4th Indian Horticulture Summit -cum-International Conference-2026

Harnessing Indigenous and Underutilized Horticultural Crops for Sustainable Development, Health and Economic Resilience

28-30 January 2026

BOOK OF ABSTRACTS

Organized by

SOCIETY FOR HORTICULTURAL RESEARCH AND DEVELOPMENT

Uttar Pradesh, India

at

RANI LAKSHMI BAI CENTRAL AGRICULTURAL UNIVERSITY

Jhansi, Uttar Pradesh, India



Co-Sponsors

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Compiled and Edited by

Balraj Singh, Som Dutt, B.S. Tomar, Manish Srivastava, Markandey Singh, J.K. Ranjan, Arvind K. Singh, P.K. Singh, Jogendra Singh, Gograj Singh Jat, Pragya Ranjan, Narendra Singh, Suman Lata, Ritu Jain, Namita Banyal, Sapna Panwar, P.P.S Verma and Paresh Chaukhande.

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Address for Communication

Dr Balraj Singh, President, SHRD, Uttar Pradesh, India, E-mail: drbsingh2000@yahoo.com, drbsingh2000@gmail.com Mobile: +91-8104736333, 9811271303

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Preface

The ***Book of Abstracts*** of the 4th Indian Horticulture Summit- cum- International Conference-2026 is a comprehensive compendium of research, innovations and policy perspectives, shaping the future of horticultural science in India and across the globe. This volume reflects the collective intellectual contributions of researchers, academicians, policy-makers, industry professionals, entrepreneurs and students who are actively engaged in advancing horticultural science, and technology development.

The abstracts written by diversified researchers have been compiled in this book which highlight cutting-edge research and practical solutions, addressing key challenges such as climate change, resource efficiency, crop diversification, value- addition, post-harvest management, and market integration. The contributions have a wide range of thematic areas including fruit, vegetable, flower, spice, plantation and medicinal crops; protected cultivation; precision and digital horticulture; biotechnology and breeding; soil and water management; pest and disease management; supply chain innovations; and entrepreneurship and start-ups.

Each abstract provides a concise yet insightful overview of the objectives, methodology and major findings of the research and the experiential work. This ***Book of Abstracts*** is intended to serve not only as a record of the scientific deliberations of the summit but also as a valuable reference for researchers, extension professionals, policy planners and students. It is hoped that the ideas and findings documented herein will stimulate further research, foster innovation, and contribute to evidence-based policy-making for the sustainable growth of the Horticulture sector, particularly in our country and the world over.

Thus, the 4th Indian Horticulture Summit- cum -International Conference-2026, through the ***Book of Abstracts***, reaffirms its commitment for promoting exchange of technical knowledge, strengthen partnerships and accelerate the transformation of horticulture into a resilient, inclusive and market-driven Horticulture sector, the lifeline of our small and marginal farmers and supports the national developmental goals.

Balraj Singh
Som Dutt

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Genetic resources, diversity, exploration, evaluation conservation and their use in crop improvement			
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Ajeet Singh	Professor	Pointed Gourd: A Profitable Vegetable Crop for Climate Resilient Farming in Bundelkhand	**IHS/T-1/OP-102**
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yogambal c	M.Sc., Hort. vegetable science	Estimation of Genetic variability and heritability in snake gourd [Trichosanthes anguina (L.)] genotypes	**IHS/T-1/OP-104**
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Ananya P Kumar	PhD student	Assessing genetic diversity in brinjal genotypes for resistance against Fusarium oxysporum f. sp. melongenae	**IHS/T-1/OP-110**
SUBOM RAI	P.hD. Research scholar	Genetic diversity studies in Teasle gourd (Momordica subangulata Blume subsp. renigera).	**IHS/T-1/OP-111**
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Daya Shankar Mishra	Principal Scientist	Characterization of Guava Genetic Resources Using Qualitative Descriptors and Quantitative Traits	**IHS/T-1/OP-114**
Shruti Soni	phd research scholar	Development of dual disease resistant breeding lines in watermelon	**IHS/T-1/OP-115**
Arpita Srivastava	Senior Scientist	Cytokinin-primed auxin surge and transient ABA stress response enable parthenocarpic fruit set in sweet pepper under low temperature	**IHS/T-1/OP-116**
Amit Kumar	Associate Professor	Elite Persian Walnut Selections from Kashmir as Revealed by Morphological Characterization	**IHS/T-1/OP-117**
Ananya Mishra	Ph.D. Scholar	Role of antioxidative enzyme activities in polyethelene glycol-mediated osmotic stress tolerance in Sweet Potato (Ipomoea batatas (L.) Lam.)	**IHS/T-1/OP-118**

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Genetic resources, diversity, exploration, evaluation conservation and their use in crop improvement			
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Honnappa Asangi	Scientist	Assessment of morphological, yield and quality attributes in elite genotypes of cardamom (Elettaria cardamomum Maton)	**IHS/T-1/OP-120**
Surendra Kumar Meena	Sr. Scientist	Screening cowpea genotypes for high phosphorus use efficiency under low-input conditions	**IHS/T-1/OP-121**
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Yvonne Angel Lyngdoh	Senior Scientist	Evaluation of Local potato landraces for yield, quality and Late blight resistance at Meghalaya	**IHS/T-1/OP-123**
Labdhi Dedhia	Former Ph.D. Scholar	Class B and C genes regulate the petal and stamen development in marigold (Tagetes erecta L.)	**IHS/T-1/OP-124**
Jyoti Devi	Senior Scientist	Genomic Dissection of the Multi-Flowering Trait in Vegetable Pea (Pisum sativum L.) Using QTL-Seq for Yield Enhancement	**IHS/T-1/OP-125**
Sachin Kumar	Senior Technical Officer	Genetic variability and correlation studies in peach (Diospyros kaki thunb.) genotypes under temperate conditions of Kashmir valley	**IHS/T-1/OP-126**
Neema M	Senior Scientist	Headspace Volatile Emission During Oil Palm (Elaeis guineensis Jacq.) Anthesis: Implications for Pollinator Attraction	**IHS/T-1/OP-127**
VARTIKA SRIVASTAVA	Scientist	Wild Edible Fruit Trees of Northeast India: Conservation and Future Prospects	**IHS/T-1/OP-128**
Diwakar Y	Senior Scientist	Identification of Elite Accessions through Multi-Trait Characterization of Conserved Coconut Germplasm	**IHS/T-1/OP-129**
Sushma Kumari	Student	Conservation and Utilization of Syzygium cumini (L.) Skeels Genetic Resources using Droplet Vitrification–Based Cryopreservation	**IHS/T-1/OP-130**
ASHOK YADAV	Scientist	Harnessing Neglected and Underutilized Fruits and Vegetables of Bundelkhand for Nutrition Security and Sustainable Livelihoods	**IHS/T-1/OP-131**
Arvind nagar	Assistant Professor	Investigation of Pollen-Pistil Interaction and Incompatibility in Interspecific Crosses of Luffa Species	**IHS/T-1/OP-132**
Renu Chauhan	Ph.D Scholar	In vitro multiplication and rooting of an endangered endemic wild species of banana (Musa indandamanensis L. J. Singh)	**IHS/T-1/OP-133**
Nisha Kumari	Ph.D. student	Genetic divergence studies in chilli (Capsicum annuum L.)	**IHS/T-1/OP-134**
Brij Bihari Sharma	Associate Professor	Genetic analysis of Fusarium wilt resistance using crop wild relatives in vegetable pea	**IHS/T-1/OP-135**
MOHD FARUK	PhD Research Scholar	Genetic evaluation of muskmelon hybrids using performance, correlation and path analysis for yield and quality traits in Kashmir	**IHS/T-1/OP-136**

