19 of 23 *Phytophthora* isolates belonged to *P. nicotianae* with nucleotide identity more than 98% and remaining isolates could be identified as *Phytophthora* species. *In vitro* evaluation of fungicides and bioagents, revealed that *Trichoderma harzianum* was found to be the most effective with mycelial growth inhibition of (84.19%) followed by *Streptomyces viridobrunneus* which recorded mycelial inhibition 81.44%. From *in vitro* studies, combination of bioagents and fungicides were selected for pot culture studies and field evaluation against *Phytophthora nicotianae* in crossandra. It was found that Arka Actino plus 5gm/l + Fosetyl Al 2000 ppm (Seedling dip + drenching) was found to be the most effective treatment followed by *Trichoderma harzianum* 5gm/l + Copper oxychloride 2000 ppm (Seedling dip + drenching) based on disease severity and growth parameters.

Keywords: Crossandra, *Phytophthora nicotianae*, genetic diversity , management

BASM/OP – 10

Detection and diagnosis of soilborne pathogen *Sclerotium rolfsii* from flower crops

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ABSTRACT

The present study, we aimed to evaluate disease occurrence on chrysanthemum, crossandra, *Gomphrena globosa*, *Jasminum sambac*, *Jasminum multiform*, marigold, and tuberose flower crops by *Sclerotium rolfsii*, analyze the variability in colony morphology, mycelial growth rate, clamp connection, sclerotium formation, sclerotial size and color and basidial stage production and the molecular data by internal transcribed spacer (ITS) sequence and test their pathogenicity on respective host. Out of 7 isolates, culture of 3 isolates were fluffy, 3 isolates were thin, whereas one isolate were compact. The mycelial growth rate of the isolates varied substantially. While marigold isolate was the fastest growing (41 mm/day), the crossandra isolate was the slowest (26 mm/day). Others varied from 27 to 40 mm/day. Production of sclerotia among isolates varied significantly. Most of the isolates produced a very large number of sclerotia (254 to 871 sclerotia/plate), while others produced fewer (27 to 139 sclerotia/plate). All isolates were produced clamp connection. Similarly, the size and color of sclerotia varied in different isolates. The average size of sclerotia of most of the isolates varied within 0.93–1.54 mm in diameter, whereas the largest (up to 1.66 mm in diameter) was produced by *J. sambac* isolate. The color of sclerotia was mostly dark to reddish brown at maturity, some isolates were light brown even after maturity. Only marigold and tuberose isolates produced the teleomorph on *Cyperus rotundus* rhizome meal agar medium. Based on the cultural and morphological characteristics of isolates, resembled the reference isolate of *S. rolfsii*. All isolates were identified as *S. rolfsii* (teleomorph: *Athelia rolfsii*) based on phylogenetic analysis of ITS1/ITS4 gene. To test the pathogenicity, six-week-old plants were inoculated with 4 mm diameter discs of five-day-old cultures that contained mycelium and sclerotia. The discs were covered with parafilm, and the plants were maintained in a greenhouse. Symptoms similar to those originally observed in the field began to appear after 13-21 days. The fungus was successfully reisolated from the symptoms of artificially inoculated plants. These findings suggested that detection and diagnosis of *S. rolfsii* in field conditions and useful for flower industry.

Keywords: *Sclerotium rolfsii* , flower crops, detection **,** diagnosis

BASM/OP – 11

Prevalence of root knot nematodes (*Meloidogyne* spp.) in coconut intercrops and their integrated management

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ABSTRACT

Root knot nematodes (*Meloidogyne* spp.) have been the silent and concealed invaders of a wide array of crops causing tremendous yield loss that goes unnoticed in any cropping system. Root samples were collected randomly from coconut intercrops such as, vegetables, fruits, tubers and spice crops from different areas of Alappuzha district, Kerala. The prevalence of root knot nematode (RKN) was observed in all the regions sampled with incidence of various levels of infestation in different crops. Among the crops analysed, amorphophallus, ginger and papaya were observed to be most severely affected by RKN with gall index varied from 3 to 5, whereas comparatively less incidence was observed in cassava and arrowroot (gall index 1). Identity of the RKN was established by morphological features and molecular tools. Analysis of 28SrRNA sequences revealed genetic relatedness of majority of the samples to *Meloidogyne incognita* and *Meloidogyne javanica* with more than 99.15% to 100% sequence similarity. Presence of *M. enterolobii* was also observed from the soil/root samples collected from two guava plants in coconut system, which forms the new distributional record of *M. enterolobii* from Kerala. Awareness was created among the farming community regarding the infestation by plant parasitic nematodes on different coconut intercrops and strategies were evolved and validated for their management. Integrated nematode management strategies like field sanitation, soil solarization, use of nematode free planting materials, application of *Trichoderma harzianum* and *Pochonia chlamydosporia* enriched neem cake and organic manures and crop rotation with less-preferable host plants like cassava were demonstrated in two farmer fields one each at Pathiyoor and Krishnapuram villages, Alappuzha district. As a result of systematic adoption of integrated nematode management strategies in a farmer participatory community mode under ICAR - Farmer First Programme, significant reduction in the nematode infestation as high as 70% to 100% was realized in the demonstration plots as compared to the neighboring farmer's plots. This clear and visible impact of the technology validation has greatly impressed the farming fraternity and aided in cross-learning among other stakeholders.

Keywords: Soil nematodes, species diversity, exotic pests, crop rotation, soil solarization, bioagents

BASM/OP – 12

Exploring the biodiversity in East Indian arrowroot (*Curcuma angustifolia)* for elucidating broad spectrum antibiotic effects

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ABSTRACT

Curcuma angustifolia Roxb (Tikhur) is a perennial and flowering rhizomatous herb from the family Zingiberaceae and popularly referred to as the East Indian Arrowroot. Despite being highly nutritious and with medicinal properties, its use is restricted to tribal hamlets and traditional medicinal formulations. Overshadowed by spice crop *Curcuma longa*, the pharmaconutrient effects of *C. angustifolia* is undermined. Recent explorations by limited number of research groups has revealed the antimicrobial effects of the methanolic extract of *C. angustifolia* rhizome. This study reports the broad spectrum antibacterial effects of methanolic extract of rhizome *C. angustifolia* from selected genotypes towards Methicillin resistant strain of *Staphylococcus aureus* along with other gram negative strains of bacteria as well as antifungal effects towards *C. albicans.* The minimal inhibitory concentration (MIC) was analysed and compared with a standard antibiotic drug, gentamycin. The methanol extract of *C. angustifolia* Chhattisgarh Tikhur-1 and accession IC641835 (IGBT) had a minimal inhibitory concentration (MIC) at 400 µg and 800µg respectively. Whereas, the standard drug, Gentamicin had MIC at 200µg. As the extract used is crude and unrefined, isolation of a pure compound in future can be a more effective drug towards *S. aureus*. The identified germplasm can be a good source to develop a new antibiotic which can act over a broad spectrum as it has shown promising results towards even Methicillin resistant *S. aureus* strain (MTCC 96) apart from other bacteria as well as a fungus. Antibiotic resistance is a major concern in the health sector with many common antibiotics being ineffective against resistant strains of bacteria. One of the major components in east Indian arrowroot is starch. Curcumin is reported to be one of the active principles which contribute to the anti-microbial activities. It can even reverse the Methicillin resistance in *S. aureus.* Previous reports show that conjugating curcumin in cassava starch nanoparticles enhances better bioavailability. In this crop, both starch and curcumin are naturally present together which will make the bioavailability of curcumin better and hence make it a better potential bet to be used as antimicrobial agent towards methicillin resistant *S .aureus.*

Keywords: *Curcuma angustifolia*, biodiversity, germplasm, antimicrobial, *Staphylococcus aureus*, methicillin resistance

BASM/OP – 13

Decoding the chemical identity of *Pimenta* spp. from Western ghats region and exploring its anti-bacterial activity against ginger bacterial wilt

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ABSTRACT

Pimenta species belongs to Myrtaceae family has flavor compounds infused in all its parts. Among them, Allspice, *Pimenta dioica*(L.) Merrilland Bay-rum, *Pimenta racemosa* (Miller) J. Moorehavegreat economicimportance. *P. racemosa* is anintroduced species allegedly as Allspice and found widespread in Western Ghats regions of India.In the present investigation, we characterized the volatile constituents of essential oil (EO) of leaves and berries of *P. racemosa* and compared the profile with sample collected from three different locations of Western Ghats region. Furthermore, a comparative volatile profiling of six samples marketed as Allspice were done along with *P. racemosa* EO. The analysis showed that the yield of EO varied from 3.5 % and 3.0 % in berries and leaves respectively. The composition analysis showed eugenol as the primary constituent (39.9 % in berries, 52.3 % in leaves) followed by myrcene (15.8 % in leaves and 22.2 % in berries). Other major compounds found are chavicol, limonene, trans-ocimene, linalool, and trans-β-caryophyllene. Volatile compounds such as myrcene, chavicol, germacrane D showed significant variation in samples of different altitudes in the Western Ghats region. Multivariate analysis of the comparative volatile profiling showed that products available in the market are indeed *P. racemosa* and not *P. dioica*. For exploring the alternate value of the spice, a study was conducted to assess the antibacterial effect of EO extracted from the leaves against wilt causing pathogenic bacterium *Ralstonia pseudosolanacearum* in ginger. The results showed that *P. racemosa* EO not only inhibited the growth but also the viability of the bacteria as assessed through *in vitro* assays. The scanning electron microscopy (SEM) images showed EO treatment caused alterations in membrane structures of the bacteria. To conclude, our study verified that *Pimenta* speciesexisting in the Western Ghats regions and also samples marketed as Allspice is actually West Indian Bay and this species has excellent antibacterial activity which could be explored for its alternate utilization to develop antibacterial formulation.

Keywords: All spice, Western ghats ,volatile constituents, anti-bacterial activity, ginger bacterial wilt

BASM/OP – 14

Studies on the eco-friendly management of leaf blight of jasmine (*Jasminum sambac* L. Aiton) caused by *Alternaria jasmini* (Fr. Keissier)

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ABSTRACT

Jasmine (*Jasminum sambac* L. Aiton) belongs to the family Oleaceae, is an important leading traditional flower crop of India, which constitute of high value commercial loose flower in Tamil Nadu. The jasmine plants suffer due to several diseases caused by the fungal, bacterial and viral pathogens and are of major constraints causing economic yield loss. Among the fungal diseases, leaf spot of jasmine is caused by Alternaria jasmini is becoming common disease on jasmine cause serious losses to jasmine plant. Control of these diseases is currently achieved through the use of chemicals but there is increasing interest in utilizing alternative approaches such asuse of biological control agents, plant oils and oil cakes. In the present study seven isolates of P. fluorescensand B. subtilisweretested against A. jasmini, VPPf and TBsrecorded the highest inhibition of mycelial growth of A. jasmini over control. With regard to different plant oils and oil cakes screened against A. jasmini, thulasi oil (1%), citronella oil (1%), lemongrass oil (1%), citriodora oil (1%)and neem cake extract @ 10 per cent concentration was the most effective in inhibition on mycelial growth of pathogen. Studies on the pot culture condition revealed that foliar application with P. fluorescens (VPPf) @ 0.2% at 35 and 50 days after planting was the most effective in controlling the disease by recording PDI of 13.55 with 81.35 per cent disease reduction over control (PDI of 72.67) which was on bar with chemical treatment.Among the plant oils tested, Thulasi oil (1%) sprayed on 35 and 50 DAP had maximum efficacy in the management of leaf blight of jasmine by recording the least disease incidence of 20.16 per cent which accounted for 72.26 per cent disease reduction over control. Among the oil cake extracts tested, foliar application with neem cake extract (10%) recorded 67.69 per cent disease reduction over control. Under field condition revealed that foliar applications with *P. fluorescens* (T1) VPPf isolate@ 0.2% was superior to all the other treatments recording only 09.97 per cent disease intensity with maximum reduction of 87.32 per cent reduction over control and recorded highest flower yield of 115.56 kg/ 15 cents.

Keywords: *Jasminum sambac,* leaf blight, *Alternaria jasmini*, eco-friendly management

BASM/OP – 15

Studies on insect pests and natural enemies in manilla tamarind [*Pithecellobium dulce* (Roxb.) Benth.]

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ABSTRACT

Manilla tamarind, *Pithecellobium dulce* (Roxb.) Benth. is a small or medium-sized, hardy, tenacious, seedy, nitrogen-fixing tree and is commonly grown in tropical and subtropical regions worldwide. The present study was conducted in two different manila tamarind varieties (PKM1 and PKM2) for the incidence of pests and natural enemies at Central farm, Horticultural College and Research institute, Periyakulam during 2022-2023. Ten plants were randomly selected from each manila tamarind varieties and observed for incidence of pests and natural enemy population and their infestation at weekly intervals. Among the two varieties, PKM 1 was found to record less incidence ofthornbug (14.1/10 trees), mealybug (1.78/10 tree) and whitefly (3.0/10 trees)as compared to PKM 2 which recorded the incidence of thornbug (20.85/10 trees),mealybug (2.71/10 trees) and whitefly (5.57/10 trees). Whereas, leafwebber (12.78%) and tussock moth(0.78/10 trees) recorded maximum damage in PKM 2 as compared to PKM 1 (6.0% and 0.57/10 trees, respectively).The seasonal incidence correlated with weather parameters revealed that thornbugincidence was positively correlated with maximum temperature (0.02) and wind speed (0.57) whereas negatively correlated with other weather parameters *viz*., minimum temperature,rainfall and relative humidity. The mealybug (0.049) and whitefly (0.092) incidence were recorded high and were positively correlated with maximum temperature and relative humidity but negatively correlated with rainfall and minimum temperature. The coccinellids (0.544) and spiders (0.627) were more during high temperatures, but leaf webberwas negatively correlated (-0.075).

Keywords: *Pithecellobium dulce*, insect pests, natural enemies

BASM/OP – 16

Variation in total phenol content in response to *Phytopthora* inoculation in betelvine

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ABSTRACT

Betelvine (*Piper betle* L.) is a dioecious, perennial creeper belonging to family *Piperaceae* is an important cash crop and used as masticatory due to the strong pungent aromatic flavor of leaves. The crop is highly susceptible to major disease caused by *Phytophthora nicotianae* which results in complete loss of plant. Understanding the complex interaction among host, pathogen and crop stage leads to resistance and susceptibility to a disease development. Phenols are the major secondary metabolites present in plants. Phenols protect the tissues from pathogens and they also act as potential antioxidants. The total phenolic content (TPC) was estimated spectrophotometrically in resistant interspecific hybrid (IIHRPBIH9) and susceptible variety (IIHRBV170) of betelvine using Folin Ciocalteu method. In the present investigation, increase in phenol content was observed during disease progression in all the samples. However, result showed that the maximum accumulation of total phenolic content was recorded in the uninoculated resistant interspecific hybrid (16.95, 17.35 and 17.86 mg per 100 g at three, five and seven dpi, respectively), followed by inoculated resistant interspecific hybrid (16.27, 16.42 and 16.85 mg/100 g at three, five and seven dpi, respectively). While, minimum phenol content was recorded in inoculated (14.93, 14.98 and 15.02 mg/100g) and uninoculated (15.74, 15.84 and 15.92 mg/100g) susceptible variety at three, five and seven dpi, respectively. Significant differences for phenol content were observed between resistant interspecific hybrid and susceptible variety. Thus, phenolic compounds may enhance the mechanical strength of host cell walls and also inhibit the growth of *Phytophthora* fungal pathogen.

Keywords: Betelvine, interspecific hybrids, phenol content, *Phytophthora* disease

BASM/OP – 17

Effect of botanicals in management of Septoria leaf blight on chrysanthemum caused by *Septoria chrysanthemi* under Punjab conditions

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ABSTRACT

The study on Septoria leaf blight of Chrysanthemum genotype "Ratlam Selection" was conducted at Research Farm, Department of Floriculture and Landscaping, Punjab Agriculture University, Ludhiana during 2022 and 2023. Six botanicals namely *Azadractica indica, Syzygium aromaticum, Allium sativum, Moringa oleifera, Murraya koenigii and Terminalia arjuna* were evaluated against *Septoria chrysanthemi*. The experiment was conducted for two years *i.e.* 2022 and 2023 consequently. The disease symptoms were first observed in the month of August. Simplest extraction method that is direct extraction in ethanol also called solid-liquid extraction (SLE), was used..Botanicals sprays were carried out at weekly interval after the appearance of first symptoms on the plant. The data revealed that *Allium sativum* @0.2% percent was found to be highly effective against *Septoria chrysanthemi* followed by *Syzygium aromaticum* @0.2%, *Azadractica indica* @0.2%, *Murraya koenigii* @0.2 %, *Moringa oleifera* @ 0.2% and *Terminalia arjuna* @ 0.2 percent. The highest yield was observed in plants treated with *Allium sativum* and minimum in plant treated with *Terminalia arjuna*. The minimum disease control of (32.35%) was in *Terminalia arjuna* and maximum of disease control of (78.70%) in *Allium sativum.* The size and duration of flower also varied but were not affected by the progression of the disease. All the treatments were found significantly superior over control.