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Genetic resources, diversity, exploration, evaluation conservation and their use in crop improvement			
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Partha Saha	Senior Scientist	Unlocking biochemical variability and bioactive compound richness in Chilli with implications for human health and suitability for breeding	**IHS/T-1/OP-137**
Ranjit Pal	Assistant Professor	Sustainable Fruit Systems: Enhancing Livelihood and Nutritional Security through the Adaptability and Productivity of Underutilized Fruit Crops in Bundelkhand	**IHS/T-1/OP-138**
ARESH CHAUKHANDE	Scientist	Dissecting the genetic architecture of tuber yield, quality, and nutritional traits in potato (Solanum tuberosum L.) through genome-wide association analysis	**IHS/T-1/OP-139**
Narendra Singh	Scientist	Exploiting Pummelo (Citrus maxima [Burm. f.] Merr.) in Interspecific Hybridization for Enhancing Fruit Quality and Nutritional Traits in Citrus	**IHS/T-1/OP-140**
Gangadhara K	Senior Scientist	Genetic variability studies in garden type of Indian bean (Lablab purpureus var. typicus L.) for nutritional security under rainfed semi-arid conditions.	**IHS/T-1/OP-141**
Krishna Prakash	Scientist	Genetic Variability, Heterosis and Evaluation of Advance Breeding Lines of Okra (Abelmoschus esculentus L.) for Enhanced Yield and Nutritional Quality under Eastern Indian Conditions	**IHS/T-1/OP-142**
Shrawan Singh	Senior Scientist	Application of Marker-assisted selection (MAS) in developing nutrient-dense vegetable varieties	**IHS/T-1/OP-143**

Theme 01 Poster Presentation			
Genetic resources, diversity, exploration, evaluation conservation and their use in crop improvement			
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Saurabh Singh	Student (Research Scholar)	Assessment of Diversity in Karonda (Carissa carandas L.) Genotypes	**IHS/T-1/PP-102**
Rajesh Kumar Singh	Professor	Potential of kharif onion in Bundelkhand region of Uttar Pradesh	**IHS/T-1/PP-103**
Srija Priyadarsini	Ph.D. Scholar	Nutritional Profiling Analysis in Amaranth Germplasm	**IHS/T-1/PP-104**
Parul Mehra	Ph.D. Hort. V.Sc.	Crop diversification with Star gooseberry (Phyllanthus acidus L.) in dryland region of Madhya Pradesh for nutritional and livelihood security	**IHS/T-1/PP-105**
Upasna Choudhary	Research Scholar	Assessment of genetic variability in garden pea for yield and yield attributing traits under Bundelkhand region	**IHS/T-1/PP-106**
Lalu Prasad Yadav	Scientist	Genetic Variability, Morphological Diversity, and Antioxidant Potential in Gynoecious Coccinia Accessions	**IHS/T-1/PP-107**
Beena Singh	Scientist	Evaluation of coconut varieties for growth attributes in the Bastar region of Chhattisgarh	**IHS/T-1/PP-108**
Arjun Lal Ola	Assistant Professor	Evaluation of Dolichos bean germplasm for vegetative and seed related traits under Bundelkhand region	**IHS/T-1/PP-109**
Amit Kumar	Associate Professor	Survey and Selection of Elite genotypes of Persimmon (Diospyros kaki Thunb.) from Ganderbal district of Kashmir valley	**IHS/T-1/PP-110**
Mallikaben Ravjibhai Sindha	Ph. D. Research Scholar	Genetic Improvement in Tuberose Through Mutation	**IHS/T-1/PP-111**
Yogesh Kumar	Ph.D. Scholar	Assessment of genetic diversity in ridge gourd (Luffa acutangula Roxb. L) by using Inter Simple Sequence Repeat (ISSR) molecular markers	**IHS/T-1/PP-112**
Anuj Kumar	Assistant Professor	Performance of chrysanthemum (Chrysanthemum morifolium Ramat.) varieties for growth, flower quality and yield parameters under Malwa Plateau conditions of M. P.	**IHS/T-1/PP-113**
Chetna Shaktawat	Student	Studies on variability and character association in brinjal (Solanum melongena L.)	**IHS/T-1/PP-114**
Shivam Kumar Rajpoot	Ph.D. Scholar	In-situ characterization and genetic diversity assessment of custard apple (Annona squamosa L.) germplasm for enhanced crop improvement	**IHS/T-1/PP-115**
Rakesh Kumar Yadav	Assistant Professor	Performance of genotypes for their quality parameters in fenugreek (Trigonella foenum graecum L.)	**IHS/T-1/PP-116**
Pradip babanrao kakde	Ph.D. Research Scholar	Effect of Stress relieving enzymatic activities in buds of Manjari Medika grapevine under semi-arid condition of Pune.	**IHS/T-1/PP-117**
VARTIKA SRIVASTAVA	Scientist	Surviving the Chill: Droplet Vitrification-based cryopreservation of Jamun (Syzygium cumini (L.) Skeels	**IHS/T-1/PP-118**

Theme 01 Poster Presentation			
Genetic resources, diversity, exploration, evaluation conservation and their use in crop improvement			
Author Name	**Designation**	**Abstract Title**	**Code**
RONANKI SRINIDHI	Research schloar	Study On Evaluating Genetic Variability of Gladiolus (Gladiolus grandiflorus L.) Cultivars Under Agro-Climatic Conditions of Prayagraj	**IHS/T-1/PP-119**
Satendra Singh Kushwah	Associate Professor	Characterization of Round Melon [Praecitrullus fistulosus (Stocks) Pangalo] Germplasm for morphological, Growth and Yield Traits	**IHS/T-1/PP-120**
Sonu Nagar	Ph.D. Scholar	Buchanania lanzan Spreng: An underutilized and valuable tropical fruit tree native to Indian forests	**IHS/T-1/PP-121**
Vikrant	Young Professional-I	Multi-environment evaluation for downy mildew disease incidence revealed the prevalence of multiple pathotypes and the need for region-specific breeding strategies in cucumber	**IHS/T-1/PP-122**
DIVYA MEEENA	MSc Scholar	Screening of sweet orange and mandarin genotypes grown under Bundelkhand region against granulation	**IHS/T-1/PP-123**
Vikash Meena	Student	Evaluation of bottle gourd germplasm for different growth and yield traits	**IHS/T-1/PP-124**
NEETU SAROJ	Student	Morpho-Biochemical Profiling of jamun (Syzygium cumini L.) germplasm available in Bundelkhand region	**IHS/T-1/PP-125**
Babulal Dhaka	SRF	EXPLORING GENETIC VARIABILITY FOR ROOT YIELD AND ITS COMPONENT TRAITS IN ASHWAGANDHA (WITHANIA SOMNIFERA L. DUNAL)	**IHS/T-1/PP-126**

Theme 02 Oral Presentation			
Genomics for improvement of indigenous and underutilized horticultural crops			
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Shailesh Kumar Tiwari	Senior Scientist	Pyramiding durable multi-pathogen wilt Eggplant (Solanum melongena L.) cultivation in tropical and sub-tropical Asia is severely hampered by a soil-borne wilt complex involving Ralstonia soresistance	**IHS/T-2/OP-202**
Ramesh Kumar Singh	Principal Breeder, Vegetables	Discovery of KASPar SNP marker assays for early blight resistance in tomato	**IHS/T-2/OP-203**
Parna Chatterjee	Student	Genome assembly and annotation to construct a high quality reference genome in okra (Abelmoschus esculentus cv. Pusa Sawani)	**IHS/T-2/OP-204**
Jagesh Kumar Tiwari	Principal Scientist	Processing Tomato Breeding: Strategies and Constrains	**IHS/T-2/OP-205**
Vidya Sagar	Scientist	Efficient In?Vitro Regeneration of Cucumber cv.?Kalyanpur?Green (Cucumis?sativus L.) Tailored for CRISPR Based Genome Editing	**IHS/T-2/OP-206**
Suman Lata	Scientist, Sr. Scale	Optimization of a protocol for efficient callus induction and in vitro plant regeneration in okra (Abelmoschus esculentus (L.) Moench)	**IHS/T-2/OP-207**
GOGRAJ SINGH JAT	Scientist	Molecular insights into charantin and ?-carotene biosynthesis in bitter gourd (Momordica charantia L.): Gene expression dynamics and metabolite profiling	**IHS/T-2/OP-208**
Jaswant Prajapati	PhD Scholar	Molecular Mapping of Gynoecy and Development of Diagnostic Markers for Breeding in underutilized Sponge Gourd (Luffa cylindrica L.)	**IHS/T-2/OP-209**
Sapna Panwar	Scientist	Genotyping-by-Sequencing: An efficient approach for the rapid discovery of genome-wide single nucleotide polymorphisms (SNPs) in marigold	**IHS/T-2/OP-210**
Raj Kumar	Student	Molecular Characterization of Flowering Locus T (FT) genes in diverse bolting cultivars of onion genotypes	**IHS/T-2/OP-211**
Gourab Saha	Student	Identification and expression analysis of 1-SST Gene(s) involved in fructan biosynthesis in onion (Allium cepa L.)	**IHS/T-2/OP-212**
Partha Saha	Senior Scientist	Genetic analysis and QTL-seq–based mapping of fruit bearing habit in brinjal (Solanum melongena L.)	**IHS/T-2/OP-213**
Amit Kumar Goswami	Sr. Scientist	Breeding Superior Guavas: Decoding Genotypes and Fruit Quality Traits	**IHS/T-2/OP-214**
Vandna - Patial	DST- Scientist	In-vitro axillary shoot meristem targetted transformation in potato c.v. kufri jyoti by injecting Agrobacterium tumefaciens culture	**IHS/T-2/OP-215**

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Genomics for improvement of indigenous and underutilized horticultural crops			
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AVANTIKA ANAND	Ph.D. Research Scholar	Genome-wide SSR Identification and Marker Development in Makhana (Euryale ferox Salisb.), an Underutilized Aquatic Crop	**IHS/T-2/PP-202**
Hardat Kaswan	PhD Student	Molecular studies on line × tester mating design in ridge gourd (Luffa acutangula (L.) Roxb) using SSR markers	**IHS/T-2/PP-203**

Theme 03 Oral Presentation			
Conventional breeding for crop improvement			
Author Name	**Designation**	**Abstract Title**	**Code**
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Arvind Kumar Verma	Senior Scientist	Mutagenesis Driven Morpho-Physiological Responses to Drought in Fennel	**IHS/T-3/OP-302**
Anil Bhushan	Professor	Elucidating Genetic Architecture for Horticultural and Quality Traits in Onion (Allium cepa L.)	**IHS/T-3/OP-303**
Keshav Gautam	Senior Scientist	Evaluation and Identification of Novel Powdery Mildew Resistance in Cucumis melo var. flexuosus (Long Melon) Germplasm	**IHS/T-3/OP-304**
Amar Jeet Gupta	Principal Scientist	Heterosis and hybrid performance in onion for earliness, yield and quality traits	**IHS/T-3/OP-305**
Ramavath Ramesh Babu	Scientist	Generation mean analysis for processing suitable seed traits of tomato (Solanum lycopersicum L.)	**IHS/T-3/OP-306**
Dr Akshay Indulal Patel	Professor	Natural and Artificial Screening of Various Chilli Genotypes to Assess Resistance for Chilli Leaf Curl Virus under South Gujarat Conditions	**IHS/T-3/OP-307**
Dr Akshay Indulal Patel	Professor	Assessing the Suitability of Exotic African Marigold Hybrids (Tagetes erecta L.) Under South Gujarat Conditions	**IHS/T-3/OP-308**
Dr Akshay Indulal Patel	Professor	Genetic diversity studies among marigold hybrids (Tagetes erecta L.)	**IHS/T-3/OP-309**
Vishal Sunartiya	Research Scholar	Sex Form Variations: A Strategy for Earliness and Yield Enhancement in Bitter Gourd	**IHS/T-3/OP-310**
Nidhish Kumar	Student	“Genetic Improvement of an Underutilized Fruit Crop: A Long-Term Breeding Strategy for Hylocereus (Dragon Fruit)”	**IHS/T-3/OP-311**
Chavlesh Kumar	Scientist	Analysis of pulp pigment and seed characteristic segregation in biparental guava progenies	**IHS/T-3/OP-312**

Theme 03 Oral Poster Presentation			
Conventional breeding for crop improvement			
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Niharika singh	Research scholer	Conventional Breeding Approaches for Improvement of Vegetable Crops	**IHS/T-3/PP-302**
Krishna Kumar Sharma	Ph.D. Research Scholar	Exploiting Genetic Heterosis in Tomato Hybrids to Strengthen Nutritional Security	**IHS/T-3/PP-303**
DIVYA ARTI	SENIOR RESEARCH FELLOW	Genetic variability studies on Indian onion genotypes for reproductive traits	**IHS/T-3/PP-304**
Yashmi Yadav	Ph.D	Conventional breeding for crop improvement	**IHS/T-3/PP-305**
Gangadhara K	Senior Scientist	Thar Kiran: Anthocyanins rich and high yielding variety of dolichos bean for rainfed semi arid conditions of western India	**IHS/T-3/PP-306**
Neha Kumari	Young Professional	Characterization and evaluation of brinjal (Solanum melongena L) hybrids for morphological and yield traits	**IHS/T-3/PP-307**
Jaswant Prajapati	PhD Scholar	Growth regulation through combining ability and heterosis in gynoecy × monoecy combinations of sponge gourd (Luffa cylindrica L.)	**IHS/T-3/PP-308**

Theme 04 Oral Presentation			
Recent advances in production technology of indigenous and underutilized horticultural crops			
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Nakul Gupta	Senior Scientist	Unlocking the physio-biochemical basis of combinational seed dormancy and its management through seed treatments in leafy chenopod (Chenopodium album L.)	**IHS/T-4/OP-402**
Sanket J. More	Scientist	Assessment of Weed Management Strategies in Onion under Different Cropping Seasons	**IHS/T-4/OP-403**
Raj Kumar Kumar	Senior Scientist & Head	Assessment of Natural Farming inputs for yield and quality of pea (Pisum sativum L.)	**IHS/T-4/OP-404**
Raj Kumar Kumar	Senior Scientist & Head	Impact of RDF and NAA on yield and quality attributes of Mango (Mengifera indica L.) cv. Kesar under semi arid ecosystem of Western India	**IHS/T-4/OP-405**
Jitendra Singh	Prof	Effect of plant and environmental variables on growth, production and quality of Nagpur Mandarin (Citrus reticulata Blanco)	**IHS/T-4/OP-406**
Sachin Kumar	Senior Technical Officer	Role of Heading Back in Early Production of Almond Nursery Plants	**IHS/T-4/OP-407**
Shivali Sharma	Ph.D. Scholar	Cow Urine-Mediated Green Synthesis of Zinc Oxide Nanoparticles and Their Role in Enhancing Yield and Postharvest Shelf-Life of Guava (Psidium guajava L.)	**IHS/T-4/OP-408**
Nirmala Singh Singh	Research Scholar	Effect of foliar-applied potassium sulphate on phenological development and quality attributes of mango cv. Amrapali	**IHS/T-4/OP-409**
Avinash Tomer	Senior Research Fellow	Study the comparative effect of organic and chemical fertilizers on growth and yield parameters of carrot (Daucus carota L.) cv. Nantes	**IHS/T-4/OP-410**
Ranjit Pal	Assistant Professor	Effect of Foliar Application of NAA on Fruit Yield and Quality Attributes of Dragon Fruit (Hylocereus spp.) under Semi-Arid Climatic Conditions	**IHS/T-4/OP-411**
Shyalli Kumari	Student	Standardization of High-Frequency Micropropagation System for Local Genotypes of Pointed Gourd (Trichosanthes dioica Roxb.)	**IHS/T-4/OP-412**
Divya Pandey	PhD Scholar	Biofortification-Based Enhancement of Strawberry Yield and Quality Using AMF, Selenobacteria and Nano Zinc Oxide	**IHS/T-4/OP-413**