Keywords: Chrysanthemum**,** *Septoria chrysanthemi*, botanicals, disease severity, management

BASM/OP – 18

Combining of fusarium wilt and WBNV resistance in watermelon using underexploited *Citrullus amarus* derived pre-bred line

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ABSTRACT

Breeding for combined disease resistance in view of Fusarium wilt and Watermelon Bud Necrosis Virus (WBNV) being advanced by BIL-53 is pre-bred line resistance to WBNV developed from the underexploited species *Citrullus amarus* and an exotic collection EC794455, which is resistant to *Fusarium oxysporum* f. sp. *niveum* race 2. The advanced breeding population derived from the parental lines were advanced from F_2 to F_3 population (BIL-53 × EC794455). The fruit weight was ranged from 300 g to 4184 g, fruit length was ranged from 6.90 cm to 20.10 cm, Fruit width was ranged from 7 cm to 19.90 cm and TSS (°B) was ranged from 1.6 to 8.1 among F_2population (BIL-53 × EC794455). The data of the population skewed positively and positive kurtosis indicated the normal distribution of F_2populations. The backcross population advanced from BC_1F_1 to BC_1F_2 [(BIL-53× EC794455) × EC794455]. The fruit weight was ranged from 182 g to 6100 g, fruit length was ranged from 7.10 cm to 21.90 cm, Fruit width was ranged from 4.10 cm to 22.90 cm an TSS (°B) was ranged from 1 to 6.3 among BC_1F_1 population and data of the population skewed positively and negative kurtosis indicated the nonnormal distribution of populations due to paternal influence of the parent on the Back crossed population.

Keywords: *Citrullus amarus,* watermelon, F_2, BC_1F_1, skewness, kurtosis

BASM/OP – 19

Introgression of fusarium wilt and gummy stem blight resistance in watermelon [*Citrullus lanatus* (Thunb.) Matsum & Nakai] through rootstock breeding

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ABSTRACT

Among the cultivated vine vegetable crops, *Cucurbitaceae* forms the largest group. Watermelon is one of the most important cucurbitaceous vegetables of the tropics and sub-tropics. Soil-borne pathogens are major production constraints in watermelon, of which fusarium wilt and gummy stem blight are of major importance. Fusarium wilt, caused by *Fusarium oxysporum f. sp. niveum* is the most serious disease globally, causing 100% yield loss. Similarly, gummy stem blight (GSB) is the emerging and the most devastating disease caused by *Stagonosporopsis cucurbitacearum*. It is reported to be seed-borne, air-borne and soil-borne, causing up to 15-50% yield losses. Management of these diseases is by use of chemicals. However, a shift from chemical to non-chemical means of control is underway to ensure environmentally safer measures to accomplish international regulations. Disease-resistant cultivars were developed to limit damages incited by the soil borne fungi. However, so far, no commercial hybrids have shown complete resistant to the race 1, 2 of *Fo N*and to GSB. Hence, rootstock breeding is one of the best strategies we can opt for securing yield stability under disease conditions in a safe manner. Apart from providing resistance to diseases, grafting is said to increase vegetative growth, plant height and fruit quality compared to the non-grafted ones. Globally, to manage soil borne pathogens through non-host resistance, *Lagenaria*, *Cucumis* and interspecific *Cucurbita* hybrid rootstocks are commonly used for grafting hybrid watermelon varieties. Grafting onto former resulted in early flowering, while the latter was found to be more vigorous with increased fruit weight, 40% increase in fruit lycopene content and increase in total yield was observed. However, the above-mentioned rootstocks have been reported to have undesirable effect on quality parameters. Efforts have been initiated to breed watermelon rootstocks, mainly of the *Citrullus* species, as a result, *C.amarus* syn. *C. lanatus* var. *citroides* possessing resistance to FON and GSB have been suggested. Till date there are no reports of *Citrullus* sp. rootstocks showing combined resistance for fusarium wilt and gummy stem blight in watermelon. Therefore, rootstock breeding programmes should address the need to develop new hybrid rootstocks by combining the desirable characteristics such as disease resistance, no negative impact on fruit quality and adaptability to environmental stress.

Keywords: Quality, rootstock, adaptability, resistance

BASM/OP – 20

Velvet bean (*Mucuna pruriens* var. *utilis*) as a rotational crop to manage root knot nematodes in cucumber under protected conditions

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ABSTRACT

Globally, plant parasitic nematodes are one of the major biotic constraints hindering successful crop production, particularly in tropical and sub-tropical regions. Overall crop losses due to plant-parasitic nematodes estimated through All India Coordinated Research Project on Nematodes in 19 major horticultural crops stands at Rs. 50,224.98 million. Regular outbreaks of root-knot disease caused by *Meloidogyne* spp. have occurred in recent years, impacting considerably on the yield of several horticultural crops, both quantitatively and qualitatively. As management by chemical means is relatively expensive and hazardous,there is always a need to develop integrated nematode management modules by judicial blend of several management options to reduce the use of chemicals. Introducing ideal nematode antagonistic crops/ non host crops in crop rotation play a significant role in reducing initial nematode population for the succeeding main crop.Experiments conducted at ICAR-Indian Institute of Horticultural Research, Bengaluru revealed that growing velvet bean (*Mucunapruriens* var. *utilis*) in polyhouse and incorporation of its residues at 45-90 DAS significantly reduced the plant parasitic nematode population in soil to the extent of 49.1 to 61.9% GCMS analysis of the root exudates of velvet bean revealed several compounds of which di-butyl phthalate and hexadecanoic acid exhibited 70.51 and 64.53% nematicidal activity, respectively. LCMS profiling of root exudates of velvet bean revealed presence of compounds involved in salicylic acid pathway which are responsible for inducing host plant resistance. Field trials were conducted for three seasons in cucumber cv. Chitra grown under polyhouse conditions to evaluate holistic modules by integrating cultural, biological and chemical components for managing nematodes. Split plot design was adopted with velvet bean and marigold as rotational crops in main plots and testing of biological (*Bacillus subtilis* IIHR Bs-2) and chemical (Fluopyram 35% EC) components in sub plots, individually and in combination. Each treatment was replicated thrice. Results revealed that pre-planting of velvet bean or marigold, application of bio-agent (*Bacillus subtilis* IIHR Bs-2) enriched FYM @ 5t/ha before planting, Fluopyram @ 500 ml/acre at 15 DAS followed by soil drenching of bio-agents at monthly intervals (5 ml/lit) recorded significantly lower nematode population in soil (81.75 to 85.47% decrease) and gall index (82.69 to 86.65% decrease) and higher yield (23.72 to 27.04% increase) compared to control. Hence this study proves that velvet bean can serve as promising cultural component as a rotational crop/cover crop in polyhouses for reducing plant parasitic nematode and can be integrated with biological and chemical control strategies for effective nematode management.

Keywords: Nematode, quantitative, qualitative, integrated

BASM/OP – 21

Morphological and molecular characterization of taro leaf blight and its resistance assessment through germplasm screening under gangetic plains of West Bengal

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ABSTRACT

Colocasia is a tuber crop that remains largely undervalued and underutilized despite its potential to ameliorate food scarcity and malnutrition in developing nations. In West Bengal, there is tremendous scope for popularizing taro as an economically profitable crop among the farmers. However, there are growing concerns over the narrow genetic base of taro cultivars particularly concerning taro leaf blight caused by *Phytophthora colocasiae*, an oomycete water mold. Initially, morphological study revealed the pathogen character as *Phytophthora* sp. and molecular studies confirmed it as *Phytophthora colocasiae* with NCBI accession number OP895693. The sporangia is ovoid/ ellipsoid, semi-papillate with short pedicel and measured from 45.1 × 22.9 µm. Evaluation of mycelial growth and sporulation events revealed that carrot agar induces sporulation earlier with maximum mycelial growth than other culture media tested at a temperature of 27ºC. Field evaluation of 30 taro germplasms for the incidence of TLB during *Kharif* 2022 under natural epiphytotic conditions revealed the cultivar Muktakeshi has very high field resistance to TLB with the lowest PDI (4.88%) followed by BCC-1, whereas the highest PDI (59.44%) was observed in susceptible check, Telia. Screening and validating of all 30 germplasms at the molecular level against *Phytophthora* blight was carried out using the primers developed from the sequences of *prg 1* and *prg 8* that give PCR amplicons of 950 bp and 1100 bp respectively. The *prg 1* and *prg 8* primers successfully classified 30 taro genotypes into four clusters based on their level of leaf blight tolerance. This study will undoubtedly shed light on defence signal ling pathways in taro and identify the resistant variety if any among the available germplasms.

Keywords: Germplasm, *Phytophthoracolocasiae*, primers, screening, taro, tolerance.

BASM/OP – 22

Evaluation of bio-pesticides against tea mosquito bug on moringa

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ABSTRACT

Moringa (*Moringa oleifera* Lam.) is a multipurpose tropical tree called as “The miracle tree” or "Tree of life" is used in cooking and has many health and medicinal benefits. It is rich in calcium, potassium, iron, magnesium, zinc, and phosphorous, and in vitamins. Even though it is tolerant of extreme temperatures and weather conditions, it is still prone to infestations from pests and contracting diseases. Moringa is susceptible to many insect pests of which, the tea mosquito bug *Helopeltis antonii* (Signoret) (Hemiptera: Miridae) is one of the important pests in moringa ecosystem which is gaining importance as a pest in recent years. The nymphs and adults desap all plant parts such as terminal shoots and pods, remains active throughout the year, resulting in drying of twigs. Feeding also leads to exudation of gum (oozing) and lead to 100% crop loss if appropriate management strategies are not adopted. Timely execution of suitable control measures can minimize the losses. Control failures are more common in fields having a practice of sole application of synthetic insecticides. This is mainly due to development of insecticide resistance. Hence, an alternate strategy involving biopesticides is highly essential for tea mosquito bug management. Field trial was conducted at Moringa orchard located at Kannur village to find out the Bio-efficacy of *Beauveria bassiana* against the management of Tea Mosquito Bug (TMB) in Moringa in a randomized block design with the following five treatments and replicated four times with a one year old PKM 1 variety. The treatments imposed were *Beauveria bassiana* @ 1x 10^8 @ 2 gm / litre, *Beauveria bassiana* @ 1x 10^8 @ 4 gm / litre, Azadirachtin (10000 ppm) @ 2 ml / lit., Malathion 50 EC @ 2ml/lit. and the Untreated check. In this field experiment, two rounds of spraying were followed after initial tea mosquito bug incidence was noticed from the flushing stage with an interval of fourteen days. Observations on the flush and pod damage, was recorded. There was no incidence in the moringa pods. For each replicated treatment, five trees were taken for observation. Flush (Greens) Yield (Kg/tree) was calculated. Per cent reduction over control was calculated. The results revealed that the pre-treatment damage per cent of TMB was non-significant in all treatments including the untreated control. Gradual reduction of flush greens infestation was observed two weeks after each round of spray. Malathion 50 EC @ 2ml/lit. was found significantly effective in controlling TMB over *B.bassiana.* However, *Beauveria bassiana* @ 1x 10^8 @ 4 gm/litre was found effective in reducing TMB damage when compared to untreated check. Yield of Flush (Greens) were on par in both *B. bassiana* and Malathion sprayed plots.

Keywords: Bio-pesticides, tea mosquito bug, moringa**,** *Beauveria bassiana*, yield

BASM/OP – 23

Evaluation of resistant line of tropical carrot to root-knot nematode *Meloidogyne incognita* using conventional method and molecular markers

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ABSTRACT

Carrots are highly susceptible to root-knot nematodes (RKN) which reduce their marketability due to deformation of roots. Hence, there is a need to identify resistant sources against RKN to accelerate resistance breeding programmes in carrot. In the current study, forty-eight carrot accessions were screened by artificial inoculation of nematodes to locate the lines resistant to *Meloidogyne incognita*. Among all, Acc- 88 was found to be immune to *M. incognita* followed by Acc-72, Acc-145 and KSP-123 which showed moderately resistant reaction. Acc -113B was highly susceptible while the rest other 44 lines recorded susceptible reaction towards *M. incognita*. The accessions were validated for *Mj*gene using linked molecular markers conferring resistance to RKN. The immune line, Acc-88 amplified at 266 bp proving the presence of resistant allele and Acc-113B generated the product size of susceptible allele revealing polymorphic difference with ESSR0110 marker. The *Mj*resistance locus carrying Acc-88 has the potential to introgress RKN resistance in susceptible varieties of carrot. The validated ESSR0110 co-dominant molecular marker is promising because it could effectively distinguish resistance and susceptible individuals, thus helps the breeder to develop stable source resistance to root knot nematode. This finding is the first report on identification of immune line and linked molecular marker in tropical carrot against *M. incognita.*

Keywords**:** Carrot, root knot nematode, *Meloidogyne incognita,* screening, marker*, Mj*gene.

BASM/OP – 24

Exploration of underutilized cucurbitaceous species as rootstocks to mitigate *Fusarium* wilt in bitter gourd (*Momordica charantia* L.)

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ABSTRACT

*Fusarium*wilt has been the greatest yield limiting constrain in bitter gourd production. Grafting in bitter gourd is useful to overcome the problem of *Fusarium* wilt and also to get increased yield. Despite the economic importance and high nutritional value, underutilized cucurbitaceous species have biotic and abiotic stressresistance. In this regard, the research was aimed to evaluate the reaction of both underutilized and major cucurbitaceous species *viz.,*Mithipakal (*Momordica charantia* var. *muricata),* fig leaf gourd (*Cucurbita ficifolia)*, zucchini squash *(Cucurbita pepo),* sponge gourd *(Luffa cylindrica)*, kumatikai (*Citrullus colocynthis),* African horned cucumber *(Cucumis metuliferous)*pumpkin (*Cucurbita moschata)*, ridge gourd *(Luffa acutangula),* bottle gourd *(Lagenaria siceraria)*, ash gourd *(Beninca sahispida)*at Department of Vegetable Crops, Tamil Nadu Agriculture University, Coimbatore during 2010-14 under*in vitro* against fusariumwilt (*Fusarium oxysporum*). Results revealed that kumatikai*(C. colocynthis),* African horned cucumber *(C. metuliferus)* andpumpkin*(C. moschata)* exhibited no symptom and manifested as resistant to fusarium wilt which could be adjudged as the best species to impart resistance against fusarium wilt and sponge gourd *(L. cylindrica)* and mithipakal (*M. charantia* var. *muricata)* showed moderately resistant reaction and these rootstocks can be identified as best and well suited rootstocks for grafting with bitter gourd scions. Side grafting technique was used in this experiment. Hence the underutilized cucurbitaceous species are the potential source of soil borne disease management without harmful to the environment.

Keywords: Grafting, underutilized cucurbitaceous species, rootstocks, bitter gourd

BASM/OP – 25

An Izosyme marker for resistance to root-knot nematode in brinjal (*Solanum melongena* L)

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ABSTRACT

The brinjal (*Solanum melongena* L) is originated in India and is known to have been cultivated for over 4000 years. In India, brinjal is grown in an area of 0.76 million ha with an annual production of 12.61 million tonnes with productivity of 16.59 tonnes ha^{-1} during 2023. The round the year production of brinjal resulted a very high pest compelx, greater yield loss and heavy application of pesticides consequently health hazard, environmental pollution etc. Hence, Grafting of cultivated brinjal varieties on its wild species as rootstocks (resistant) is one of the handy methods to mange pest ecofriendly. The present study revealed that the wild species and susceptible check inoculated with *M. incognita*, *S. torvum* had the least gall index of 2 (resistant) as against *S. xanthocarpum*, *S. incanum* and *S. elaegnifolium* exhibited moderately resistant by recording gall index of 3 (MR). *S. viarum* and Co-2 attained the reaction category of 'susceptible' (S) and highly susceptible. A wider variation observed for total phenols (19.78mg g-1), OD phenol (15.62mg g-1), peroxidase (3.52), polyphenol oxidase (3.68) and its activity (16.12nmol) and root acid phosphatase activity content (131.67mmols) in the grafts of COH2 hybrid grafterd on wild *Solanum* rootstocks. For confirmation, the izosyme analysis for peroxidase revealed a uniform appearance PO2 isoform in all the genotypes except CO-2, with varying intensity of band. More number of isoforms was observed in the wild species *S. torvum*. The SDS-PAGE revealed a predominat-banding pattern of protein in *S. torvum* on COBH 2 as compared to *S. viarum* on COBH 2. The compatible grafts have induced protein with molecular weight of 24 K Da and 66 K Da and the two proteins appeared with high intensity, which was also detected in the *S. torvum* rootstock. This novel izosyme marker peroxidase will accelerate brinjal breeding for nematode resistance.

Keywords: Isozyme, rootstock, gall index, grafted

BASM/OP – 26

Antimicrobial activity of macro algae against *Colletotrichum capsici* and its management

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ABSTRACT

Marine macroalgae are rich source of structurally novel and biologically active metabolites that could be used in biological control in the agricultural field. Many bioactive compounds have been identified from marine algae with antimicrobial activity, some of these compounds are sterols, terpenoids, polysaccharides, peptides, proteins, vitamins, acrylic acid, terpenes, chlorophyll ides, phenols, heterocyclic compounds, halogenated ketones and alkanes and cyclic polysulphides (Abdel-Raouf et al. 2015). The present study is conducted to estimate the antimicrobial potential of extract of fifteen marine macroalgae. Among the 15 seaweeds *Padina gymnospora* at the 30% highest concentration was found to the best in the reduction of mycelial growth and increase the germination percentage under *invitro* condition. Application of the *P. gymnospora,* in *invivo* chilli pot experiment significantly decreased the percent of fruit rot in fruit 43.43 by 60.52 and 71.01 % on 80,100 and 120 DAT respectively. Moreover, *P. gymnospora* enhanced growth performance of chilli plant in term of shoot length and root length. Interestingly, the seed and air free pathogen treated with *P. gymnospora* showed significant increase in flower compared to the control treatment besides increasing of fruit fresh weights. The considerable antimicrobial activity and the presence of phyco-chemical naphthalene indicated that *P. gymnospora* can be considered as a source of biocidal and biostimulant agent against anthracnose plant disease.