Theme 04 Poster Presentation			
Recent advances in production technology of indigenous and underutilized horticultural crops			
Author Name	**Designation**	**Abstract Title**	**Code**
Bhakti Bharatkumar Panchal	Scientist	Effect of growth regulators and apical pinching on growth and yield of okra	**IHS/T-4/PP-401**
Dr. Ashok Choudhary	Assistant Professor (Horticulture)	Bio fortified Vegetables: A Sustainable and Scientific Strategy to Alleviate Malnutrition	**IHS/T-4/PP-402**
Hari Dayal Choudhary	Assistant Professor	Effect of Foliar Micronutrient Application on Growth, Yield, Quality and Economic Returns of Garlic in Western Rajasthan	**IHS/T-4/PP-403**
Manish Kumar Singh	Assistant Professor	Taro: A Climate-Resilient Underutilized Tuber with Nutritional and Economic Potential	**IHS/T-4/PP-404**
Soumadeep Putatunda	PhD research Scholar	Avenues for Valorisation, Enhancing the Utilization and Commercial potential of Ivy Gourd (Coccinia grandis (L.) Voigt)	**IHS/T-4/PP-405**
Mayank Sharma	Research scholar	Effect of Zinc and Humic Acid on Growth, Yield and Quality of Broccoli (Brassica Oleracea Var. Italica Plenck)	**IHS/T-4/PP-406**
Mahesh	Student	Role of Indigenous Underutilized Horticultural Crops in Enhancing Nutritional Security	**IHS/T-4/PP-407**
Sujeet Singh	Ph.D. Scholar	Effect of different spacing and NPK combination on growth and fruit yield of strawberry (winter dawn).	**IHS/T-4/PP-408**
Himanshu Yadav	Research scholar	EFFECT OF NPK, SULPHUR, ZINC AND BORON IN ONION (ALLIUM CEPA L.)	**IHS/T-4/PP-409**
Lalita Bochalya	P.h.D.	To optimize moisture and fertilizer levels for seed production and evaluate cost-effectiveness	**IHS/T-4/PP-410**
Banti Bairwa	Student	Potential of Underutilized Vegetable Crops in Indian Agriculture	**IHS/T-4/PP-411**
Rahul Kumar Bochalya	Student	Gibberellic Acid and Micronutrient Applications: Impacts on Garden Pea Growth, Yield and Quality	**IHS/T-4/PP-412**
Banwari Lal Nagar	Professor	Response of Potato (Kufri Ganga) to different nitrogen doses in relation to growth, yield, and tuber quality under South-Eastern Rajasthan	**IHS/T-4/PP-413**
anshita salaria	student	towards next-generation strawberry production- enhancing yield and quality attributes	**IHS/T-4/PP-414**
Rajni Kumari	Ph.D scholar	Rapid In Vitro Regeneration and Mass Multiplication of Long-Day Garlic	**IHS/T-4/PP-415**

Theme 04 Poster Presentation			
Recent advances in production technology of indigenous and underutilized horticultural crops			
Author Name	**Designation**	**Abstract Title**	**Code**
Saurabh Tomar	Subject Matter Specialist	Enhancing Productivity of Old Mango Orchards through Centre Opening Canopy and Nutrients Management in Tarai Region of Uttar Pradesh	**IHS/T-4/PP-416**
Jigar Sureshbhai Parasana	Assistant Professor	Effectiveness of Integrated Nutrient Management in Enhancing Growth, Yield and Quality Attributes of Rejuvenated Guava (Psidium guajava L.) cv. Bhavnagar Red"	**IHS/T-4/PP-417**
Sidharth	YP-II	Effect of transplanting dates and micronutrients on growth and yield of different tomato cultivars	**IHS/T-4/PP-418**
Tendul Chouhan	Ph.D. Fruit Science	Influence of KNO3 and GA3 on Vegetative Growth of Dragon Fruit [Hylocereus costaricensis (Web.) Britton and Rose]	**IHS/T-4/PP-419**
Sarjesh Kumar Meena	Ph.D scholar	Effect of various inorganic and organic sources on the ultimate analysis of Water chestnut	**IHS/T-4/PP-420**
Saroj Choudhary	Ph.D Research Scholar	Role of Biostimulant in Enhancing Yield and Physico-Chemical Attributes of Garlic (Allium sativum L.)	**IHS/T-4/PP-421**
Dhaneshra Kumari Gurjar	Ph.D. Research Scholar	Effect of position and portion of canopy on yield, quality and their associated attributes on Jamun (Syzygium cuminii Skeels.) cv. Goma Priyanka	**IHS/T-4/PP-422**
Vinod Kumar	Assistant Professor	Suitability of Kalmegh (Andrographis paniculata Nees.) Cultivation under Organic Conditions	**IHS/T-4/PP-423**
GANESH RAM	PhD Research Scholar	Synergistic Influence of Gibberellic Acid (GA?) and Potassium on Seed Yield and Quality of Red Radish (Raphanus sativus L.)	**IHS/T-4/PP-424**
Puneet Thakur	student	The effect of foliar application of zinc and boron on yield and physico-chemical attributes of guava (Psidium guajava L.) cv. Lalit and Shweta under Bundelkhand region of U.P.	**IHS/T-4/PP-425**

Theme 05 Oral Presentation			
Post-harvest management, processing, value addition, and Agri-export zones for indigenous and underutilized horticultural cops			
Author Name	**Designation**	**Abstract Title**	**Code**
Anup Kumar Bhattacharjee	Principal Scientist	Prospects and Potential of Fruit Processing in Bundelkhand Region of India	**IHS/T-5/OP-501**
Dev Raj	Professor and Head	Mango Peel and Kernel utilization to Prepare "Nankhatai"	**IHS/T-5/OP-502**
Arvind K. Verma	Senior Scientist	Mutagenesis riven morpho-physiological responses to drought in fennel	**IHS/T-5/OP-503**
Dr.Preethi Palpandian	Senior Scientist	Pretreating Avocado Seeds for cocoa powder replacement in chocolate preparation	**IHS/T-5/OP-504**
Vijay Rakesh Reddy S	Senior Scientist	Standardization of pre storage treatments for extended marketability and quality of Rose apple (Syzygium jambos L.) fruits	**IHS/T-5/OP-505**
Alka Joshi	Scientist	Flash vacuum expansion: A novel extraction technique for betalains from beetroot and its stabilization through copigmentation	**IHS/T-5/OP-506**
Pasupuleti Pranuthi	Assistant Professor Horticulture	EDIBLE FLOWERS	**IHS/T-5/OP-507**
Diwakar Bahukhandi	Principal Scientist Retd.	Nutritional Value and Nutraceutical Properties of Mushrooms	**IHS/T-5/OP-508**
Alla Venkata satya Hyndavi	PhD scholar	Effect of Brining Concentration and Packaging Material on the Shelf Life and Quality of Minimally Processed Tender Jackfruit Slices (Artocarpus heterophyllus L.)	**IHS/T-5/OP-509**
Raghavendra H R	Scientist	Optimizing Phenolic Extraction from Potato Using Ultrasound- Assisted Technique: A Response Surface and Genetic Algorithm Approach	**IHS/T-5/OP-510**
Ghanshyam Abrol	Assistant Professor	Optimization of functional drink from the dragon fruit peel using BBD RSM	**IHS/T-5/OP-511**
Poonam Kumari	Senior Scientist	Comparative evaluation of drying techniques on bioactive compounds, nutritional quality, and anti-nutrients of Kachnar (Bauhinia variegata L.) flowers	**IHS/T-5/OP-512**
Ganesh B Kadam	Senior Scientist	DEVELOPMENT OF A COST-EFFECTIVE PACKAGE FORMULA FOR ENHANCING THE VASE LIFE OF CUT ROSES	**IHS/T-5/OP-513**
Akansha upadhyay	student	Valorization of Jamun Seed Waste: Influence of Drying Methods on Nutraceutical Quality	**IHS/T-5/OP-514**
Rajan Mahendra	PhD	Broccoli Leaf Waste: An innovative approach for Carotenoid Extraction via Green Solvent and Advanced Mechanical Technique	**IHS/T-5/OP-515**
Namita	Principal Scientist	Genotypic Determinants of Fruit Quality and Phytochemical Diversity in Rose Hips (Rosa spp.)	**IHS/T-5/OP-516**
Tanuj Misra	Assistant Professor	Deep Learning–Driven Dragon Fruit Maturity Grading Using a Smartphone-Based System	**IHS/T-5/OP-517**
PRIYANKA SHARMA	Assistant Professor	Optimization of process parameters for the extraction of pigments for herbal gulal preparation	**IHS/T-5/OP-518**