Keywords: Macro algae, *Padina gymnospora,* antimicrobial activity, phytochemical analysis

Theme – 5
Biotic and Abiotic Stress Management
Poster Presentations

BASM/PP – 1

Seasonal incidence of insect pests and natural enemies in wood apple, *Feronia limonia* (L)

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ABSTRACT

Wood apple, *Feronia limonia* (L) (*Rutaceae*), is a species native to southern India and Sri Lanka. Wood apple grows in abundance throughout drier regions of India. The intensive cultivation of wood apple and climate change pave way for the various insect species attacking wood apple in different regions of the world and their abundance vary with geographic locations, availability of food sources and seasons of the year. Hence, survey was conducted in wood apple for the incidence of pests and natural enemies at Central farm, Horticultural College and Research institute, Periyakulam during 2022-2023. Twenty plants were selected and observed by visual counting the pests and natural enemy population and their infestation from 10 randomly selected fruits and twigs per cultivar at weekly intervals and per cent damage on growing shoots, leaves and fruits were recorded. For fruit fly exit hole or deformation of fruit were taken as identification mark of infestation. The incidence of pests and natural enemies in wood apple revealed that PKM 1 variety was found to be less susceptible for fruit borer (1.50%), striped mealybugs (3.21/tree) and more susceptible to citrus butterfly (2.5/trees), spiralling whitefly (3.64/ trees), ash weevil (1.4/tree) and leaf miner (9.0%). The spider population was observed to be lesser in PKM 1 (2.43/10 trees), but coccinellids population was high in PKM 1 (13.93/ 10 trees). The seasonal incidence revealed that spiralling whiteflies are more during hot weather and was positively correlated with maximum and minimum temperature (0.701 and 0.791 respectively) whereas they are negatively correlated with other weather parameters *viz*., rainfall, wind speed and relative humidity. Coccinellids were maximum during low temperature conditions (0.421) and positively correlated with maximum temperature (0.189) but negatively correlated with rainfall and relative humidity. But, spiders are found to be maximum at low temperature conditions (0.078) and positively correlated with rainfall (0.017) but negatively correlated with maximum temperature, relative humidity and wind speed.

Keywords: Seasonal incidence, fruit borer, white flies, spiders

BASM/PP – 2

'NAUROJI Stonehouse' fruit fly trap: an IPM tool for eco-friendly fruit fly management in mango

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ABSTRACT

Fruit flies, *Bactrocera* spp. (Tephritidae: Diptera), are the most destructive pests of many fruits and vegetables all over the world. The fruit loss in mango ranges from 5 to 80% was reported due to fruit flies and pests of quarantine importance. In India, the average loss in fruit yield is 16% and ranges from 1 to 31%. Among various alternate strategies available for the management of fruit flies, use of methyl eugenol trap is the most eco-friendly and remunerative approach. The use of chemical attractant along with appropriate trapping technique has also been found effective in monitoring, suppressing fruit flies on large areas by Male Annihilation Technique (MAT) and even complete eradication of various fruit flies. The scientists from Navsari Agricultural University, Navsari have developed a fruit fly trap, in Gujarat. Further this technology was re-named as "*NAUROJI* Stonehouse fruit fly trap". All India Co-ordinating Research Project on Fruits (AICRP-F) is working all over the country for developing and strengthening different technologies through multi-location trial in different agro-eco-systems. With the financial assistance under the SCSP-AICRP-Fruits, Paria center demonstrated this technology in Valsad District and attempt had also been made to increase awareness among farmers regarding this technology by various extension activities. Results revealed that the farmers were successful in keeping off the fruit fly incidence from their field with the advanced guidance provided by AICRP scientists. In demonstrated field average 4 to 7 per cent fruit fly damage was observed as against 14 to 18 per cent in control/farmers practice. Average 525.31 numbers of fruit flies were trapped per week. Besides this, 6.78 per cent yield was found increased over control. Ultimately, by adopting *NAUROJI*Stonehousefruit fly trap technology with meager investment of Rs. 660.00 per ha as technology cost, average net profit of Rs. 18900/- was obtained.

Keywords: Fruit fly, male annihilation technique, NAUROJI Stonehouse fruit fly trap

BASM/PP – 3

Defence modulators for enhancing quality and disease resistance in underutilized fruit crops

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ABSTRACT

The world population is increasing at an alarming rate and is expected to reach about 10 billion by the end of 2050, but the productivity of food is decreasing due to the effect of various biotic and abiotic stresses and post-harvest losses of produce. A complicated interconnection of biotic and abiotic stresses and post-harvest storage losses leads to enormous usage of agrochemicals. There are numerous technical options available to combat this problem (Gowthami, 2018). However, with rising consumer interest in food, attention has shifted more towards quality assurance with particular emphasis on the enhancement of health-promoting phytochemicals that promote health. Keeping this back ground, pos-tharvest defence modulators/elicitor treatments may a viable option to elicit the desired effect and to ensure an efficient and consumer-oriented supply chain. Reports indicate defence modulators/elicitors are the compounds derived from biotic or abiotic factors that are used to augment the secondary metabolites accumulation by altering the physiological system of the plant thus, improving the qualitative characters of fruits. These defense modulators trigger the hypersensitive response in plants leading to enhanced resistance and also provoke the synthesis of phytochemicals, which are responsible for plant cell adaptation to the adverse environment and enhances antioxidant properties of fruits as per published reports. The underutilized fruit crops like soursop, durian, dragon fruit, mangosteen, kokum etc, are all higher in antioxidant properties and would able to combat cancerous properties. Thus elicitation of these crops with defence modulators may enhance their quality and helps to extend shelf life. The utilization of elicitors is gaining wider acceptance because of its eco-friendly, non-toxic nature coupled with quality produce. Thus, considering the positive aspects of elicitors in protection of environment and human health, it could a viable alternative in place of agro chemicals for enhancement of growth, yield and quality of fruit crops.

Keywords: Elicitors, soursop, mangosteen, kokum, antioxidants

BASM/PP – 4

Approaches to safe integrated pest management in exotic and underutilized horticultural crops

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ABSTRACT

Worldwide, many horticultural crops are available as underutilized. Underutilized fruits and vegetables are considered as mines of nutrients and antioxidants. Despite their high nutritious value, medicinal properties and ability to grow in adverse soil and climatic situations, they have not received much attention. However, these underutilized horticultural crops are essential part of traditional foods, especially in rural areas and tribal communities. In recent years, there has been a growing awareness of the nutritional and economic value of underutilized fruits and vegetables. Additionally, they hold promise for export-oriented opportunities, creating income generation potential at both national and international levels. However, production of underutilized horticultural crops is also being hampered by many pests and diseases that have received less attention.Invertebrate pest control in horticultural systems continues to present many challenges. In the past, direct application of chemical products has been a common method of pest control. Though, in response to the environmental, economic and other problems associated with excessive use of chemical pesticides, increasing efforts have been made to develop integrated pest management (IPM) approaches. IPM combines various techniques, including biological controls, cultural practices and judicious use of pesticides, to minimize the impact of pests while maintain the environment and non-target organisms. Before developing strategies to promote the use of underutilized fruit crops, careful analysis is required to monitor and document the exact impacts of pests and their management practices. In addition, if it were possible to predict likely flare up of these pests before they develop in the field, it might be possible to develop strategies to avoid the problems.IPM is presented as a viable approach to addressing the unique challenges facing exotic and underutilized horticultural crops, with an emphasis on minimizing the environmental impact of pest management while maximizing economic potential.

Keywords: Fruits, vegetables, IPM, pest control, viable approach

BASM/PP – 5

Powdery mildew caused by *Phyllactinia corylea* affecting sweet Indian berry /mulberry (*Moris* sp.) cultivation

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ABSTRACT

Mulberry cultivation has gained economic importance because of the multiple uses the crop provides, the leaves are fed to silkworms, animals, fishes and its delicious fruits used for human consumption due to the presence of numerous pharmaceutical compounds of which some are the alkaloids, vitamins, fats, minerals, amino acids, carotenoids, flavonoids, antioxidants. The root and stem bark of mulberry has purgative, anthelmintic, and astringent properties apart from being a rich source of phenolic compounds such as maclurin, rutin, isoquercitrin, resveratrol and morin. The crop, also called as the sweet Indian berry is believed to have originated in the foot hills of Himalayas, and later on spread to the tropics. In India, though the crop is mainly raised for the leaves there is ample scope for the large-scale fruit production in the future, owing to its health benefits, as this potential is still underutilised. The crop produces dense canopy because of the size and shape of the leaves paving way for the incidence of diseases. The disease namely powdery mildew is one of the serious diseases affecting mulberry causing heavy loss to the foliage which may affect the fruit production. The incidence is initiated after the raining season when the temperature rises to 35°C accompanied with the prevalence of sultry weather. The disease was recorded to be high during January (40 PDI) and February (32.3 PDI) than the other months after which there was lot of leaf shedding caused by the infection. This reduces the photosynthetic ability and directly affected the growth and vigour of the plant.

Keywords: Sweet Indian berry, mulberry, powdery mildew, leaf shedding

BASM/PP – 6

Entomofauna status of longan (*Dimocarpus longan*) and way forward

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ABSTRACT

Longan, *Dimocarpus longan* (*Sapindaceae*) is a highly esteemed fruit in Asia having pleasant flavour. Although it is not so well known across Indian subcontinent, in recent years, its popularity has risen in U.S. and European markets. So, realizing this, targeting the major pests of longan can enhance country's export potential and domestic market value as well. Some of the major pests of Sapindaceae also reported to affect longan like, fruit borer, *Conopomorpha sinensis*, oriental fruit fly, *Bactrocera dorsalis*. Moreover, longan witches' broom syndrome induced by mite daamge is a major factor causing 50-86 % annual crop loss across the globe. Further, algal leaf spots caused by *Cephaleuros virescens* were also reported in Bihar (India), where the symptoms appeared on the upper leaf surface as dark to reddish rust-coloured lesions, with raised velvety appearance. In this regard, integrated pest management (IPM) practices can be followed to keep the pest population below economic threshold level. The trees can be fertilized with compost inoculated with antagonistic *Trichoderma* fungus. Methyl eugenol traps and protein baits can be used for fruit fly management. *Beauveria bassiana, Paecilomyces sp*, or *Metarrhizium sp*. can be used for controlling stink bug damage. Neem oil and petroleum oil can be used to control longan eriophyid mite, *Eriophyes dimocarpi*. Further, fruit bagging has been proven to be an effective technique for the fruit borer, *C. sinensis* management. Further, longan fruit also provides enough scope for crop diversification. When the flowering of litchi and mango are over, longan bear profuse flowering and provide enough pollen and honey for honeybees. Being a cross pollinated crop, it can act as a floral source for the pollinators in the non-flowering seasons of litchi. Thus, managing the entomofauna in longan is crucial for the fruit growers, pharmaceutical industries and this will ultimately increase country's production potential and enhance the exportability as well.

Keywords: Longan, crop diversification, stink bug, fruit borer, integrated pest management

BASM/PP – 7

Screening of exotic mango varieties against mango hopper and black sooty mould

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ABSTRACT

The exotic mango varieties *viz.,* Lily, Ostin, Keitt, Kent and Tommy Atkins were screened against mango hopper and black sooty mould at Regional Fruit Research Station, Vengula (M.S.) during 2018-19 to 2021-22. The results revealed that the mango hopper incidence was the least (7.36 hoppers/panicle) on the exotic variety Kent and the maximum incidence of mango hopper was recorded on the exotic variety Tommy Atkins (13.85 hoppers/panicle) during peak flowering period (4th SMW-22th January to 28th January). The maximum black sooty mould incidence was recorded in the exotic variety Tommy Atkins (33.47%) during 11th SMW (12th March to 18th March). The incidence of mango hopper and black sooty mould was comparatively more on the check variety i.e. Alphonso (18.27 hoppers/panicle and 46.11%).

Keywords: Mango hopper, black sooty mould, Kent, Tommy Atkins

BASM/PP – 8

Evaluation of pheromone of citrus leafminer, *Phyllocnistis citrella* (Lepidoptera: Gracillariidae) in India

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ABSTRACT

An essential tool for eco-friendly pest management is the use of female sex pheromones to manage insect pests through mass male trapping. Field research conducted in Japan and the USA raises the idea of geographic variation and changes to the content of pheromones. However, In India no such studies on pheromone of *P. citrella* are reported to our knowledge. Use of pheromones could be a potential tool, to bringing down the potential level of infestation. Hence, the present investigation was undertaken to evaluate the synthetic pheromone components for effective management of citrus leafminer. The experiment was conducted deploying the Randomized Block Design comprising the six treatments and five replication including control at Yadagiri and Vijaypur districts during 2017-18 and 2018-19. The results showed a significant differences in male moth trap catches among different pheromone components lures traps across different weeks of the duration of the experiment. Further, the interaction between the trap catches and infestation also exhibited a positive relation in the attraction of male moths of CLM. The highest trap catches in Yadagiri and Vijaypur were recorded in traps loaded with T4 (Triene: Diene @ 3:1) (2.20 and 3.74 moths/trap/week, respectively) followed by T5 (Triene : Diene: Monoene @ 30:10:1)(2.01 and 2.80 moths/trap/week, respectively) during 2017-18. Similarly, the highest trap catches in Yadagiri and Vijaypur were recorded in traps loaded with T4 (Triene: Diene @ 3:1)(4.46 and 17.18 moths/trap/week, respectively) followed by T5 (Triene : Diene: Monoene @ 30:10:1)(3.58 and 14.76 moths/trap/week, respectively) during 2018-19. The least catches were recorded in control traps in both the district experiments. These results can be used under IPM and mass trapping of CLM.

Keywords: Trap, Triene, Diene, citrus, Yadgir, Vijayapur

BASM/PP – 9

Challenges in ensuring availability of label claim pesticides for underutilized fruits and vegetables in India

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ABSTRACT

India's diverse agro-climatic conditions offer a conducive environment for cultivating over 30 lesser-known vegetable crops and numerous fruits, yet these remain overlooked. Underutilized crops such as elephant foot yam, pointed gourd, amaranthus, rhubarb, parsnip, kale, asparagus, amla, wood-apple, jackfruit, jamun, bael, carambola, elephant apple, star aonla etc., boast essential nutrients, contributing to diverse diets and a robust food system. Dependence on a limited number of staple crops can pose risks to food security, making underutilized crops vital in mitigating failures due to pests, diseases, or climate change. However, the production of these crops faces challenges from pests and diseases, often managed through chemical means. Unfortunately, label claim pesticides, which undergo rigorous testing for safe residue limits, are scarce for these crops. Such pesticides are crucial for proper usage, safety precautions, and compliance with regulatory standards, addressing risks associated with mishandling, protecting crops, and promoting awareness about safe pesticide use.In the absence of label claim pesticides tailored to these crops, farmers may resort to generic alternatives, risking ineffective pest control and environmental harm. Stringent international market regulations on pesticide residues highlight the importance of label claim pesticides, facilitating access to markets and export opportunities. Nevertheless, the development and registration of new pesticides are costly and time-consuming, dissuading investment for minor or underutilized crops. India's pesticide registration process involves exhaustive data collection, toxicological studies, efficacy trials, and regulatory compliance. Yet, the demand for specialized pesticides for minor crops may not justify the costs, leading to a dearth of label claim options. Additionally, farmers cultivating underutilized crops may lack awareness of the significance of label claim pesticides, potentially compromising pest management practices and crop quality.

Keywords: Underutilized vegetables and fruits, pesticide label claim, environmental harm

BASM/PP – 10

Effective utilization of underutilized pomegranate: Sub-Himalayan wild types for biotic stress

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ABSTRACT

Pomegranate belongs to *Punicaceae* family, is renowned for its rich nutritional and therapeutic benefits. In addition to being a delectable dessert fruit, it serves as a valuable acidulent known as anardana. Anardana is derived from wild pomegranate types found in the northern regions of Uttarakhand, Himachal Pradesh, and Jammu & Kashmir. Initially, its consumption was primarily confined to North India, but its growing recognition for its nutraceutical properties is gradually introducing it to Southern and Central India. Furthermore, pomegranate crops in the sub-Himalayan regions have exhibited resilience to both biotic and abiotic stress factors. Recognizing the potential of these sub-Himalayan pomegranate varieties to withstand biotic stress, the Indian Institute of Horticultural Research embarked on an exploration mission. They collected 38 sub-Himalayan pomegranate accessions from Phagli, Himachal Pradesh, and subsequently domesticated them through cuttings and multiplication. These accessions underwent rigorous screening against various stress factors, including bacterial blight, wilt, nematode infestations, and shot hole borers, using standardized protocols. Among the collection, an accession 'IC 318762' demonstrated remarkable tolerance to nematodes. Given that nematodes are one of the causative agents of wilt in pomegranate, IC 318762 will undergo further evaluation and be incorporated into hybridization programs, holding promise for enhancing the resilience of pomegranate crops. This discovery has the potential to contribute significantly to the cultivation of healthier and hardier pomegranate varieties in India.

Keywords: Pomegranate, Sub-Himalayan types, anardana, nematode, wilt

BASM/PP – 11

Seasonal incidence of insect pests and natural enemies in bael (*Aegle marmelos Correa*.)