Theme 05 Oral Presentation			
Post-harvest management, processing, value addition, and Agri-export zones for indigenous and underutilized horticultural cops			
Author Name	**Designation**	**Abstract Title**	**Code**
Sanjay Kumar	Scientist	Essential Oil–Mediated Biochemical Defense Mechanisms Governing Storage Pest Resistance in Coriander Seeds	**IHS/T-5/OP-519**
Naresh Kumar	SRF	Influence of Blending and Storage on Physico-Chemical and Sensory Quality of Ber-Based Squash	**IHS/T-5/OP-520**
Shubham Samkaria	Research Associate	Title: Comparative evaluation of drying techniques on bioactive compounds, nutritional quality, and anti-nutrients of Kachnar (Bauhinia variegata L.) flowers	**IHS/T-5/OP-521**
Shubham Samkaria	Research Associate	Vinegar production through semicontinuous acetification of sand pear base wine via regulating the air flow rate.	**IHS/T-5/OP-522**

Theme 05 Poster Presentation			
Post-harvest management, processing, value addition, and Agri-export zones for indigenous and underutilized horticultural cops			
Author Name	**Designation**	**Abstract Title**	**Code**
Vartika Singh	Assistant Professor	Post-Harvest Treatment Effects on Shelf -Life and Quality Parameters of Various Cultivars of Indian Gooseberry	**IHS/T-5/PP-501**
Nityamanjari Mishra	Assistant Professor (Vegetable Science)	Role of Underutilised Vegetables towards Nutritional Security of Tribal Communities in North Central Plateau Zone of Odisha	**IHS/T-5/PP-502**
KIRTIKA MISHRA	Ph.D. Scholar	Moringa Leaves: A nutritional powerhouse with improved shelf -stability	**IHS/T-5/PP-503**
Km Rooma	student	Effect of edible coatings on the shelf life of guava (Psidium guajava L.) cv. Hisar Safeda	**IHS/T-5/PP-504**
SANJAY SEEMAWAT	Ph.D. Scholar	Nutritional Diversification through Indigenous Underutilized Horticultural Crops	**IHS/T-5/PP-505**
Krishna Jat	Phd(Hort.) Vegetable science	Hyperspectral Imaging–Based Intelligent Sorting: An Advanced Non-Destructive Approach for Enhancing Post-Harvest Quality and Value in Horticultural Crops	**IHS/T-5/PP-506**
Sudha Patil	Assistant Professor	Utilization of gladiolus corms as an antimicrobial agent in food processing and traditional medicine	**IHS/T-5/PP-507**
Babanjeet	Research Scholar	Metabolic resilience induced by preharvest micronutrient nutrition enhances tomato (Solanum lycopersicum L.) quality as revealed by FT-IR fingerprinting and sensory evaluation	**IHS/T-5/PP-508**
Shristi rai Rai	M.sc. fruits science Student	Post harvest management, Processing and Value addition for indigenous and underutilized Horticultural crops	**IHS/T-5/PP-509**
Soujanya Battula	Ph.D Scholar	Empowering Rural Economies through Value Addition and Export Promotion of Underutilized Fruits	**IHS/T-5/PP-510**
Akansha upadhyay	student	Effects of Drying Methods for Retention of Bioactive Compounds and Minerals in Jamun (Syzygium cumini) Pulp Powder: Implications for Value Addition and Storage Stability	**IHS/T-5/PP-511**
Renu Godara	SMS Home Science	Comparative Sensory Evaluation of Single-Fruit and Blended Amla–Guava Value-Added Jam	**IHS/T-5/PP-512**
PALLAVI ANAND	MSC Student	Identification and Characterization of Bioactive Peptides from Aconitum heterophyllum Wall ex Royle	**IHS/T-5/PP-513**
Kaustubh Yashvant Deshmukh	Research Scholar	Effect of Drying Methods and Packaging Materials on Storability of Jamun (Syzygium cumini L.) Pulp Powder	**IHS/T-5/PP-514**
Jayveer sahu	Student	Standardization of Post-Harvest Drying and Resin Embedding Methods for Value-Added Floriculture Products	**IHS/T-5/PP-515**
Dinesh Kumar Malav	Student	Assessment of Nutritional Quality in Pigmented Okra (Abelmoschus esculentus (L.) Moench) Genotypes	**IHS/T-5/PP-516**
Alan Evon Singh	JRA	Development and Evaluation of Dragon Fruit Leather Fortified with Oats for Enhanced Functional and Nutritional Properties	**IHS/T-5/PP-517**

Theme 05 Poster Presentation			
Post-harvest management, processing, value addition, and Agri-export zones for indigenous and underutilized horticultural cops			
Author Name	**Designation**	**Abstract Title**	**Code**
SHANKAR RAJPOOT	YOUNG PROFESSIONAL	Impact of Storage Time on the Physico-Chemical Properties and Bioactive Potential of Carambola Bagasse-Fortified Mix Fruit Juice Powder	**IHS/T-5/PP-518**
Vardiboina Ruchitha	Masters scholar	Development and standardization of functionally enriched edible film from dragon fruit peel polysaccharides	**IHS/T-5/PP-519**

Theme 06 Oral Presentation			
Clean planting material and high yielding seeds			
Author Name	**Designation**	**Abstract Title**	**Code**
Natasha Gurung	SCIENTIST	Morphological, biochemical and yield evaluation of mandarin (Citrus reticulata blanco) accessions for elite germplasm selection in the Eastern Himalayas	**IHS/T-6/OP-601**
S RAMACHANDRAN	Senior Scientist	Effect of Organic Amendments and Microbial Consortia on Dragon Fruit Sapling Vigor and Growth	**IHS/T-6/OP-602**
Manja Naik E	Student	A Respiration-Based Colorimetric Assay for Rapid Evaluation of Seed Viability in Vegetable Crops	**IHS/T-6/OP-603**
Hanuman Ram	Scientist	Coat-type surface covering protective vegetable nursery technology for hot arid climate	**IHS/T-6/OP-604**
Poster Presentation			
Desh Raj Choudhary	District Extension Specialist	Front line demonstration: An effective way of dissemination technology of fenugreek in Jhajjar district of Haryana	**IHS/T-6/PP-601**
Desh Raj Choudhary	District Extension Specialist	Impact of micronutrient spray on growth, bulb yield and economics of onion	**IHS/T-6/PP-602**
Upendra Yadav	Research Scholar	Studies on Effect of Budding Height on Success of Patch Budding in Aonla (Emblica officinalis Gaertn)	**IHS/T-6/PP-603**
Dhruv Kumar	Prin. Scientist	Varietal Differences in Development of Clones in Nucleus Seed Production (Stage-I) of Potato	**IHS/T-6/PP-604**
Kalp Das	PhD Research Scholar	A preliminary assessment of seed yield and seed quality traits in ridge gourd (Luffa acutangula L.) genotypes under Chhattisgarh plains	**IHS/T-6/PP-605**
SUNIL KHANDOLIYA	Ph.D. Research Scholar	Propagation Efficiency of Wedge Grafting in Custard Apple: Cultivar- Specific Responses	**IHS/T-6/PP-606**
Nayan Priya	Msc	Studies on the effect of plant growth promoting rhizobacteria (PGPR) on the growth of budded plants of walnut (Juglans regia L.)	**IHS/T-6/PP-607**

Theme 07 Oral Presentation			
Protected cultivation and precision farming			
Author Name	**Designation**	**Abstract Title**	**Code**
Ankita Mohapatra	PhD scholar	Comparative performance of lettuce cultivars under different media in an aggregate hydroponic system	**IHS/T-7/OP-701**
Akash Sharma	Senior Scientist	Effect of Soil and Substrate Composition for Cultivation of Kagzi Lime Grown under Rooftop Farming.	**IHS/T-7/OP-702**
Sudha Patil	Assistant Professor	Optimization of micronutrient doses for aster [Callistephus chinensis (L.) Nees]	**IHS/T-7/OP-703**
Rekha Meena	Assistant Professor	Optimization of LED Quality Parameters to Enhance Antioxidant Potential and Quality Attributes in Microgreens	**IHS/T-7/OP-704**
Dilip Jat	Scientist	Real Time Nitrogen Estimation and Automated Foliar Spraying System for Poly house Cultivation	**IHS/T-7/OP-705**
Sanket J. More	Scientist	Harnessing UAV-Based Multispectral Sensing, Growth Simulation, and Machine Learning for Precision Onion Crop Management	**IHS/T-7/OP-706**
M. Ramesh Naik	Senior Scientist	Global Research Trends in Protected Cultivation: A Bibliometric Analysis of Horticultural Crops	**IHS/T-7/OP-707**
Suresh Kumar J	Scientist	Advancing Sweet Potato Production Through Soilless Systems	**IHS/T-7/OP-708**
MOOMAL BHARADWAJ	Ph.D. Scholar	Impact of bio-botanicals on yield and fruit quality of Okra [Abelmoschus esculentus (L.) Moench] var. Pusa Bhindi-5	**IHS/T-7/OP-709**
Neeraj Singh Negi	Dr.	LED-based growth chamber module for crop regulation in Chrysanthemum morifolium cv. Zembla	**IHS/T-7/OP-710**

Theme 07 Poster Presentation			
Protected cultivation and precision farming			
Author Name	**Designation**	**Abstract Title**	**Code**
Raju - Yadav	Dr.	Optimization of Seed Production Technology of Cucumber (Cucumis sativus L.) cv. Pusa Parthenocarpic Cucumber-6 under Naturally Ventilated Polyhouse Condition	**IHS/T-7/PP-701**
Dhaneshvari arya	Ph.D. Final Year Vegetable Science	New Age Farming Technologies in Vegetable Crops with Special Emphasis on Protected Cultivation	**IHS/T-7/PP-702**
Rajesh Kumar Singh	Professor	Studies on enhance income through vertical farming of vegetables under protected cultivation	**IHS/T-7/PP-703**
Krishna Dahre	Research Scholar	A Review on the Impact of Drip Irrigation on Growth, Yield, and Economic Viability of Maize (Zea mays L.)	**IHS/T-7/PP-704**
Krishna Dahre	Research Scholar	Effect of Plant Growth Regulators on Yield, Quality and Economics of Onion (Allium cepa L.)	**IHS/T-7/PP-705**
Baldev Jayani	Student	Precision Farming Strategies for Resource-Efficient Vegetable Production	**IHS/T-7/PP-706**
Naveen Ola	Student	Protected Cultivation of Vegetable Crops: Enhancing Productivity, Quality, and Climate Resilience	**IHS/T-7/PP-707**
Sourabh Sherawat	Student	Integrated Approaches to Sustainable Horticulture: Protected Cultivation Meets Precision Farming	**IHS/T-7/PP-708**
NITU KUMARI	Ph.D Scholar	Vertical Hydroponic Cultivation of Strawberry (Fragaria × ananassa): A Sustainable Approach for Enhanced Productivity in India	**IHS/T-7/PP-709**
Rohitashv Sharma	PhD Scholar	Performance of Vegetable Crops under Different Protected Cultivation Structures	**IHS/T-7/PP-710**
Pushprajsinh Dolatsinh Solanki	Assistant Professor	EFFECT OF DIFFERENT COLOUR MULCHING ON GROWTH AND FLOWERING OF STRAWBERRY UNDER ORGANIC CONDITION	**IHS/T-7/PP-711**
Babanjeet	Research Scholar	Chrono-regulatory effects of ethephon on growth and reproductive performance in bottle gourd (Lagenaria siceraria Mol. Standl)	**IHS/T-7/PP-712**
Anand Sahil	Young Professional 2	Performance Evaluation of Lettuce Varieties under Aeroponic and Geoponic Growing Systems: An Interaction Study	**IHS/T-7/PP-713**
Abhishek Kumar	SRF	Influence of Inorganic, Organic and Biofertilizer-Based Nutrient Management on Growth and Yield of Tomato (Solanum lycopersicum L.)	**IHS/T-7/PP-714**
SHUBHANGI SHEKHAR	Student	Advances in Production Technology for Strawberry under Protected Conditions through Plant Growth Regulator Application	**IHS/T-7/PP-715**
KAUSHALYA CHOUDHARY	Student	Smart Precision Horticulture: Role of Remote Sensing, GIS and Machine Learning in Vegetable Production	**IHS/T-7/PP-716**
Md Faishal Ahmad	M.Sc. Floriculture and landscaping.	Smart Floriculture for Sustainable Development	**IHS/T-7/PP-717**

Theme 08 Oral Presentation			
Diseases and pest management of horticultural crops			
Author Name	**Designation**	**Abstract Title**	**Code**
Amrita Das	Senior Scientist	Antimicrobial efficacy of volatile compounds from antagonistic yeast Hanseniaspora uvarum LE-1 against postharvest pathogens	**IHS/T-8/OP-801**
Rakesh Balavantrao Sonawane	Assistant Professor of Plant Pathology	Management of twister disease of kharif onion from nursery stage	**IHS/T-8/OP-802**
Saheb Pal	Scientist	Employing resistant Citrullus sp. rootstocks for sustainable management of Fusarium wilt and enhanced productivity of watermelon	**IHS/T-8/OP-803**
Jaydeep Halder	Senior Scientist	The bioefficacy of different insect pest management modules against the tomato insect pests and their potential predators	**IHS/T-8/OP-804**
Manjunatha Gowda Thondihalu	Scientist	Integrated strategies for the management of root-knot nematode, Meloidogyne incognita on cucumber grown under protected conditions	**IHS/T-8/OP-805**
J K Ranjan	Principal Scientist	A novel hydroponic approach for efficient screening and rapid phenotyping for identification of Fusarium wilt resistance in brinjal (Solanum melongena l.) and wild Solanum species	**IHS/T-8/OP-806**
AMISH KUMAR SUREJA	Principal Scientist	Transmission Dynamics of Squash Leaf Curl China Virus Associated with Yellow Mosaic and Leaf Curl Disease in Pumpkin	**IHS/T-8/OP-807**
Jogendra Singh	Scientist	Genetic mapping and molecular insights into powdery mildew resistance for sustainable disease management in bottle gourd [Lagenaria siceraria (Mol.) Standl.]	**IHS/T-8/OP-808**
Ramesh K B	Scientist	Genome-Wide Identification and Functional Characterization of Odorant-Binding Proteins in the Red Pumpkin Beetle, Aulacophora foveicollis	**IHS/T-8/OP-809**
Vaishali Singh	Student	Potato Dry Rot –The Silent Threat to Post Harvest Quality	**IHS/T-8/OP-810**
Yogendra Kumar Mishra	Assistant Professor	To evaluate the bio efficacy of Beauveria bassiana by using different substrates against the Helicoverpa armigera (Hübner) (Lepidoptera: Noctuidae) under laboratory condition	**IHS/T-8/OP-811**
Naval Kishor Sepat		Biosafety Norms for Handling Horticultural Pathogens: Ensuring Plant Health and Biosecurity	**IHS/T-8/OP-812**
Vikas Bamel	Senior Scientist	Pathogenicity of citrus nematode, Tylenchulus semipenetrans, on acid lime (Citrus aurantifolia Swingle) var. Pusa Udit	**IHS/T-8/OP-813**
Mahendra Singh	Senior Scientist	Integrated strategies for sustainable management of root-knot nematode (Meloidogyne incognita) in vegetable crops under protected cultivation systems	**IHS/T-8/OP-814**
Dr. Sabina Islam	Principal Scientist	Emerging pathogen of kharif onion in North Indian plains and their management strategy	**IHS/T-8/OP-815**