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ABSTRACT

Bael (*Aegle marmelos Correa*.) is one of the most important minor fruit crops with medicinal and antioxidant properties grown in India from sea level to moderately high altitude. It is also called as Bengal quince or Indian quince. About 30 species of insect and mites have been reported feeding on the bael in India. A survey was conducted in different bael cultivars for the incidence of pests and natural enemies at Central farm, Horticultural College and Research Institute, Periyakulam during 2022- 2023. The cultivars surveyed were Goma Yashi, NB-5 and , NB-6. During the survey ten trees were randomly selected and observed by visual counting the pests and natural enemy population and their infestation in selected fruits and twigs at weekly intervals as per standard methodology. The incidence of pests and natural enemies in different bael cultivars revealed that the citrus butterfly, fruit fly, mealybug, whitefly, common green colonel, leaf miner and spiralling whitefly were found to be major pests in bael ecosystem of Horticultural College and Research Institute, Periyakulam. The infestation of whitefly (22.14/tree), citrus butterfly (5.35/tree), leaf miner (5.28%) in Goma Yashi was found maximum whereas whitefly (23.21/tree) infestation was high in NB-5 as compared to other cultivars. The bael cultivar Goma Yashi was found to record less mealybug damage (1.14%) compared to NB-6. In NB-6 cultivar, high infestation of citrus butterfly and mealybug were recorded. Leaf miner incidence was positively correlated with maximum temperature (0.608) while, mealybug incidence was positively correlated with minimum temperature (0.650). Rainfall was negatively correlated with the incidence of all the pests recorded in bael.

Keywords: Bael, fruit fly, whitefly,cultivar, leafminer

BASM/PP – 12

Seasonal incidence of sucking pests and natural enemies of anola under arid zone farming ecosystem

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ABSTRACT

Aonla (*Emblica officinalis*) the king of arid fruits has excellent nutritive and therapeutic values and great potentiality for processing into various quality products. Being a hardy fruit, it is marked by abiotic limitations such as high temperature, low erratic rainfall, high evapotranspiration etc., and biotic factors like insect pests which are restrictive factors for crop production. Hence, a study was conducted to find the impact of weather parameters on insect pests incidence at Horticultural College and Research Institute, Periyakulam during 2021-2022. The incidence of mealy bug population showed significant negative relationship (r=-0.4120) with maximum temperature but minimum temperatures showed non-significant negative relationship (r = -0.1770). The correlation studies (r) between weather parameters and aphid population revealed that the maximum and minimum temperatures showed non-significant negative relationship (r = -0.2383 and r = -0.1850), while relative humidity had non-significant positive relationship (r = 0.2163) with aphid population, where as rainfall exhibited non-significant negative relationship (r = -0.0059) with aphids population. The weather correlation studies on rthrips population revealed that the maximum temperature showed significant negative relationship (r = - 0.4667) and minimum temperature showed non-significant negative relationship(r = - 0.1850), while relative humidity had significant positive relationship (r = - 0.5375) with thrips population, where as rainfall exhibited non – significant positive relationship (r=0.3366) with thrips population. The correlation studies (r) between weather parameters and per cent parasitism revealed that the maximum temperature, minimum temperature and relative humidity showed non-significant positive relationship (r = 0.0180, r = 0.0386 respectively) with per cent parasitism, where as rainfall exhibited significant positive relationship (r = 0.4593) with per cent parasitism.

Keywords: Aonla, thrips, aphids, weather parameters

BASM/PP – 13

Occurrence of fruit rot in soursop caused by *Lasiodiplodia theobromae* in India

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ABSTRACT

Soursop, also called as graviola (*Annona muricata* L. *Annonaceae* family) has a delicious flavor and possesses immense health benefits. It is amenable for cultivation as an intercrop in plantation based cropping system. Severe incidence of fruit rot disease was observed in soursop grown in coconut- based cropping system during April to May 2022. Symptoms were visualized as brown color lesions either on the distal end or in middle surface of fruit. The lesions subsequently joined together leading to complete rotting of fruit including internal rotting of tissues and falling of infected fruits. The fungal isolates were consistently isolated from the infected samples and were characterized based on morphological traits, molecular phylogenetic analysis and pathogenicity test. The isolates were characterized as whitish grey color colonies which later turned to dark grey with wooly aerial mycelium. The immature conidia were hyaline, aseptate, ellipsoidal and unmelanized, while the mature conidia were septate, melanized, brownish with longitudinal running striations (25.4 × 14.3 μm). In pathogenicity tests, typical symptoms of fruit rot disease were recorded on fifth day and complete rotting by the seventh day after incubation. The combined multi-locus sequence analyses, coupled with a critical examination of the phenotypic characters, revealed the association of *Lasiodiplodia theobromae* with fruit rot of soursop. To our knowledge, this is the first report of *L. theobromae* causing fruit rot in soursop in India.

Keywords: Soursop, phyologenetic analysis, sequence analysis

BASM/PP – 14

Performance of grafted cherry tomatoes in *Ralstonia solanacearum* (bacterial wilt) infested greenhouse soil

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ABSTRACT

Grafting is gradually becoming akey tool that minimizes the risks associated with intensive vegetable production systems, including soil-borne diseases. This study assesses the performance of two cherry tomato hybrids (‘Cheramy’ and ‘Sheeja’) grafted onto three tomato and five eggplant local rootstock genotypes (cultivated/wild) under *Ralstonia solanacearum* (bacterial wilt)-infested greenhouse soil. The impact of grafting on growth, yield and fruit physical quality was mainly influenced by the response of rootstocks to disease resistance. The non-grafted plants of both the cultivars were severely affected by bacterial wilt, thus presenting high susceptibility to disease. Eggplant rootstocks imparted moderate to high resistance against bacterial wilt in both the scions, while tomato (cultivated or wild) rootstocks did not improve disease resistance, except ‘Anagha’, which provided resistance to scion cv. ‘Cheramy’. In general, scion cv. ‘Cheramy’, grafted or non-grafted, showed superior growth, yield and fruit quality compared to ‘Sheeja’. The most productive graft combinations for both the cultivars involved resistant rootstocks, i.e., ‘Sheeja’ onto eggplant rootstock ‘Surya’, and ‘Cheramy’ onto tomato rootstock ‘Anagha’. Fruit quality attributes such as ascorbic acid and lycopene contents were considerably higher, and the total soluble solids (TSS) content was considerably lower in scion cv. ‘Cheramy’, whether grafted or non-grafted, than those involving scion cv. ‘Sheeja’. The grafting effect on fruit chemical quality attributes was not promising, except grafting ‘Sheeja’ onto ‘*Solanum pimpenellifolium*’ for TSS, ‘Sheeja’ onto ‘*Solanum torvum*’ for lycopene and ‘Cheramy’ onto ‘Ponny’ for total phenols, though no clear connection with disease incidence was in these grafts. Conclusively, eggplant rootstock imparted wilt resistance, while both eggplant and tomato rootstock grafting was beneficial to both scion cultivars in boosting the overall production and economic gains, especially for ‘Cheramy’ grafted onto ‘Anagha’ rootstock under bacterial wilt infested soil of greenhouse.

Keywords: Rootstocks, phenols, grafting, greenhouse

BASM/PP – 15

Role of *Piriformospora indica* in mitigating drought stress in watermelon

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ABSTRACT

Watermelon (*Citrullus spp*.) is a tropical fruit that belongs to the Cucurbitaceae family. Long-term drought stress lowers fruit yield in watermelon. *Piriformospora indica* is a novel root endophytic fungus that enables plant growth under severe biotic and abiotic stresses. The effect of *P. indica* on the growth and physio-biochemical attributes of watermelon seedlings of a drought tolerant (Thar Manik) and drought susceptible (Sugarbaby) variety grown under well- watered and drought conditionswere investigated. The results indicated that *P. indica* has promoted shoot and root growth in both the varieties of watermelon irrespective of the water treatment. Drought stress has decreased the leaf relative water content in both the varieties, but to a lesser extent in *P. indica* inoculated seedlings. The leaf proline content and catalase activity was significantly increased under drought stress and it was further enhanced due to pre-treatment with *P. indica.* The average leaf antioxidant activity of *P. indica* treated Sugarbaby and Thar Manik seedlings were estimated as 19.95% and 26.02% under water deficit, whereas those of the non-treated seedlings were 16.39% and 21.58% respectively. The chlorophyll concentration was also found to be higher in *P. indica* treated seedlings (4.81 and 4.21 mg g^{-1} FW) than in the non- treated ones (4.00 and 3.94 mg g^{-1} FW). *P. indica* treatment has also resulted in a better photosynthetic activity, stomatal conductance and transpiration rate upon drought stress. Among both the varieties, Thar Manik had a better performance under drought stress, but the influence of *P. indica* was more pronounced in Sugarbaby. This study reveals the positive impact of *P. indica* in enhancing drought tolerance in watermelon.

Keywords: Chlorophyll, tolerance, transpiration, photosynthesis

BASM/PP – 16

Evaluation of heat tolerant potato (*Solanum tuberosum* L.) genotypes for growth and yield parameters

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ABSTRACT

A field experiment was conducted to identify heat tolerant potato genotypes suitable for cultivation under high temperature regions of South India. Eight potato genotypes (HT/14-95, HT/14-109, HT/12-834, HT/16-113, HT/12-116, HT/10-1554, HT/12-830 and HT/15-240) along with Kufri Surya as check were evaluated at two different planting dates of November 10 and November 17 during *rabi* season of 2020-21 at College of Horticulture, Dr.YSR Horticultural University, Venkataramannagudem, West Godavari district, Andhra Pradesh. All growth and yield parameters were found significantly higher at 10th November planting compared to 17th November planting. Genotypes HT/12-834, HT/15-240, and HT/14-109 performed better over other genotypes for growth attributes. Maximum number of tubers per plant was recorded in HT/12-834 while highest diameter of tubers and maximum average tuber weight were recorded in HT/10-1554. Membrane stability index was observed highest in Kufri Surya while highest chlorophyll content and chlorophyll stability index were recorded in genotype HT/12-830. Genotypes HT/12- 830, HT/12-834, and HT/15-240 were found significantly superior over the check variety Kufri Surya for total and marketable yield of tubers per hectare, while the genotypes HT/14-109 and HT/12-116 were found on par with it. The above mentioned superior genotypes can be successfully used for breeding and development of heat tolerant potato varieties suitable for cultivation under high temperature plains.

Keywords**:** Heat tolerant genotypes, membrane stability index, chlorophyll stability index

BASM/PP – 17

Solanum torvum: An indispensable resource for eggplant advancement

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ABSTRACT

To meet the demand of food, nutritional security in most populated country like India, accompanied bythe voice of climate change, it's time to tap the underutilized crop species to harness their benefits. *Solanum torvum*, the most appreciated crop wild relative of eggplant in the solanaceous family. An evergreen, tiny tree, bearing white flowers and small green fruits, is commonly called as, Devil's fig, Prickly solanum, turkey berry, Bhankatiya, Sundakkai etc. The species is native to Central America and geographically distributed in the Caribbean, few parts of Africa, Southeast Asia. Like cultivated species, torvum also has antiviral, antimicrobial, immune secretory, anti-inflammatory, antioxidant and nutraceutical properties. The delicious fruits rich in micronutrients are available in the markets and consumed as an ingredient popularly in various parts of the world, where, Thai curry, Indian sambar, Ghanaian Kontomire Stew, Filipino Pinakbet, Sri Lankan Pickles and Jamaican Callaloo are the most famous and unique flavoured cuisines made out of it. Apart from its utilization as a vegetable, as a rootstock, its application is just awesome in advancing the brinjal, tomato breeding for combating biotic stresses like bacterial and fungal wilts, root knot nematode, spider mite and few abiotic stresses including salt stress tolerance. Additionally, it also serves as a source from which the genes can be transferred into other backgrounds through conventional and through applying modern biotechnological tools. Turkey berry is the most widely used rootstock for eggplants, accounting for over 50% of the total area of grafted eggplants in Japan. Through the exploration of this particular species in breeding system, one could also contribute to the conservation of the wild/uncultivated species, preserving genetic resources, broadening the genetic base. In time to come, use of CRISPR/Cas 9technologyfor targeted modification of required traits can be exploited.

Keywords: Rootstocks, conventional, traits, wild, antioxidants

BASM/PP – 18

Influence of eggplant rootstocks on yield, quality and bacterial wilt resistance in tomato

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ABSTRACT

Bacterial wilt is one of the most economically important diseases of tomato in the tropics and subtropics. Grafting onto resistant rootstocks can provide an alternative and effective solution to manage soil-borne bacterial wilt disease in tomato. The present investigation was conducted in September 2022 to January 2023 with an objective to study the influence of rootstocks on yield, quality and bacterial wilt resistance in F1 hybrids of tomato. Experiment was laid out in RBD with two replication. Four bacterial wilt resistant eggplant (*Solanum melongena*)varieties (Surya, Haritha, SM116, SM3) and two *Solanum torvum* accessions (TNAU-1 and KAU-1) were evaluated as rootstocks for grafting with two commercially grown F1 hybrids of tomato (Lakshmi and Sampoorna) as scion under open field conditions in Kerala. Graft compatibility using the wedge grafting method as well as incidence of bacterial wilt (wilting percentage), fruit yield and quality parameters were assessed. All the rootstocks showed good graft compatibility (85% and above) and grafted plants showed low wilting percentage (0.0–20.0%) in bacterial wilt sick field. Four eggplant (*Solanum melongena*) rootstocks evaluated were immune to bacterial wilt and two *Solanum torvum* rootstocks (KAU-1 and TNAU-1) imparted moderate resistance. Grafting significantly improved plant height, average fruit weight and fruit yield/plant of tomato. Among grafted plants, grafts of tomato on Haritha rootstock recorded significantly higher fruit yield/plants. Fruit quality were assessed in terms of TSS, acidy, lycopene and vitamin C content of the fruits. Rootstocks used in the study does not had a significant influence on TSS and lycopene content of the fruits. Titrable acidity was improved whereas vitamin C content was decreased. These results shows that the rootstocks used in the study can effectively impart bacterial wilt resistance and improve fruit yield in tomato.

Keywords: Yield, resistance, replication, graft

BASM/PP – 19

Natural and artificial screening of chilli germplasm for tolerance to leaf-curl mosaic complex virus disease.

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ABSTRACT

Chilli is a vegetable crop grown worldwide and India is the largest producer, consumer and exporter of chilli. Fungal, bacterial and viral diseases in chilli contribute to a great loss of yield, among which up to 100% yield losses have been reported due to viral diseases and their complexes in chilli. The management of diseases and pests in chilli is mainly reliant on the advancement of host plant resistance and chemical control. Hence, a total of sixtyfour genotypes of chilli belonging to *Capsicum annuum*, *C. frutescens* and *C. chinense* were screened under natural and artificial environments to find out resistance against leaf curl-mosaic complex. Natural screening was initiated during the summer season (January–March). Artificial screening was done by espousing graft transmission. The variables used for screening were disease vulnerability and disease incidence. The sixty-four genotypes were further alienated into twelve clusters by implementing Mahalanobi's D2 statistics. Thirty genotypes were carefully chosen for their complex disease tolerance under natural conditions based on disease scoring, vulnerability index, and disease incidence. The graft transmission revealed that among the sixty-four genotypes, nine were tolerant to the leaf curl-mosaic complex virus. Members of different clusters showing tolerance to the disease can be used for the development of hybrids that are high-yielding and have tolerance to the leaf curl-mosaic complex virus.

Keywords**:** Chilli-host plant resistance, vulnerability index, mahalanobis D^2 statistics

BASM/PP – 20

Understanding resistant reaction to *Globodera rostochiensis* through transcriptome analysis in potato (*Solanum tuberosum* L.)

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ABSTRACT

In temperate potato-growing areas, potato cyst nematode (PCN) is a major pest worldwide, including India. It remains in the soil and negatively impacts potato yield and output long-term. What molecular changes result from PCN infection in the roots is mostly unknown. The generation of resistant cultivars will be aided by identifying the transcripts and genes controlling PCN resistance. Therefore, RNA sequencing was used to examine the gene expression profiles of compatible (Kufri Jyoti) and incompatible (JEX/A-267) genotype roots at 0 DAI and 10 DAI infection of *Globodera rostochiensis* juveniles. Each sample produced 33–37 million total reads, with 48–84% of those reads matching the potato reference genome. In total, 516 genes were downregulated and 566 genes were upregulated in the JEX/A-267 infected roots, while 316 and 554 genes were downregulated and 566 genes were upregulated in Kufri Jyoti. It was found that pathogenesis-related proteins, disease-resistance proteins, zinc finger proteins, WRKY transcription factors, and cell wall proteins were primarily responsible for the incompatible reactions after PCN nematode infection in the resistant genotype. Quantitative real-time PCR was used to confirm the RNA-Seq data, and it was shown that the ATP, FLAVO, CYTO, and GP genes were upregulated at 5 DAI and subsequently downregulated at 10 DAI. The genes encoding *ATP, FLAVO, LBR* and *GP* were present in >1.5 fold before infection in JEX-A/267.These genes were upregulated 7.9 to 27.6 fold at 5 DAI; afterwards, most were downregulated to 0.9 to 2.8 fold except *LBR,* which was again upregulated to 44.4 fold at 10DAI.

Keywords: *Globodera rostochiensis*, gene expression, PCN, potatoes, resistance, RNA seq

BASM/PP – 21

Drought tolerance of lesser known cucurbits

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ABSTRACT

Cucurbits are a vast group of vegetables grown throughout the world and contribute to the daily diet of a large global population. Drought is one of the major factors limiting the agricultural production. The effect of drought on the growth and physio-biochemical attributes of some selected genera of cucurbits were investigated. The species of cucurbits selected for this study were *Cucumis callosus, Cucumis melo* var. *momordica, Luffa aegyptiaca, Luffa acutangula, Cucurbita moschata,Cucumis melo var. conomon, Momordica charantia var. muricata etc*. Relative water content was decreased in all the species, but to a lesser extent in *Cucumis callosus, Momordica charantia var. muricata* and *Cucumis melo var. momordica* under water deficit. The leaf proline content had significantly increased under water deficit, and it was also found to be higher in these species (371.11, 770.79, and 490.85 mg/g FW). The average leaf antioxidant activity of *Cucumis callosus, Momordica charantia var. muricata* and *Cucumis melo var. momordica* were estimatedas 47.38%,46.13 % and 64.58% under water deficit, whereas those of well-watered were 54.09%, 52.55% and71.76 % respectively. The difference in chlorophyll concentration under well-watered and water deficit condition were also found to be lesser in these species compared to other species taken for study. Compared with others, these species exhibited higher photosynthetic activity, stomatal conductance and transpiration rate even under water deficit. The drought tolerant promising species identified from the study were *Cucumis callosus, Momordica charantia var. muricata* and *Cucumis melo var. momordica.*

Keywords: Stomata, transpiration, drought, photosynthetic

BASM/PP – 22

Evaluation of F_2 segregating population of chilli (*Capsicum annuum.* L) for yield and leaf curl virus resistance

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ABSTRACT

Chilli (*Capsicum annuum* L.) is an important vegetable crop belonging to the Solanaceae family with a diploid chromosome number of 2n=2x=24. The incidence of various biotic and abiotic stresses have resulted in the reduction of productivity which is a major constraint in chilli cultivation. Chilli is susceptible to various pathogens including viruses, which cause heavy production losses and so far different viruses have been reported, including begomo viruses infecting chilli throughout the world. The present experiment was carried out during 2020 - 2021 at College of Agriculture, Vellayani, Kerala Agricultural University to evaluate the F_2 segregating population of two chilli crosses *viz.,* CHIVAR-6 x Sel-4 and CHIVAR-10 x Sel-3 for yield and leaf curl virus resistance. 200 segregants from each cross were evaluated in the field along with their parents. Based on the field observation, the segregants were categorized into highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible. The coefficient of infection revealed that both the F_2 segregants and their parents displayed high resistance for leaf curl virus. The results revealed that based on the yield and leaf curl virus resistance studies, the segregants of cross CHIVAR-10 x Sel-3 performed better than cross CHIVAR-6 x Sel-4 and the segregants C-2-161, C-2-168, C-1-117, C-2-10, C-2-154 and C-1-151 showed the highest yield as well and resistance to leaf curl virus hence are suitable for further studies.

Keywords**:** Chilli, segregants, chilli leaf curl virus, resistance

BASM/PP – 23

Diversity analysis in yardlong bean (*Vigna ungiculata* subsp. *sesquipedalis* L.) genotypes grown under coastal ecosystem

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ABSTRACT

Yardlong bean [*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdcourt] is an important leguminous vegetable grown in every ecosystem. Though, it is a highly nutritive summer vegetable, there are few commercial variety of yardlong bean with high yield and better pod quality have been released for other ecosystem and no commercial variety is recommended for saline ecosystem. The crop remained unexploited owing to low productivity, long duration and indeterminate growth habit. Hence, an efforts for improving yield potential among genotypes by breaking the yield barriers, the present investigation on genetic diversity analysis to isolate superior genotypes under saline condition. The Mahalanobis D^2 statistics revealed that the 21 genotypes were grouped into nine clusters. Among them, nine genotypes grouped in cluster I, six genotypes in Cluster V, three genotypes in cluster IV and VII respectively. Cluster II, III and VI had two genotypes each and cluster VIII and IX had monogenotypic which indicated that these clusters contain most diverse genotypes. The average intra cluster distances between nine clusters revealed that the cluster IV (161.76) followed by cluster VII (154.30) was found to have the maximum intra cluster distance and the genotypes in these clusters are more diverse. The traits viz., yield plant^{-1} (88.18 per cent) was the maximum contributor to genetic divergence, followed by number of pods plant^{-1} (7.39 per cent) and vitamin C content (1.23 per cent) showed maximum contribution towards genetic diversity and these traits could be considered for selection. The wider yield range (0.54kg to 4.35kg plant^{-1} under saline condition reflected a greater scope to exploit yard long bean for greater yield.

Keywords: Yardlong, ecosystem, saline, yield, genotypes

BASM/PP – 24

Field evaluation of sweet potato genotypes for resistance to *Cylas formicarius* (Coleoptera: Apionidae) infestation in pasighat, Arunachal Pradesh, India

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ABSTRACT

The sweet potato is one of the most significant tuber crops grown in India's North Eastern states, and it serves to reduce poverty, promote food security, and improve nutrition and health. In this region, farmers are facing a major problem of yield decline due to the most destructive pest, the sweet potato weevil, *C. formicarius*. The current study was conducted at the Vegetable Research Farm of the College of Horticulture and Forestry in Pasighat (Arunachal Pradesh) for two consecutive Rabi seasons in 2021–22 and 2022–23. The study was aimed at evaluating 29 local genotypes of Northeast India, along with two commercial cultivars, Sree Bhadra and ST-14, for their relative susceptibility to the infestation of sweet potato weevil under natural infestation conditions. Vine sensitivity and resistance to sweet potato weevil, grasshopper, and thrips infections were investigated. The sweet potato weevil infestation on the tuber was recorded for parameters such as the number of holes per tuber, damage length in tubers per vine, the number of infested and uninfested tubers per vine, the total number of tubers per vine, the percent tuber damage, the weight of infested and uninfested tubers per vine, the tuber weight per vine, and the tuber weight per vine. Sweet potato weevil and grasshopper infestations on the vines were lowest in CHFSP-10, while thrips infestations were lowest in CHFSP-07. In terms of tuber incidence, the genotypes CHFSP-10, CHFSP-14, and CHFSP-15 performed much better against *C. formicarius*. Sweet potato weevil infestation on thevine showed a positively significant association ($p<0.05$) with damaged tubers per vine (% on number basis) ($r=0.50$) but a negatively significant correlation ($p<0.05$) was exerted by thrips infestation ($r=-0.02$), total number of tubers per vine ($r=-0.40$) and a highly negative correlation ($p<0.01$) was recorded with number of uninfested tubers per vine ($r=-0.47$). Thus, the current study reveals the substantially decreased sensitivity of CHFSP-10, CHFSP-14, and CHFSP-15 to sweet potato weevil and the feasibility of using them in varietal development to improve breeding programmes.

Keywords**:** Sweet potato weevil, grass hopper, thrips, sweet potato genotypes, correlation

BASM/PP – 25

Bio-fortification of underutilized horticultural crops

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ABSTRACT

Biofortification has emerged as a strategic approach to enhance the nutritional quality of horticultural crops, offering a potential solution to malnutrition and associated health issues. This abstract provides an overview of the concept of biofortification in fruits and vegetable crops, focusing on the enrichment of essential vitamins, minerals, and other beneficial compounds. Various biofortification techniques, including traditional breeding methods and modern biotechnological approaches, are explored in the context of improving the nutritional content of fruits and vegetables. This discusses about the importance of targeting key nutrients such as iron, zinc, vitamin C, and antioxidants to address specific dietary deficiencies. Moreover, the potential impact of biofortified horticultural crops on both local and global nutrition is discussed, along with challenges related to regulatory considerations, consumer acceptance, and agronomic feasibility. Collaboration among researchers, horticulturalists and nutritionists is essential to overcome these challenges and ensure the successful development and dissemination of biofortified horticultural crops.

Keywords: Bio-fortification, underutilized horticultural crops, malnutrition

BASM/PP – 26

Management of black leaf spot of ber using biocontrol agents, fungicides and botanicals

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ABSTRACT

Ber leaf spot is the most devastating disease in ber cultivation during monsoon season and causing economic losses. It is caused by the fungus *Isariopsis personata*var. *zizyphi.* The fungus produces some black powdery growth on the lower and upper leaf surfaces. Taxonomically it is related with sooty mold fungus. Due to this disease the photosynthetic area is highly reduced and resulted in yield reduction. In advance cases the pathogen causes necrotic patches and rotting on fruits. In severe cases the leaf spot incidence ranged up to 70 Per cent Disease Index

Keywords: Ber, disease index, lower leaf

Theme – 6
Technology Assessment
Oral Presentations

TA/OP – 1

Mangosteen cultivation: successful case studies from Southern India

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ABSTRACT

Mangosteen, often referred to as the "queen of fruits," is a tropical evergreen tree valued for its juicy, delicate texture and slightly astringent flavor. Globally celebrated for its myriad health benefits including anti-inflammatory properties, mangosteen cultivation thrives primarily in Southeast Asia and India emerging as a significant contributor to the world's production. This research paper portrays the socio-economic analysis of the cultivation practices, economic returns and challenges faced by multiple mangosteen farmers of Kerala. On an average, farmers reported a yield of around 1 ton per acre in initial years. Farmers' have been guided and trained through Vegetable fruits production centre, Kerala and KAU on production techniques of mangosteen. All the respondents possessed higher social participation by being members of farmer producer groups/self help groups/gram panchayath etc. A broad spectrum of experience is observed from novices with less than 5 years to seasoned cultivators with over 20 years in the field. Transplanting saplings of mangosteen is the popular method, though some also employ direct seeding. Bi-weekly irrigation, primarily from natural wells, combined with a preference for organic compost and manure indicates a trend towards sustainable practices. Economic yielding started between 6-8 years. Financial analysis revealed that all farmers operated on their own capital without any government subsidies or financial borrowings. The major cost factors identified included seedlings/ planting materials, labor, and irrigation & water management. Mangosteen was harvested every year during April-July. On an average 60-80 mangosteen plants were planted in an acre and returns ranged significantly around Rs.5,00,000/acre/year. Farmers experienced a profit increase between 11 to 20% over the past three years. Diversification in crops resulted in supplementary income with the growing of nutmeg, rambutan, cardamom, coconut trees, dragon fruit, banana, Mango, Guava and rubber plantations etc. The mangosteen fruit marketing channels are direct marketing from farmers to consumers, and indirect marketing as wholesale to traders and in VFPCK's market. The fruits are marketed and supplied mainly to Bengaluru, Chennai, Hyderabad, Delhi and Mumbai. Some farmers witnessed a steady market and others faced inconsistent price fluctuations. Interventions for improved 'kokum' utilization in Southern India may include the organization of growers and collectors, increasing public awareness on the medicinal properties of kokum and the introduction of value adding technology. The mangosteen agribusiness development needs regional government intervention in the form of facility and infrastructure requirement as well as supply chain strengthening in order to create large-scale, economical, and highly competitive farms.

Keywords: Mangosteen, Kerala farmers, production, marketing, financial analysis

TA/OP – 2

Cultivating avocados in tropical climate: farmers perspective

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ABSTRACT

The cultivation of temperate fruits in tropical regions presents a fascinating agricultural confluence that has garnered increasing attention in recent years. The cultivation of temperate fruits in tropical climates offers a spectrum of potential advantages. It can diversify the agricultural landscape, reducing dependence on conventional crops and enhancing food security. Avocado, in particular, stands out for its nutrient-rich composition and healthy fats, making it a valuable addition to local diets. Additionally, the cultivation of temperate fruits may open new avenues for income generation for small & medium farmers, as these fruits often command higher market prices due to their relative scarcity in tropical regions. To comprehensively assess the perceived benefits and challenges associated with cultivating temperate fruits, especially avocados, this study was conducted in different parts of tropical Karnataka, Andhra Pradesh and Telangana region in 2023. The findings revealed that 86.25 per cent of farmers perceived avocado as a high-value crop capable of substantially augmenting farmers' income. Moreover, 75% of the respondents perceived that avocado cultivation had the potential to diversify the horticultural sector and reduce reliance on traditional crops. However, this practice is not without its challenges. The primary challenge is the stark contrast in climate requirements between temperate and tropical regions. An overwhelming 98.75 per cent of farmers identified susceptibility of avocado crops to specific pests and diseases not well-understood in local contexts as major challenge. Additionally, 73.75 per cent of respondents pointed out that avocado farming demand a consistent and controlled water supply, which can be challenging, as a substantial challenge to successful avocado cultivation. Addressing these challenges will necessitate collaborative efforts among farmers, researchers, and policymakers to ensure the sustainability and prosperity of temperate fruit cultivation in tropical regions. Furthermore, adopting a holistic approach that integrates environmental and socioeconomic considerations will be instrumental in harnessing the full potential of this horticultural endeavor, particularly in the context of a shifting climate and evolving global food systems.

Keywords: Avocado, unconventional climate, Opportunities, Challenges

TA/OP – 3

Leveraging Ag-startups in mid-stream segment of supply chain of underutilized horticultural crops

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ABSTRACT

Ag-startups have played a significant role in the entrepreneurship ecosystem in recent years and their role is well witnessed from farm to fork, however, they still have a greater role to play in the mid-stream sector of supply chain of fruit sector, particularly in the under-explored crops like Dragon fruit. Such fruits are reported to provide not only nutritive value and health benefits but also tolerant to abiotic stresses and hence startups can sense and seize such opportunities by developing unique business plan and viable product. While doing so, they would solve the problem of fragmented and inefficient supply chain and also generate a lucrative earnings model to survive and succeed in the market, which can benefit the tri-actors of agri-startup eco system; the farmers, consumers, and startup founders. The startup founders can also collaborate with Fintech startups for financing and farmers' associations for sourcing and capacity utilization. Such under-utilized fruits for potential business can fetch remunerative prices to farmers and also satisfy the nutritive requirements of the consumers. The model can identify niche territories and target consumer base while offering the unique product to ease the pain point in the mid-stream of the supply chain. It is witnessed that there has been whopping private equity investments in ag-startups that can make use of the opportunity at the niche segment of supply chain of fruit crops focusing mainly on cold chain, automated warehousing, and market linkage. Capitalizing on such favourable investment opportunities and startup policy environment, ag-startups can tackle the problems of mid-stream sectoral supply chain in the fruit sector, which will take a leap forward in the entire agri-entrepreneurship eco system.

Keywords: Ag-startups, supply chain, entrepreneurship, unique earning model, niche product

TA/OP – 4

Heliconia-An exotic floral crop for enhancing of income from coconut plantation in coastal regions of India

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ABSTRACT

Heliconias, which are native to South and Central America, are popular as ornamental plants and cut flowers because of their brilliant colours and exotic appearance. In order to exploit the potential of heliconias as an intercrop in the coconut plantations, a study was undertaken in the 20 year old coconut plantation (Cv. *Benaulim*) in ICAR -CCARI, Old Goa during 2015-2019. The study includes 25 varieties of heliconias planted as intercrop in the existing coconut plantations. The study was conducted for five years for different purpose like cut flower production, cut leaves production, suckering habit, vase life studies *etc.* At the end of the study, it was proven that heliconia is an ideal and profitable cut flower crop in coconut plantations. Practically heliconias can be planted in all the inter space of coconut. But for easy management and flowering, it is planted at a spacing of 1.5 x 1.5m so as to accommodate 16 heliconia plants in four coconuts planted at 8x8m spacing. Generally heliconia starts first flowering at 6-8 months after planting depending on the variety. The performance under coconut indicated that it produced around 10-15 flowering suckers/clump/year depending on the variety. On an average, 600-700 plants of heliconia can be planted in one hectare of coconut plantation as inter crop. Each clump can produce 5-10 flowering suckers/clump in one year. The average price of heliconia flower ranges from Rs.5 to Rs.20 depending upon the variety. Hence a minimum income of around Rs.25, 000/ha to maximum of Rs.90, 000/ha can be realized depending upon the variety of heliconia planted. In addition to flower, production of sucker is an important income generation activity. The sucker production depends on the variety and it ranges from 15-35 suckers per clump. Even 5-10 suckers per clump has to be periodically removed to maintain the spacing and lighting for plants. Hence, the average price of sucker is around Rs.20-50 depending upon the variety. An average of Rs.10/sucker can yield up to Rs.50, 000/ha through sale of sucker and it will be an additional income to the farmers. The promising varieties or types of heliconia as intercrop in coconut are Sexy Pink, Temptress, Lobster Claw-1 and 2, Pedro Ortiz, Golden Torch, Kauwachi, Sassy and Adrian Red.

Keywords: Heliconia, coconut plantation, intercrop, income generation

TA/OP – 5

Role of Agro-Eco Tourism (AET) centres in the promotion of underutilized and exotic horticulture crops

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ABSTRACT

Agro-ecotourism (AET) is a perfect blend of agriculture and ecotourism that is one of the emerging enterprises in the country. AET centres act as a centre of knowledge and experience of agriculture and rural life for its visitors by providing them with a chance to see the farm, do activities, taste the produce and stay in the farmhouse. India is the homeland of several horticultural crops that are not cultivated on a commercial scale but can be rated as potential sources of nutrients and medicines. The indigenous wisdom about these crops may be lost from generation to generation.AET centres are potential units to conserve these crops and showcase them to the young generation and modern society. Similarly, the scope of the introduction of exotic horticultural crops also exists there. Visitors can enjoy the flavours of the exotic fruits and vegetables and the beauty of exotic flowers.The idea of processing and value addition of these crops as food as well as medicine can also be dispersed in the processing unit of the centre. The nursery of the AET centre can sell quality planting materials for these crops and the souvenir counter can sell fresh or processed products. AET centres provide a sustainable livelihood to the farmers through crop diversification, value addition and guest management. ICAR-Central Coastal Agricultural Research Institute, Old Goa, the nodal centre for agro-ecotourism in our country. Through the model AET units, the institute demonstrates the propagation, cultivation, and value addition of indigenous underutilized and exotic horticultural crops. The interested farmers and rural youth were also given training on the establishment and management of AET centres by this institute.