Theme 08 Oral Presentation			
Diseases and pest management of horticultural crops			
Author Name	**Designation**	**Abstract Title**	**Code**
Suresh Kumar Jat	Assistant Professor	Effectiveness of Cyantraniliprole 10.26% OD Against Sap Feeder Insect Pests Infesting Pomegranate	**IHS/T-8/PP-801**
Prahlad Sahay Sharma	M.Sc. Scholar	Integrated Pest Management Approaches in Horticulture	**IHS/T-8/PP-802**
Dhananjay Vitthal Shirsat	Senior Research fellow	Rhizosphere Microbial Communities as Biocontrol Agents Against Insect Pests of Onion (Allium cepa L.)	**IHS/T-8/PP-803**
Suresh Reddy Yerasu	Senior scientist	Validation of markers linked to major genes/ QTLs resistance to major biotic stresses in tomato	**IHS/T-8/PP-804**
Shakti Khajuria	SMS Plant Protection	Validation of Integrated Disease Management Technologies for Little Leaf Disease in Brinjal	**IHS/T-8/PP-805**
RAYAPU SAI THEJA	Ph.D	, Evaluation of IPM modules against sucking pests in Hibiscus rosa-sinensis L	**IHS/T-8/PP-806**
Sangeeta Pandey	Head and Professor	HWT and fungicide treatments for reduction of postharvest anthracnose disease in Guava (Psidium guajava L)	**IHS/T-8/PP-807**

Theme 09 Oral Presentation			
Climate-resilient horticulture production			
Author Name	**Designation**	**Abstract Title**	**Code**
Disha Baishnabi	PhD Research Scholar	Harnessing native endophytic microorganisms to enhance salt stress resilience in sweet potato (Ipomoea batatas L. Lam)	**IHS/T-9/OP-901**
Prabhat Tiwari	Assistant Professor	Potential of Horti-silvi-pasture based land use system in Bundelkhand	**IHS/T-9/OP-902**
Priti Upadhyay	DST WoS A	Genome-wide QTL mapping reveals the genetic architecture of heat tolerance in chilli (Capsicum annuum)	**IHS/T-9/OP-903**
Vikas Singh	Principal Scientist	Standardization of sodium chloride thresholds for salt tolerance screening in vegetable cowpea (Vigna unguiculata L. Walp.)	**IHS/T-9/OP-904**
Jagesh Kumar Tiwari	Principal Scientist	Climate-Smart Tomato Breeding: Enhancing Resistance to Biotic and Abiotic Stresses	**IHS/T-9/OP-905**
RK PATEL	Pr. Scientist & Head	Soil and water conservation measures with good agricultural practices in fruits of Bundelkhand region	**IHS/T-9/OP-906**
Sunil Kumar	Science	Climate-Resilient Management of Fruit Cracking and Scorching in Litchi (Litchi chinensis Sonn.): Integrating Genotypic Selection and Orchard Microclimate Modification	**IHS/T-9/OP-907**
Raj Kumar	Senior Scientist	Physiological Responses of Date Palm (Phoenix dactylifera L.) to Varying Levels of Sodicity and Salinity in Haryana	**IHS/T-9/OP-908**
HARISHA CB	Scientist	Morpho-physiological responses of geranium (Pelargonium graveolens) varieties to salinity stress and its alleviation by foliar KNO?	**IHS/T-9/OP-909**
Sonu Nagar	Ph.D. Scholar	Underutilized Fruit Crops of Indian Arid and Semi-Arid Regions: Importance, Conservation and Utilization Strategies	**IHS/T-9/OP-910**
Brijesh Kumar Maurya	Senior Research Fellow	Salt Injury Index and Membership Function Value Based Evaluation of Salinity Tolerance in Pea (Pisum sativum L.) Genotypes	**IHS/T-9/OP-911**
Boraiah KM	Senior Scientist	Unravelling the Differential Mechanisms Promoting Pollination in White-and Red-fleshed Dragon Fruit Varieties	**IHS/T-9/OP-912**
Ranjit Pal	Assistant Professor	Performance of dragon fruit (Hylocereus spp.) and strawberry (Fragaria × ananassa Duch.) intercropping model under semi-arid conditions of the Bundelkhand region	**IHS/T-9/OP-913**
Manju Shukla	Agromet Observer	Effect of different chemicals on seed germination and growth of papaya (Carica papaya L.)seedlings under polyhouse condition	**IHS/T-9/OP-914**
Anita Meena	Senior Scientist	Climate-Resilient Nutrient Strategies for Green Vegetable Production under Saline Irrigation in Arid Region	**IHS/T-9/OP-915**

Theme 09 Poster Presentation			
Climate-resilient horticulture production			
Author Name	**Designation**	**Abstract Title**	**Code**
Sandeep Chopra	Professor & Head	Differential Response of Varieties and Bio-inoculants on Yield, Quality and Biotic Stress Traits in Pumpkin	**IHS/T-9/PP-901**
Rajendra Kumar Yadav	Assitant Professor	Effect of drip irrigation and fertigation schedule on productivity, profitability, water and fertilizer use efficiency in strawberry (var. Winter dawn) grown under S-E Rajasthan	**IHS/T-9/PP-902**
Krishna Dahre	Research Scholar	Soil Carbon Sequestration: Mechanisms, Management Practices, and Its Role in Sustainable Agriculture-A Review	**IHS/T-9/PP-903**
Krishna Dahre	Research Scholar	Influence of Biofertilizer and Integrated Nutrient Management on Yield Attributes and Yield of Brinjal (Solanum melongena L.)	**IHS/T-9/PP-904**
Lal Chand Sarswat	Student	Trends in Agricultural Diversification and Their Role in Income and Risk Management in India	**IHS/T-9/PP-905**
Aurosikha Swain	Ph.D. Scholar	Amaranthus: A Climate-Resilient Superfood	**IHS/T-9/PP-906**
Tulsi Dharmvir Gurjar	Assistant Professor	New access to augment the growth of banana	**IHS/T-9/PP-907**
Manju Shukla	Agromet Observer	Effect of micro nutrients on yield and quality of mango (Mangifera indica L.) cv. Dashehari	**IHS/T-9/PP-908**
Balreet Kaur	Student	Litchi under stress: understanding and managing nature's impact on growth and fruit quality	**IHS/T-9/PP-909**
Km. Akanksha Rai	Ph.D.	Strategies for Cost-Effective and Sustainable Intensification of Horticultural Production Systems	**IHS/T-9/PP-910**
Jigar Sureshbhai Parasana	Assistant Professor	Influence of farming systems on organoleptic quality, soil health and economic performance of papaya (Carica papaya L.) cv. GJP 1	**IHS/T-9/PP-911**
ASHOK YADAV	Scientist	Pomegranate–Melia dubia based Climate-Resilient and Remunerative Agroforestry System for the Semi-Arid Bundelkhand Region	**IHS/T-9/PP-912**
Rajendra Kumar Yadav	Assistant Professor	Effect of drip irrigation and fertigation schedule on productivity, profitability, water and fertilizer use efficiency in strawberry (var. Winter dawn) grown under S-E Rajasthan	**IHS/T-9/PP-913**
Akanksha Arya	PG Scholar	Climate-resilient horticulture production: A review	**IHS/T-9/PP-914**
JYOTHI RANGASWAMY	Ph.D.	Soil health management, nutritional security and economic benefit of Dolichos bean cultivation as intercrop in mango orchards	**IHS/T-9/PP-915**
Himanshu Chawla	Ph.D. Scholar	Influence of Changing Rainfall Regimes on Flowering and Yield of Nagpur Mandarin (Citrus reticulata Blanco) in Southeastern Rajasthan	**IHS/T-9/PP-916**
Toshika Tamrakar	Phd scholar	Neem–Turmeric Agroforestry System for Enhancing Productivity and Sustainability in the Semi Arid Bundelkhand Region	**IHS/T-9/PP-917**