Keywords: Agro-eco tourism, promotion, underutilized crops, exotic crops

TA/OP – 6

Sigandhini: The resilient savior of India's spice heritage

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ABSTRACT

India, often hailed as the "Spice Bowl of the World," has a rich history intertwined with the cultivation and trade of exotic spices. The arrival of the British in India was largely driven by the allure of these spices, with black pepper reigning as the "King of Spices." For centuries, the Western Ghats region has been a primary hub for black pepper cultivation. However, changing climate patterns and other factors have brought new challenges, particularly for the ruling variety, Panniyur-1, which is susceptible to slow and quick wilt diseases, leading to reduced yields and increased prices. Amidst this crisis, a remarkable farmer, Mr. Ramakantha Hegde, and his ancestors from Siddapura Taluk in Uttara Kannada, have conserved an age-old black pepper variety called Sigandhini, renowned for its resistance against wilt diseases and its high bulk seed density. With the support of scientists and under the Protection of Plant Varieties and Farmers' Rights Act (PPVFRA), Mr. Ramakantha Hegde secured "Farmer's Rights" for Sigandhini. This right grants him the authority to propagate and sell Sigandhini seedlings across India. In recognition of his outstanding contribution to conserving this heritage variety, Mr. Ramakantha Hegde was recently honored with the prestigious Plant Genome Savior Award by the Honorable President of India. Today, Sigandhini is gaining popularity among farmers, not only in its traditional cultivation areas but also in non-traditional regions. Farmers are increasingly choosing Sigandhini as a resilient alternative to combat wilt diseases while sustaining the rich legacy of Indian spices. To meet the growing demand for Sigandhini seedlings, Mr. Hegde has entered into a memorandum of understanding (MOU) with the University of Horticultural Sciences, Bagalkot, on a royalty basis. This partnership ensures the wider availability of Sigandhini seedlings, promoting its adoption and securing a more resilient future for black pepper cultivation in India.

Keywords: Black pepper variety, Sigandhini, resistance, wilt diseases, high bulk seed density

TA/OP – 7

Local natural resource utilization and conservation through strategic natural farming system – A concept model for Churachandpur district, Manipur

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ABSTRACT

Natural Farming System (NFS) model can be an opportunity for an on-farm conservation of diverse natural resources including wild exotic plants, fungi, orchids and honey bee. A survey conducted in the Churachandpur district of Manipur revealed potential information of existing rich flora and fauna, which can be incorporated into NFS model. A total of 115 plant species belonging to 45 families includingPaoceae (10.43 %), Papilionaceous and Cucurbitaceae (6.96 % each), Solanaceae with (5.23 %), Araceae, Mimosaceae, Rutaceae (4.35 % each), Anacardiaceous, Arecaceae, etc. were documented. The region also has potential for cultivation of bamboo with some reported species like *Bambusa cacharensis, Bambusa nutans, Bambusa tulda, Bambusa vulgaris, Melocanna bacciferae*tc. These wild floras are acknowledged for their medicinal, cultural, forage and economic values. Wild edible fungi viz., *Auricularia delicata* (Fr.) Henn., *Lactarius volemus* (Fr.), *Termitomyces eurhizus* (Berk.) R. Heim, *Schizophllum commune* Fr.are also prevalent in the region. Besides the crops and fungi, wild honey bees*viz*. *Apis dorsata*, *Apis cerana Himalaya, Apis florea, Tetragonula iridipennis*are reported which can be reared as part of the NFS.The traditional method of farming practices like Jhum cultivation and other agriculturalmalpracticesin the hilly areas lead to deforestation and loss of biodiversity.Therefore, it is necessary to re-advocate the domestication of wild edible horticultural plants, fungi, orchids, wild honey bees etc. and take up proper conservative measures for protection of local gene pools or landraces. Hence, the natural farming system as a means for the conservation of the wild indigenous flora and fauna can be adopted in the regionwith a view to sustain the nutritional security and ecosystem restoration.

Keywords: Local exotic wild flora, natural farming system, resource conservation, nutritional security

TA/OP – 8

Economic resurgence of nigella to safeguard Byadgi chilli agripreneurs in Karnataka

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ABSTRACT

Nigella or Kalonji (*Nigella sativa* L.) boasts a unique standing in agriculture and healthcare. Originally flourishing in north Indian states, its resurgence in Karnataka, driven by its exceptional medicinal attributes, cannot be overlooked. This study, recognizing the growing significance of Nigella, delves into its economic dynamics in Rajasthan and as an alternative crop in Haveri district, Karnataka. In 2023, an extensive field survey was conducted across four major districts in Rajasthan, involving 120 randomly selected farmers. Employing the cost-returns method and the Cobb-Douglass production function, this study meticulously unraveled Nigella's economic intricacies. The findings are intriguing. Nigella cultivation costs stood at INR 54,901 per hectare, offering a clear financial outlook. More significantly, it revealed Nigella's potential as a lucrative venture, yielding net and gross returns of INR 2,26,704 and INR 2,28,605 per hectare, respectively. With a benefit-cost ratio of 5.13, Nigella cultivation presents a compelling income-enhancing opportunity for farmers. Furthermore, the study emphasizes the pivotal role of resource management, showcasing the prudent use of machinery, bullocks, seeds, and fertilizers as key drivers of overall profitability. Recognizing the hurdles in the Nigella industry, particularly the absence of improved varieties to meet the demand of farmers and the pharmaceutical industry, we passionately advocate for research and innovation to bolster its prospects. Notably, Haveri district in Karnataka, once renowned for Byadgi chilli, has transitioned a substantial portion of its agricultural landscape to Ballari and Raichur due to disease outbreaks. Intriguingly, Haveri's climate holds promise for Nigella cultivation, despite its limited current adoption. This study fervently endorses Nigella as a promising alternative to Byadgi chilli, not just for Haveri but also as a shining prospect beyond its borders.

Keywords: *Nigella sativa* , alternative crop, Byadgi chilli, agripreneurs

TA/OP – 9

The way forward for hedging price risk in turmeric: a curcumin-based price discovery mechanism

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ABSTRACT

Turmeric (*Curcuma longa* Linn), "the Golden Spice of life," is the most essential, high-valued, and non-perishable crop known for its culinary and health benefits. The demand for turmeric as an immunity booster has increased since the Covid-19 pandemic. As the most exported spice from India, it brings in a substantial amount of foreign currency. India alone contributes about 80 per cent of global production and 67 per cent of global trade. Nearly 80 per cent of the turmeric produced is consumed domestically. However, the marketing of turmeric has inefficiencies and lacks innovative strategies. The farmers receive a low share of the consumer rupee. The supply chain of turmeric is very complex. Most of the raw and dried turmeric is handled through the APMC system; thus, it is crucial to increase marketing effectiveness in response to the growing demand and price fluctuations. There is a pressing need to ensure turmeric farmers have the best market access and facilitations to hedge price risks through better market integrations, futures markets, and new price stabilization mechanisms based on quality/curcumin content. This study aims to mitigate the pricing risk brought on by the marketing system's inefficiencies. This study proposes a curcumin-based price discovery mechanism, termed the "Kilogram Curcumin System," to mitigate pricing risks arising from the inefficiencies in the turmeric marketing system.

Keywords: Turmeric, Covid-19, supply chain, inefficiencies, price risk, curcumin, hedge

TA/OP – 10

ICAR–CIAH Khejri technology for climate resilient horticulture and eco-system services in Thar desert

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ABSTRACT

Khejri (*Prosopis cineraria*) is a versatile tree of *Thar* desert and well-known for its nutrition rich immature green pods (*sangri*) and leaf-fodder (loong), and exerts favourable effects on the soil and environment. ICAR-CIAH, Bikaner has made a series of technological advancements for systematic horticultural harnessing and promotionof Khejrias environmental service tree with farming models. The important techniquesincludes clonal multiplication for uniform plantations of genotypes, varietal improvement for high quality harvest from thornless plants (Thar Shobha & Thar Amruta), orchard establishment models for maximizing the resources productivity and minimize the ill-effects of abiotic factors, crop regulation to harvest both *sangri*(green pods) and *loong*(leaf fodder)annually, value addition, packaging and marketing protocol adopting integrated concept HBCPSMA for nature's resilient farming. The native fruits and perennials (jharber, ker, lasora, kumat, phog, kheemp, tumba, rohida) and arid vegetables (kachri, kaakdia, mateera and cluster bean) were primary component crop-plants for long-term studies. The virgin sand-dunes landscape khejri block was developed *in-situ* with HBCPSMA concept and maintained under natural conditions till-date (2007 to 2023) without applying any out-sourced input. Space between the perennial components was utilized for growing monsoon supported seasonal crops and grasses of arid region only. Most of above least-known horticultural crop-plant produce used fresh, dehydrated or processed, and marketed at very high price as unique product of Indian desert. With khejri technology, monsoon supported crop-plant harvest from main, intra &inter and boundary-side of production system was studied during 2014 to 2017 to quantify the scope of resource productivityadopting HBCPSMA concept. Khejri based crop-combinations resulted into regular family employment and returns @ Rs 75,000–2,25,000 per ha/year in comparison to the conventional (Rs. 23,000–42,000 per ha/year) cropping systems. The yield, bio-mass harvest and income is stabilized at 5–6 years age-group in khejri and jharber, and double income from the production site is further in the increasing order with 8–10 years period of establishment of HBCPSMA concept.

Keywords: Khejri technology, arid horticulture, desert crop-plants, HBCPSMA concept

TA/OP – 11

Challenges and opportunities in gypsophila cultivation in Karnataka: An overview

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ABSTRACT

Gypsophila, also known as baby's breath, is a prized exotic floral filler gaining prominence in India. This abstract delves into the challenges and opportunities that confront Gypsophila cultivators. In and around Bengaluru region, Gypsophila cultivated across approximately 150 acres both in open and protected cultivation. The predominantly grown ones are the white-colored variety, with leading cultivars like Pearl Blossom, Excellence, and Casopia. The mother plants of Gypsophila are sourced internationally, which are multiplied locally and distributed to farmers for cultivation. Gypsophila boasts a short production cycle of 60 to 80 days, allowing for up to four annual cycles. Several challenges loom over the industry. Analysis of challenges showed that leaf miner infestations and phytophthora fungal disease rank as major concerns as per 100.00 per cent of the farmers. Maintaining proper water balance post-pruning is crucial to counter die-back issues, a common farmer's woe (95.00 %). Minor diseases such as root rot and crown rot occasionally surface (76.25 %). Additionally, unpredictable weather patterns, notably untimely rainfall during flowering, threaten crop yields especially in open condition. Market acceptance has dwindled as production increased, necessitating intervention. Key areas include combating fungal infections, educating farmers on proper pruning, and raising awareness about water management, pest control, and disease mitigation. A single Gypsophila plant is priced at Rs. 40, while its market value fluctuates between Rs. 75 and Rs. 150. Research institutes play a pivotal role in providing solutions for managing fungal disease complex and improving soil and nutrient management practices. Crop losses pose a significant issue, especially considering the substantial initial investment required for Gypsophila cultivation. Early-stage losses can lead to significant financial setbacks for farmers. In conclusion, Gypsophila cultivation presents both challenges and opportunities. While market acceptance has declined due to increased production, profitability remains possible. Addressing disease challenges, optimizing cultivation practices, and expanding market reach are essential steps for sustainable growth in the Gypsophila industry. Collaborative efforts between farmers, researchers, and industry stakeholders are crucial to navigate these challenges and capitalize on the opportunities presented by Gypsophila cultivation.

Keywords: Gypsophila, pythopthora, fungal complex, challenges

TA/OP – 12

Kashi Manu: a climate resilient water spinach variety for upland cultivation, crop diversification and economic security

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ABSTRACT

Water spinach (*Ipomoea aquatica)* is commonly used as a food plant in several parts of the country. The leaves are good source of minerals, vitamins and are considered a possible source of food protein. All aerial parts of the young plant of water spinach are edible. In certain traditional systems of medicine, water spinach has known to be used as a poultice or topical application for skin conditions, minor wounds, & inflammation. In addition, when water spinach is commonly grown in waterlogged areas requires cumbersome practices for plant protection measures and harvesting. The advantages of Upland water spinach are multiple cuttings, can be grown throughout the year, submerged condition is NOT necessary, leafy biomass free from water pollutants, upland field cultivation technology promises "Safe Biomass". Variety Kashi Manu is a good source of Vit A (133 mg), minerals 141.92 mg calcium, 59.67 mg iron, 462.22 mg magnesium, 1.59 mg zinc and 2.19 mg dietary fiber per 100 g edible leafy biomass. Variety Kashi Manu is heat tolerant, withstands water logging and suitable for throughout year cultivation and leafy biomass becomes ready to harvest 20 days after seed sowing. About 90- 100 tons/hectare leafy biomass can be harvested. Leafy biomass are usually sold in 500 g bunches in the markets at the rate of ₹ 35- 40/kg with tune of income to ₹ 12.0 to 15 lakh/ hectare/year. This variety is also suitable for kitchen garden/roof gardening with minimum inputs**.** In view of the importance, popularization of Kashi Manu water spinach for Upland field cultivation on a large scale could make a significant contribution towards crop diversification, nutritional security and economic upliftment of the marginal farmers and also proved as a potential candidate crop variety for organic / natural farming.

Keywords**:** Water spinach, Kashi Manu, climate resilient, crop diversification, economic & nutritional security

TA/OP – 13

‘Phule Suvarn’ variety of underutilized crop double bean

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ABSTRACT

Phaseolus lunatus, butter bean or lima bean, is an herbaceous plant in the *Fabaceae* (legume or bean family) native to Central and South America, now cultivated in warm, semi-tropical regions throughout the world for its beans, which can be eaten fresh (generally without the bean pods) or dried. In India, it is grown in Maharashtra (Pune, Satara Ahmednagar and some parts of Jalgaon districts), Karnataka (Chikmagalur) and Tamil Nadu (Dindigul and Nilgiri) etc. along trails and on fences. Despite double bean being nutritious crop, it has not obtained due importance in our cropping pattern and little research work has been done on crop improvement programme in Maharashtra as well as in India. Hence, the improvement programme was started at Vegetable Improvement Project, NARP, Ganeshkhind, Pune during 2005-2006 to develop new genotype of double bean with high pod yield and quality by collecting local germplasm from Pune (Bhimashankar and around area), Satara (Mahabaleshwar and Wai), Ahmednagar (Parner) and Jalgaon districts. The double bean (lima bean) genotype GK-11 was found promising in eight station trials and nine multilocation trials. The pooled data revealed that the genotype showed superiority over local check variety in respect of pod length (10.94cm), pod breath (2.52 cm), pod weight (10.30 gm) and average grain weight (2.46 g). The double bean genotype GK-11 recorded 26.51 % increase in pod yield over local check variety. Pods are green in colour with bold grain size. Therefore, it is release the double bean (lima bean) variety 'Phule Suvarn' (GK-11) for cultivation in Western Maharashtra.

Keywords: Genotype, butter bean, herbaceous, double bean

TA/OP – 14

Ganesh broccoli - a new genotype for tropical climate

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ABSTRACT

Broccoli (*Brassica oleracea* var. *italic* Plenck) is an important cole crop especially around big cities and tourist places in India. Broccoli is a temperate crop requires cool climate for good quality head and yield. It has anticancer properties and thus high medicinal value. There are few cultivars such as KTS-1 and the very recent once Palam Smridhi and Punjab Broccoli-1which are developed for very cool winter of North India. There is no cultivar evolved for tropical climate, which is an important constraint in popularizing evaluation of this crop. Hence, to explore the prospects of broccoli for tropical climate, the study was carried out in Randomized block design with four replications and five genotypes at ZARP, Ganeshkhind, Pune. Among the five genotypes, the genotype, Ganesh broccoli (GK-2-5) is an early 40-45 days for first harvest, high yielding (66.21 q/ha), having excellent curd quality – dark green, compact, attractive, dome shaped and big in size and ability to produce seeds under tropical condition. Hence, the tropical broccoli cultivar Ganesh Broccoli has been released for commercial cultivation at Pune condition.

Keywords: Broccoli, tropical broccoli, Ganesh broccoli

TA/OP – 15

Demonstration of performance of cluster beans (*Cyamopsis tetragoloba* L.) variety MDU 1 for higher productivity

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ABSTRACT

Salem district was established during 1790 and it gave birth to Dharmapuri, Krishnagiri, and Namakkal districts subsequently. The geographical area is 5245 sq,km. Average temperature is 32^0 C, maximum and 19.6 degree minimum with humitidy ranging from 39 to 85%. During SW monsoon, a rainfall of 545 mm and during NE monsoon 564.2 mm was recorded. Net sown area is 22,33,70 ha and area sown more than once 81670 ha. Area under horticultural crops is 39765 ha and area under cluster beans cultivation is around 120 ha in Salem District. Cluster bean is a arid zone under utilized legume vegetable crop with drought tolerance and it is also known as Guar.Guar gum obtained from the endosperm of the cluster beans seed is used in many industrial application like mining, petroleum drilling and textile manufacturing sectors. Apart from this, guar gum is refined to make yellowish white powder for consumption in bakery units as stabilizer, thickener, emulsifier and fat replacer. Private and few local varieties are ruling in the market. The variety released from Tamil Nadu Agricultural University MDU 1 cluster bean was demonstrated as front line demonstration to popularize the variety among farmers of Salem District by ICAR-KVK, Salem. Cluster bean MDU 1 and local variety were used for the demonstration during two seasons for studying onsite adaptability. Farmers were educated and trained to follow all the advanced technologies of crop management and crop protection from seed treatment to harvesting. The data on plant height, days to 50% flowering, number of fruits per plant, fruit weight, length and girth of fruits, yield per plant and yield per hectare were recorded. The results revealed that MDU 1 recorded higher yield of 12.50 t/ha when compared to the yield of local check variety (8.50 t/ha). High yielding cluster bean variety MDU 1 recorded higher BCR of 2.95 and it was lower in local check variety (1.95).

Keywords**:** Cluster beans, MDU 1, Front Line Demonstration, performance

TA/OP – 16

Design and development of low cost tower growing system for leafy vegetables (lettuce)

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ABSTRACT

Lettuce is one among the leafy green vegetables widely consumed. These are packed with vitamins, minerals and fibre but low in calories. These compounds have antioxidant and anti-inflammatory properties, which results in a variety of health benefits, including a lower risk of stroke, anaemia, high blood pressure, certain cancers, and diabetes. Hence, leafy vegetables are widely consumed across the globe and age group. As the awareness of consuming of pesticide free and hygienically grown leafy vegetables, urban dwellers have started to grow their own homestead/terrace gardens. However, the urban population has limitation with the space available for growing homestead garden. Tower growing system is an alternative growing system where the space is the constraint. A low cost tower growing system was designed, developed and evaluated for growing leafy vegetables at IACR-Indian Institute of Horticultural Research, Bengaluru. The basic tower was fabricated out using PVC pipe of 1200 mm height. The design of tower had two variables viz., i) size of PVC pipe (Two levels: 150 mm dia. and 100 mm dia.) , ii) pattern of plugs (Three levels: in line, opposite and spiral). These structures were filled with Arka Fermented Cocopeat and lettuce was grown. The experiment was conducted on terrace under 50% shade net house, during 2022-23. The observations recorded were: a) Temperature, b) relative humidity, and c) light twice in a week at 10 a.m., 1 p.m and 4 p.m during the crop growing season. The crop growth parameters viz., i) height, ii) number of leaves and iii) yield were recorded. Highest yield of 1251 g of lettuce was recorded in 150 mm diameter of spiral pattern. It was concluded that lettuce crop could be successfully grown in PVC tower system when grown in optimal volume of growing media.

Keywords: Antioxidants, fermented, cocopeat, relative humidity

TA/OP – 17

Unearthing the hidden treasure: economic viability of teasel gourd (*Mada hagalakayi*) enterprise in Uttara Kannada District

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ABSTRACT

Uttara Kannada district, nestled in the western ghats of Karnataka, harbours a treasure trove of underutilized crops thriving in their natural wild habitat. Among these, the teasel gourd, locally known as *Mada hagalakayi*, is a remarkable find. Traditionally grown by only a handful of farmers, primarily for personal consumption or sporadically collected from the wild for sale, this crop has remained largely unexplored in terms of its economic viability. This study endeavours to shed light on the economics of teasel gourd cultivation as a means to fulfil the visionary statement of the Government of India – doubling farm incomes. The investigation collected data about the investment patterns, establishment costs, maintenance costs, and returns from 30 farmers randomly in Uttara Kannada district during the year 2023. The findings of this study paint a compelling picture of the teasel gourd entrepreneurial landscape.To establish a teasel gourd garden in Uttara Kannada district, an investment of up to INR 5,97,668 per hectare is required, with the support system accounting for approximately 54% of the total establishment cost. The subsequent maintenance costs vary, ranging from INR 294,938 in the first year to INR 3,66,575 by the fifth year. As for profitability, the net returns from teasel gourd farming are strikingly promising, fluctuating between INR 13,97,604 and INR 11,06,350 by the fifth year and B:C ratio figures underscore the crop's potential to significantly boost the income of farmers. This study underscores the need for capacity-building programs aimed at popularizing teasel gourd cultivation among farmers in the Uttara Kannada district. By tapping into this underutilized crop's economic potential, we can not only enhance the livelihoods of local farmers but also contribute to the realization of the Government of India's vision of doubling farm income. Teasel gourd farming could very well be the key to unlocking prosperity in Uttara Kannada's agricultural landscape.

Keywords: Underutilized, landscape, establishment cost, teasel gourd

TA/OP – 18

Impact and assessment study of oyster mushroom production technology through training and demonstration

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ABSTRACT

The key role played by Krishi Vigyan Kendras (KVK) of India in popularizing oyster mushroom cultivation technology among the rural youths through training and demonstration programmes has been widely appreciated. The present study was undertaken to find out the impact of training programmes, assessment of mushroom production technology conducted by KVK, Tapi (Gujarat) and the constraints faced by the adopters during 2018 and 2019.The reasons for participating in training and demonstration programme found that 88 and 80 per cent of the respondents were interested to know the mushroom cultivation technology for additional source of income with agricultural farming and animal husbandry during 2018 and 2019, respectively. In another study to assess the gain in knowledge after training and demonstration programmes it was observed that pre-training knowledge score was not much satisfactory (48 and 60% of the respondents had low level of knowledge during 2018 and 2019, respectively). However, the knowledge score gained by respondents after training was more satisfactory in all aspects (60 and 72 per cent had medium while 40 and 28 per cent respondent had high level of knowledge). The socio economic factors of the participants*viz*. education level played a significant positive role on the knowledge gain of the participants. The results of assessment of demonstration of mushroom production on small scale were positive by earning net profit of Rs.1600.00 with BC ratio of 5:1 and Rs.1625 with BC ratio of 4:25 against one kg spawn during both the consecutive years. The study on the constraints faced by adopters indicated that lack of supply of mushroom spawn was the major constraint faced by all the respondents followed by lack of organized market for fresh oyster mushroom (96 %) and lack of government initiatives or support in terms of subsidies on small scale mushroom cultivation unit (90 %).

Keywords: Oyster mushroom, KVK, Training, Demonstration, Assessment, Spawn

TA/OP – 19

Punjab Tarwanga 1: a commercial viable outcome of intraspecific hybridization between two underutilized vegetable crops, namely long melon and Wanga

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ABSTRACT

Long melon and wanga, two lesser-utilized members of the *Cucumis* genus, face restricted adaptability in the Punjab region. Long melon fruits exhibit a curved shape and lower water content, whereas wanga fruits though crisp, have an unappealing oval appearance. Consequently, long melon cultivation is primarily limited to northern Punjab, while wanga thrives in western Punjab. To address the less favorable characteristics of both underutilized crops, a process of hybridization and selective breeding spanning multiple generations was initiated.The objective was to create a new salad crop that combines the desirable fruit shape of long melon with the flavorful attributes of wanga. This effort culminated in the release of Punjab Tarwanga-1 for cultivation in the Punjab region in 2023.Punjab Tarwanga-1 is characterized by its green leaves, medium-sized vines with intermediate internodal length, and cylindrical fruits. The fruits are initially dark green during the immature stage, transitioning to a brown color upon maturity. During the spring season, it boasts a yield of 194 quintals per hectare. Notably, Punjab Tarwanga-1 offers improved crispiness compared to long melon and a more appealing shape than wanga. These enhancements in appearance and yield are poised to provide better economic returns to growers while enhancing the palatability for consumers, making it a promising addition as a new salad crop.

Keywords: Long melon, Punjab Tarwanga-1, palatability, cylindrical fruits

TA/OP – 20

Enhancing socio-economic status of farmers through adoption of cultivation of an underutilized vegetable teasel gourd

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ABSTRACT

Teasel gourd (*Momordica subangulata* subsp. *renigera* (G.Don) is an underutilised vegetable cultivated for its fruits in various parts of India and is known by various names such as kankada, aakakarkay, kakrol, kantola, kartoli, etc. Though it does not occupy much area, its fruits are very high in demand in various states of India.It is being commercially cultivated in Odisha, West Bengal, Maharashtra, Andhra Pradesh, Andaman and Nicobar Islands, Karnataka, and North-Eastern states like Assam and Tripura. Due to increase in the consumer preference and response, the demand for its planting material is also increasing rapidly. In an effort to popularise the variety Arka Neelachal Gourav, developed by ICAR-IIHR, farmers in Odisha were encouraged to adopt teasel gourd cultivation for its high market demand. The average yield was 53Q per acre. All farmers adopted trellis system. Most farmers (45.2%) used wooden poles or bamboo poles (35.5%) for trellising. More than 70 % farmers felt that doing manual pollination is a constraint, however none of the farmers were willing to leave the cultivation of teasel gourd due to this constraint. Most of the farmers carried out manual pollination by self or by using family members. More than 60% farmers took their produce to market for sale while remaining farmers preferred sale at farm gate. Most of the farmers are yet to resort to making planting material for sale, though 22.6 % farmers have plans for preparation of planting material for sale in future. Improper pollination and resultant fruit drop was one of the major concerns of the farmers. All the farmers got higher income than the previous crop grown in the same piece of land. The sale price ranged from ₹60 to ₹160 per kg of fruits. An incidence of leaf spots and downy mildew below 5% was observed. Overall, teasel gourd, the versatile and nutritious vegetable, has proved to enhance per unit profitability of the beneficiary farmers and bring significant changes in socio-economic conditions of some of the marginal farmers.

Keywords: Tassel gourd, trellies, marginal farmers, pollination

Theme – 6
Technology Assessment
Poster Presentations

TA/PP – 1

Empowering avocado farmers: Assessing training needs to thrive in shifting horticulture landscape

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ABSTRACT

The horticulture sector faces numerous challenges, including climate change, market fluctuations, and rapid advancements in technology. To effectively tackle these challenges and thrive in this dynamic landscape, farmers must remain well-informed and adaptable, constantly updating their knowledge and skills. In recent years, avocado cultivation has experienced a remarkable surge in popularity, expanding beyond its traditional cultivation areas to new regions. This significant shift has brought to the forefront the need for a specialized approach to training and capacity-building for farmers. A crucial step in this process is the systematic conduct of a Training Needs Assessment (TNA), which serves to identify the specific knowledge, skills, and competencies required by farmers to enhance their production practices. A study was conducted to assess the training needs of farmers involved in the production of Avocado in 2023. This comprehensive study identified four major thematic areas and was systematically incorporated into an interview schedule, which was administered to the farmers. The findings of this study revealed that a substantial 66.25 per cent of the farmers expressed a moderate need for training. This indicates a clear recognition among the farming community of the importance of acquiring new knowledge and skills to enhance their production practices and meet the challenges. Among the major components, it was observed that pest and disease management had the highest demand for training, with 91.25 per cent followed by quality planting material (73.75 %) and post-harvest activities and quality assurance (66.25 %). The study underscores the importance of continuous training and capacity-building for farmers in this sector. These findings provide valuable insights for policymakers, agricultural extension services, and training institutions to tailor the programmes and initiatives to address the specific training needs of farmers in the production of exotic fruit crops, thereby fostering the sustainability and competitiveness of this vital sector.

Keywords: Training need assessment, avocado, knowledge, skills

TA/PP – 2

Suitability of chrysanthemum (*Dendranthema* x *grandiflora* Tzvelev) genotypes for making different value-added products to enhance farmer's income

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ABSTRACT

The present investigation was carried out at the experimental farm of Department of Floriculture and Landscape Architecture, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, India during 2019-20. The investigation consisted of two studies in which the first one involved morphological characterization of eight genotypes for loose flower production and the second one to prepare different value-added products from the flowers of selected genotypes. The loose flowers and the value-added products were then evaluated for their marketability and profit from sale of each was studied. For the genotypes evaluated for loose flower production; maximum flower size (7.54 cm), number of flowers per plant (180.08), flower weight per plant (835.28 g) and shelf life (7.5 days) were recorded in cv. 'Solan Shringar'. For different value-added products prepared from loose flowers, highest B:C ratio (10.37) was recorded in special garlands followed by the B:C ratio of ordinary garlands (7.75) prepared from cv. 'Solan Shringar'. However, when the loose flowers of the same cultivar were sold, B:C ratio was calculated to be 3.32. Therefore, it was concluded in the study that for profit maximization, cv. 'Solan Shringar' is recommended for loose flower production under North-Indian conditions.

Keywords: Chrysanthemum, loose-flower, ordinary garlands, special garlands, profit maximization

TA/PP – 3

Optimizing sustainability and economic viability: Management of floral waste in India

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ABSTRACT

India grapples with a monumental challenge: the daily generation of 4.7 x 10^6 million metric tonnes of floral waste from diverse sources, including temples, festivals, and flower markets. This waste, laden with pesticide residues, poses grave environmental concerns, contributing to aquatic pollution, eutrophication, and greenhouse gas emissions. To address these issues, a comprehensive waste management strategy that is both eco-friendly and sustainable is imperative. The potential of floral waste is vast. It can be transformed into an array of valuable products with applications in agriculture and the pharmaceutical industry. Anaerobic digestion of floral waste offers a dual benefit: a source of biogas energy and a means to curtail environmental pollution. Vermicomposting of temple flower waste emerges as an eco-friendly solution, yielding valuable products and fostering a healthier, waste-free environment. Furthermore, discarded marigold flowers, rich in lutein, can be repurposed as poultry feed, enhancing the colour of egg yolks. Floral dyes derived from flower waste provide a safe and sustainable alternative to synthetic dyes, catering to the textile and leather industries. Additional avenues for floral waste utilization encompass the production of value-added products like incense sticks, handmade paper, essential oils and organic gulaal. Notably, the AICRP on Floriculture in Vellanikkara is actively researching the production of mosquito-repellent incense sticks from floral waste, demonstrating the transformative potential of bioconversion in generating additional income and employment opportunities. In conclusion, addressing India's floral waste challenge not only safeguards the environment but also presents a new paradigm for economic growth and employment. Through eco-friendly practices and innovative product development, floral waste can be sustainably utilized.

Keywords: Floral waste management, sustainability, economic viability

TA/PP – 4

Studies on enhancing yield performance of chrysanthemum (*Chrysanthemum morifolium* R.) cv. Chandrika through intervention of light interruption

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ABSTRACT

An investigationwas undertaken at College of Horticulture, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Distt. Ratnagiri during the year 2020-2021 to study the effects of light interruption on vegetative and floral attributes of chrysanthemum cv. 'Chandrika' grown within a polytunnel environment. The experiment was laid out in randomized block design with three replications and nine treatments involving different light/dark period interruptions. Among the different treatments, T_6, which involved interrupting light or providing darkness for 180 minutes using a 90% black shade net in chrysanthemum cv. Chandrika, showed promising results in terms of vegetative and flowering characteristics, as well as yield-related parameters. These included maximum plant height(75.11 cm), the number of leaves(186.13), basal stem diameter of the plant(7.57 mm), total leaf area(2094.49 cm^2), flowering duration (162.32), the number of flower buds per plant(52.00), the number of flower buds per plot(2525.83), the number of flowers per plant(31.93), the number of flowers per plot(1247.78), flower yield per plant (315.20 g/plant), yield per plot(6.47 kg/plot),yield per hectare(18.82 t/ha) and minimum number of days taken for early flowering (62.53).Furthermore, as a result of implementing dark exposure with a 90% black shade net, flowers bloomed earlier than the usual time-frame (resulting in off-season production).Also, the flowers produced using 90% black shade net fetched higher price (Rs 303/kg) as compared to those produced through normal cultivation practices (Rs 90-150 /kg). This led to farmers achieving higher profits when compared to producing crops during the regular season.

Keywords: Chrysanthemum, dark exposure, Chandrika, yield, leaf area.

TA/PP – 5

Location specific hybrid seed production as strategy for alternate opportunities in farming: A case study in marigold (*Tagetes erecta* L.)

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ABSTRACT

Seed is the first and foremost vital resource for successful crop cultivation, which is also a crucial input for the creation of sustainable crop production. The Indian seed market is projected to grow at a compound annual growth rate of 6.8% during 2022-2027. Hybrid seed production in India has enormous potential due to factors such as diverse agro climatic conditions, abundant and affordable human resources and inflated demand in domestic and export markets. Considering the fluctuating price and seasonal demand for flowers, seed production will provide better opportunities for farmers compared to regular farming. Seed production needs the assessment of locations before implementing it as a commercial venture. With this background, a study was conducted using four different hybrid combinations of marigold involving MS_1 and MS_2 male sterile lines and four different pollen parents P_1, P_2, P_3 and P_4 at two different agroclimatic zones (location 1 and location 2) with varied climatic conditions. Factorial analysis of multiple parameters associated with seed production suggested a major contribution of locations, followed by seed and pollen parents on quantity and quality of seed produced. The results revealed that among the four hybrid combinations, $MS_2 \times P_3$ exhibited more number of seeds (151.5) and seed weight (354.16 mg) per flower. The hybrid combination of $MS_1 \times P_2$ exhibited significantly more number of seeds per gram (598.19). Among the two different locations, irrespective of hybrid combinations, hybrid seed production was better in location 1 compared to location 2 for number of seeds per flower (150.47), seed weight per flower (304.38 mg) and weight of single seed (2.04 mg). Hybrid seed production will provide opportunities and higher remuneration for skilled manpower. Location specific hybrid development will help in better utilization of resources for commercial seed production and alternate opportunities for economic growth of the selected region.

Keywords: Hybrid combination, marigold, seed production, male sterility

TA/PP – 6

From backyard beauty to global markets: The prospects of *Etlingera elatior*

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ABSTRACT

Etlingera elatior, commonly known as torch ginger or Emperors Rod, is a species of flowering plant belonging to the family Zingiberaceae. It is an herbaceous perennial ornamental plant cultivated in backyard gardens. Typically, they are low-maintenance plants with attractive foliage and magnificent, long-lasting blooms that can be used for floral arrangements as cut flowers. *Etlingera elatior* is primarily native to Southeast Asia, including countries like Malaysia, Indonesia and Thailand. It is also cultivated in other tropical and subtropical regions with favorable climatic conditions. The spicy flavor of young flower and sour taste of the ripe seed-pod, together are used in salads, curries, stewed fish and various other culinary preparations. Traditionally, the flowers were used to treat a range of ailments, including digestive issues and respiratory problems, pain reliver and as anti-cancer. The plant is also regarded as climate resilient in addition to its aesthetic and edible uses. Its extensive rhizomatous root system helps stabilize soil and prevent erosion in regions prone to heavy rainfall. The plants are recommended as a drought tolerant specimen plant in sustainable landscape for xeriscaping. Further, the dense lush green foliage creates a congenial microclimate in the surrounding areas, thus reducing the urban heat island effect, contributing to carbon sequestration and for fauna conservation. The global trade of the plant is restricted only in the South-East Asia, while in India, its cultivation is still limited as a backyard plant. Thus, the awareness for its cultivation and conservation of genetic diversity of the species is the need of an hour. Furthermore, its distinguishing appearance can attract the international markets for specialty floral arrangements, thus helps in diversifying the market opportunities for the growers.

Keywords: Torch ginger, nutraceuticals, backyard plant

TA/PP – 7

Nasturtium: A multi-useful underutilized flower crop

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ABSTRACT

Nasturtium also called as garden nasturtium, nasturtium, Indian Cress and monk's cress species of flowering plant belongs to the Tropaeolaceae family. It is an easily grown annual with disc shaped leaves bearing brilliant yellow, orange or red flowers. Its leaves demonstrate the lotus effect where the falling rainwater on the surface gathers into globular droplets. The plants' entire above-ground structure can be consumed. The blossom is most frequently consumed and makes for a highly attractive salad element. It also works well in stir-fries and has a somewhat peppery taste reminiscent of watercress. The flowers have medicinal as well as nutritional values and are rich source of vitamins, antioxidants and mineral elements including vitamin C, vitamin D, iron, makes them a nutritious addition to diet. They have anticancer, anti-inflammatory, antitumor, antimicrobial and antimutagenic properties too. However, it is also helpful to repel certain garden pests, such as aphids, whiteflies, and cucumber beetles. Planting them alongside vegetables can help protect the crop naturally. It also attracts pollinators like bees and butterflies, which can benefit by promoting cross-pollination and increases fruit and vegetable quality and yields. Thus not only beautify the surroundings also provide farmers an additional income. They thrive in poor soil and require minimal care thus can be grown in the neglected area. Thus increasing the area under these crops provides multiple benefits like medicinal, pollinator, ornamental, insect repellent and edible nature.

Keywords: Nasturtium,underutilized flower crop, medicinal,pollinator, insect repellent

TA/PP – 8

Green precision: Transforming landscape gardens with GPS and GIS mapping

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ABSTRACT

The mapping and cataloging of landscape gardens through the utilization of GPS (Global Positioning System) and GIS (Geographic Information System) technologies represent a significant advancement in landscape architecture and management practices. This abstract provides an overview of the key aspects and implications of this innovative approach. The integration of GPS technology facilitates the precise georeferencing of landscape garden elements, enabling accurate spatial representation and measurement of various features such as pathways, water bodies, topographical variations, and existing vegetation. Furthermore, the incorporation of GIS allows for the creation of comprehensive and dynamic digital maps that store and manage an extensive range of data relevant to landscape design and maintenance. This includes information on soil composition, sunlight exposure, plant species distribution, and historical records of garden changes.The benefits of employing GPS and GIS in landscape garden management are multifaceted. Landscape architects can leverage these tools during the planning and design phase to optimize the layout, ensuring the harmonious placement of plants, hardscapes, and amenities. By analyzing data on soil conditions and sunlight patterns, designers can make informed decisions on plant selection and placement, fostering sustainable and thriving garden ecosystems.In addition to aiding in the creation of aesthetically pleasing landscapes, GPS and GIS enable ongoing monitoring and adaptive management. Real-time data on environmental factors such as weather conditions and soil moisture levels can be collected and analyzed, allowing for responsive adjustments to irrigation schedules, fertilization regimes, and pest control measures. This data-driven approach enhances the resilience of landscape gardens in the face of changing environmental conditions. In conclusion, the mapping and cataloging of landscape gardens using GPS and GIS technologies offer a powerful toolset for landscape architects and garden managers. This approach enhances the precision, sustainability, and adaptability of landscape design and maintenance, ultimately resulting in more vibrant and resilient outdoor spaces.

Keywords: Mapping, cataloging, landscape gardens, GPS, GIS , sustainable garden ecosystems

TA/PP – 9

Nerium: An underutilized medicinal crop yet potential biopesticide

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ABSTRACT

Nerium oleander, is an evergreen shrub which belongs to the family *Apocynaceae*. It is commonly known as Kaner or Indian Oleander and is the only species classified under the genus *Nerium*. It is widely grown as an ornamental shrub in gardens, parks, and along roadsides for its attractive flowers and evergreen foliage. It is drought-tolerant and can thrive in various agro-climatic conditions. It contains several compounds such as alkaloids, flavonoids, caerdenolides including oleandrin and neriine, which are cardiac glycosides and have been found to possess insecticidal properties.It is an underutilized plant with potential for biopesticidal properties. The extract of nerium leaves has exhibited larvicidal and ovicidal activity. Studies have shown that it has larvicidal activity against the fourth larval stage of mosquitoes (*Anopheles stephensi*) and effect on *Helicoverpaarmigera*.Oleander has been associated with various medicinal uses in traditional and folk medicine andits oil is used for the treatment of leprosy and skin diseases. Leaves and flower are cardiotonic, anti-bacterial and anti-diabetic. Whole plant has anti-cancer properties andessential oil from the flowers has antitumor activity and has potential for treatment of cancer. Considering the versatility of the plant, nerium can be a futuristic crop for biopesticidal and medicinal application apart from its ornamental importance.

Keywords: Oleander, nerium, oleandrin, neriine, biopesticide, insects and anticancer

TA/PP – 10

Flower Forcing

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ABSTRACT

Flower forcing refers to any operation or treatment to the plant once it has reached its ripeness-to-respond stage, in order to stimulate it to flowerat a particular time or during off-season periods, when it would not naturally do so.Forcing operation can be done either by adjusting factors affecting flowering or using chemicals or by special practices.Modifying the photoperiod involves either using supplementary light from artificial sources, to extend the duration of day length, or keeping the plants under black cloth to shorten the duration of day length. For low temperature requiring plants, the temperature can be adjusted by keeping the plant parts, mostly bulbs or seeds, in the refrigerator or freezer. In general, increased irradiance reduces the length of the juvenile period in many plant species. Prolonged exposure to high temperatures reduces or inhibit flowering. Certain fertilizers affect the C/N ratio of the plant, which in turn affects flowering. Gibberellins have the unique ability among plant hormones to stimulate extensive growth of intact plants. It can substitute for the long-day requirement in some species. The right choice of cultivars is crucial for successful cultivation for the offseason. Pruning can be easily applied to control quantity and quality of flowering. Size and the thermal history of the storage organ, that are used for planting influence the time of development and characteristics of the flower stem in geophytes. The scheduling of plant production is a crucial aspect in the modern floricultural industry, due to changing market demand. Advancements in plant physiology, photomorphogenesisand greenhouse technologies through time have paved the way for the development of multiple strategies in order to finely regulate the rate of plant growth and development in numerous crops.

Keywords: Forcing, off-season, demand, photoperiod, pruning, hormones

TA/PP – 11

Introduction of IIHR developed gladiolus variety cultivation in Hajo region of Assam for rainy season

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ABSTRACT

The gladiolus, colloquially referred to as Sword Lily, is a member of the *Iridaceae* family. It stands as a prominent ornamental plant mainly cultivated for its vibrant flowers and wide range of colours. This ornamental plant serves a dual purpose, being sought after both as a cut flower and used in gardens. With its elongated spikes, Gladiolus becomes an ideal choice for crafting bouquets and various floral arrangements. In Assam, most of the gladiolus is cultivated in Hajo Region of Kamrup district. In Assam, gladiolus is typically planted with a spacing of 15cm X 15cm, allowing for the placement of 12 corms per square meter of land. Initially, corms are sold for about ₹6.00 each, but the spikes can be sold for ₹7.00 in the market. This pricing makes gladiolus farming unprofitable in the first year. However, flower growers in the Hajo region store the corms after the first season and then replant them in the following years. This method of storing corms and multiplying cormels has turned gladiolus cultivation into a profitable venture for these farmers. Each corm has the potential to produce approximately 10-15 cormels depending on the specific variety of gladiolus. Farmers grow these cormels for two growing seasons, after which the corms eventually produce the flowers. Farmers have highlighted another benefit of cultivating small corms. When you grow gladiolus from smaller corms, the resulting flower spikes have a reduced diameter and length. This makes them ideal for intricate floral decorations. In contrast, larger diameter spikes, due to their weight, are mainly suitable for use in bouquets. One significant challenge for gladiolus growers is the occurrence of fusarium rot in the corms, especially during the rainy season. This disease limits gladiolus cultivation precisely when market prices are high. To tackle this issue, specialized varieties like Arka Keshar, Arka Ayush, and Arka Amar, developed by IIHR Bengaluru were introduced. These varieties have proven to be highly effective and ensure successful gladiolus cultivation even during the rainy season.

Keywords: Gladiolus, sword lily, corm, cormel, spikes, fusarium rot

TA/PP – 12

Ornamental trees for futuristic interiorscape- A review

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ABSTRACT

The global issue of deteriorating indoor air quality resulting from air pollution has prompted a need for innovative solutions. One such solution is indoor landscaping, which has emerged as a means to promote a healthier lifestyle within polluted indoor environments. Nowadays, individuals typically spend approximately 90% of their time indoors, where they are susceptible to exposure to a variety of indoor pollutants released by various appliances and decor. This approach to improving indoor air quality has seen significant development and continues to evolve. Plants play a pivotal role in mitigating indoor pollution by employing processes such as phytoremediation, adsorption, absorption, and stomata uptake. These processes are influenced by factors like the plant's surface area, temperature, humidity, available water, and light source. Ornamental trees have proven to be particularly effective in this regard due to their large leaf surface area and year-round coverage, making them superior filters compared to shrubs and grasses. In particular, the Indian subcontinent offers favorable atmospheric conditions for a range of indoor trees, eliminating the need for extensive environmental control. Beyond their air-purifying abilities, these indoor trees also contribute to the creation of aesthetically pleasing and harmonious interiorscapes, benefiting both the flora and human occupants. Therefore, understanding the specific plant species capable of addressing Indoor Air Pollution (IAP) holds great scientific and public value. This paper aims to review the potential applications of ornamental trees for interiorscaping.

Keywords: Ornamental trees, interiorscape, indoor atmosphere and aesthetic appeal.

TA/PP – 13

New technologies booming in lettuce

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ABSTRACT

Lettuce (*Lactuca sativa* L.) is one of the most important salad vegetable crops, exclusively consumed raw and fresh, acting as an excellent source of dietary fiber fetching remunerative price targeting continental hotels, metropolitan consumers. It occupies a maximum area under mild to cool conditions thus, cultivated throughout the tropical and subtropical countries as a sole as well as filler crop. One of the biggest challenges is delivering sufficient, diverse, and safe food to satisfy global needs. Climatic changes such as rainfall, temperature fluctuation and CO_2 concentration are the major production constrains. Lettuce is an ideal choice even under problemic to unconventional areas including the space and hence also referred as the space crop providing astronauts varied diet. Utilization of the latest technologies coupled with advanced methods of crop production will certainly increase our capacity to deal with the modern challenges. It is classified as a crop of high water requirement; the water deficit potentially leads to osmotic and oxidative stress within the plants. Use of magnetically treated water increased the water use efficiency of lettuce production addition minimizing the percentage occurrence of tip-burn. Lettuce performs incredible under protected conditions especially artificially controlled conditions including hydroponic, aquaponic and vertical growing systems. Hoagland solution with an organic concoction technique produced good quality lettuce with higher yields. The plant acoustic frequency technology generator significantly increased the growth of lettuce. Practice of precision farming technique with intelligent greenhouses 3D imaging and computer vision for plant spacing decisions has improved production. Investigations of technical modules *i.e.* mini-PV with pattern design, produced a scattered shadow (SS treatment) and thus, achieved higher productivity.

Keywords: Lettuce, hydroponic, aquaponic, mini-PV modules, scattered shadow, acoustics

TA/PP – 14

Assessment of under utilized green leafy vegetable manathakkali (*Solanum nigrum* L.) variety CO1 under organic and inorganic farming in Salem District

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ABSTRACT

Salem district of Tamil Nadu has got 20 blocks with an area of 39,765 ha under horticultural crops. Area under vegetable crops is more than 15250 ha and area under different green leafy vegetables including *Moringa oleifera, Solanum nigurm, Amaranthus species, Hibiscus cannabinus, Hibiscus subdarifa, Chenapodium album, Alternenthera sessilis and Sesbania grandiflora* is around 720 ha in Salem District. The farmers growing green leafy vegetables are located in Veerapandi block Salem district. The underutilized indigenous green leafy vegetables are nutritionally and medicinally important and used to diversify and improve nutritional security and also fill up to biomedicine industry. Black night shade or Manathakkali (*Solanum nigrum* L.) is an important under utilized green leafy vegetable cultivated in Salem District. Tamil Nadu Agricultural university released a new variety of manathakkali namely CO1 was demonstrated by KVK, Salem to make it popular among the farmers. Ten farmers were issued with seeds of CO 1 variety and they were instructed to follow organic farming practices including application of vermicompost soil application and panchakavya foliar application, inorganic farming practices and control as without any application of fertilizers or manures. Among different treatments, inorganic farming in CO 1 variety recorded higher yield of 30 t/ha and higher BCR of 3.67 and local check variety as a control recorded lower yield of 26 t/ha with BCR of 2.67. Although organic cultivation of CO 1 manathakkali recorded lower yield when compared to inorganic cultivation, it was on par with yield of inorganic cultivation.

Keywords: Underutilized leafy vegetable, *Solanum nigrum* L. variety CO 1, organic farming

TA/PP – 15

Studies on spread and acceptance of IIHR released brinjal hybrid "Arka Anand" in South India

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ABSTRACT

The spread and acceptance of ICAR-IIHR released brinjal hybrid "Arka Anand," was studied based on survey carried out in South India (Tamil Nadu, Kerala, Karnataka, Andhra Pradesh and Telangana) and the per cent of awareness was ranged from 3.63 – 7.27% and spread was 1.26 % to covered an area of 2850ha in South India. The reasons for spread and acceptance of brinjal hybrids are listed here based on farmers (adopters) opinion (i) High yielding capacity (86.6 %) (ii) Cluster and continuous bearing (80.0%) (iii) Good fruit quality (73.3%) (iv) Resistant to bacterial wilt (70 %) and (iv) Good field establishment (53.3%) and (vi) Suitable for ratoon crop (16.6%).The main reasons for non-adoption of brinjal hybrids in farmers field are (i)Less market demand (Colour and shape @84.3%) (ii)Less consumer preference (80.0%) (iii)Not aware of this hybrid (70.0%) (iv) non-availability of quality seeds at their location (60.1) and (v) Poor storage life (52.1%).Economic impact study on Arka Anand hybrid in comparison with Private hybrid revealed that the an average yield of Arka Anand at farmers field ranged from 37- 52 t/ha and an mean potential yield was @39.4 t/ha was noticed at farmers field where as the private hybrid yield was ranged from 35-44 t/ha.(Mean yield@ 35.1t/ha).There was an improvement in yield (12.3%v) was noticed in Arka Anand when compared to private hybrid. Moreover, it was observed 13.2 % lesser cost of production with the B:C ratio of 1:2.49 was noticed in Arka Anand.

Keywords: Arka Anand, brinjal hybrid, ICAR-IIHR hybrid

TA/PP – 16

Spread, acceptance and economic feasibility of IIHR released chilli hybrid Arka Haritha in South India

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ABSTRACT

ICAR-IIHR developed many superior high yielding chilli hybrids have made great impact at the national level which will give higher yield coupled with good quality fruits Among the chilli hybrids, "Arka Haritha" is high yielding hybrid coupled with higher pungency which is reported on tolerant to powdery mildew and virus diseases. The present study aimed to study the spread, acceptance and economic feasibility of this hybrid in South India. Based on the survey conducted in South India (Tamil Nadu, Kerala, Karnataka, Andhra Pradesh and Telangana) it was observed that the spread of chilli hybrid Arka Haritha was maximum of 1,05 % and it was covered an area 3160 ha. The reasons for spread and acceptance of Chilli hybrids are listed here based on farmers (adopters) opinion (i) Medium to High pungent fruits (76.7%) (ii) High yielder (70.8%) (iii) Attractive dark green fruits (62.5 %) (iv) Less incidence of powdery mildew diseases (34.1 %) and (v) Good keeping quality (Green fruits @7.66%). It was noticed that 70.8 – 76.7% of the farmers accepting ICAR-IIHR released Chilli Hybrid "Arka Haritha". In South India because of its high yielding potential coupled with good level of pungency. In case of economic benefit,12.9 % higher yield,13.6 % lesser cost of production coupled with higher cost benefit ratio of 1:3.31 was observed.

Keywords**:** Arka Haritha, chilli hybrid, ICAR-IIHR hybrid



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