Theme 09 Poster Presentation			
Climate-resilient horticulture production			
Author Name	**Designation**	**Abstract Title**	**Code**
ARATHI BALAN	Ph.D. Scholar	Solar Orcharding: A Climate-Smart Farming System	**IHS/T-9/PP-918**
Raman Choudhary	Research Scholar	Zinc oxide nanoparticles (ZnO NPs) enhance growth, yield, and curcumin content in different turmeric (Curcuma longa L.) genotypes through foliar application	**IHS/T-9/PP-919**
Saurav Vats	Ph.D Research Scholar	Unravelling the Potential of Biocapsule and Nanozeolite for Climate-Resilient and Sustainable Production of Apple (Malus domestica Borkh. cv. HRMN-99) in Subtropical Regions	**IHS/T-9/PP-920**
Jitendra Gurjar	PhD Scholar	Injection Method of NPK Fertilization for Climate-Resilient Date Palm (Phoenix dactylifera L.) Production in Arid Region	**IHS/T-9/PP-921**

Theme 10 Oral Presentation			
Entrepreneurship development and Farmer Producer Organizations (FPOs)			
Author Name	**Designation**	**Abstract Title**	**Code**
Kuldeep Shivjiram Choudhary	Senior Scientist	Farmer Producer Organizations as Catalysts for Growth in the Indian Horticulture Sector — Evidence, Constraints, and Way Forward	**IHS/T-10/OP-1001**
Sanjiv Kumar	Senior Scientist	Agritech Startups Transforming Horticultural Sector in India	**IHS/T-10/OP-1002**
Umesh Hudedamani	Scientist	Intellectual Property Protection and Management for Horticultural Crops and Produces	**IHS/T-10/OP-1003**
Theme 09 Poster Presentation			
Vinayak Nikam	Senior Scientist	Enhancing Horticulture Income Through Farmer-Producer¬ Organisations	**IHS/T-10/OP-1004**
Pragya Uikey	Ph.D. Scholar	Cultivating Business: The Potential of Moringa Entrepreneurship	**IHS/T-10/PP-1001**



Theme 1

Genetic resources, diversity, exploration, evaluation, conservation and their use in crop improvement

IHS/T-1/OP-101

Development of tropical carrot MAGIC populations for enhanced food and nutritional security

Raman Selvakumar and Pritam Kalia

Centre for Protected Cultivation Technology, ICAR-Indian Agricultural Research, New Delhi
Corresponding author: selvakumarsingai@gmail.com

Abstract

A tropical carrot MAGIC population was developed using four contrasting Indian cultivars, Pusa Asita (black), Pusa Rudhira (red), Pusa Meghali (orange) and Pusa Kulfi (yellow). These parents represent diverse root colours and are rich sources of anthocyanins, lycopene, β-carotene and other carotenoids, alongside desirable agronomic and stress-adaptive traits. A structured multi-parent crossing scheme, followed by intermating and selfing, was employed to generate advanced MAGIC lines with high levels of recombination and near-homozygosity. The resulting lines were evaluated under tropical field conditions for root yield, earliness, root morphology, heat tolerance and disease reaction, together with detailed assessment of nutritional parameters including total carotenoids, β-carotene, lycopene, anthocyanins, dry matter and total soluble solids. Parallel genotyping with DNA markers were used to characterize the genetic structure of population and to identify marker–trait associations and quantitative trait loci for key agronomic and nutritional traits. The multi-coloured tropical carrot MAGIC resource developed is expected to deliver elite lines and trait-linked markers for breeding climate-resilient, biofortified carrot cultivars tailored to tropical production systems. Such cultivars will contribute to sustainable vegetable-based nutrition, improved provitamin A intake and future food and nutrition security in vulnerable regions. Contributing to diversified vegetable consumption and improved functional food options.

IHS/T-1/OP-102

Pointed gourd is profitable vegetable crop for climate resilient farming in Bundelkhand

Ajeet Singh, Manish Kumar Singh, A. C. Mishra, Bhanu Prakash Singh, Himanshu Singh, Amit Kumar Singh and Shikhangi Singh

Banda University of Agriculture and Technology, Banda, Uttar Pradesh, India
Corresponding author: ajeetsinghbuat@gmail.com

Abstract

Pointed gourd (*Trichosanthes dioica* Roxb.) has emerged as a promising climate resilient vegetable due to its moderate drought tolerance, supported by a perennial root system and adaptability to tropical environments. This crop exhibits vigorous vegetative growth, efficient water utilization, and the capacity to maintain stable yields under moisture stress. Its ability to perform well in marginal soils with minimal inputs, combined with a continuous fruiting habit, ensures reliable harvests and steady income generation for farmers. In addition, strong market demand and price stability enhance its economic viability, while its nutritional composition, rich in vitamins, minerals, and antioxidants, contributes to dietary diversity and improved household nutrition. Collectively, these attributes establish pointed gourd as a strategic crop for advancing climate resilient and sustainable vegetable production systems in Bundelkhand and comparable semi-arid regions.

IHS/T-1/OP-103

Estimation of genetic variability and heritability in bitter gourd [*Momordica charantia* (L.)] genotypes

Jeyaswetha B., J. Sherly, C. Yogambal, V. Kanthaswamy and V. Vengadessan

Pandit Jawaharlal Nehru College of Agriculture and Research Institute
Puducherry, Karaikal
Corresponding author: swesaravanan09@gmail.com

Abstract

The experiment was conducted to magnitude the genetic variability, heritability and genetic advance in bitter gourd for identifying desirable parents. Thirty genotypes were evaluated for twenty-three characters through RBD during 2025. The phenotypic coefficient of variance (PCV) was slightly higher than their corresponding genotypic coefficient of variance (GCV) for all characters. Relatively high estimates of GCV and PCV were recorded for fruit yield per vine, fruit yield per plot, individual fruit weight, fruit length and crude fibre content, signifying a high degree of genetic variability for these traits. Moderate estimates of GCV and PCV were observed for number of fruits per vine, pericarp thickness, vine length at final harvest, node bearing the first male flower, number of seeds per fruit, estimated yield, number of primary branches, fruit girth, vine length at first flowering and node bearing the first female flower. These moderate values reflect moderate genetic variability. High heritability coupled with high genetic advance was observed for fruit yield/vine, fruit yield/plot, individual fruit weight, fruit length, crude fibre content, number of fruits/vine, pericarp thickness, vine length at final harvest, number of seeds/fruit, estimated yield, fruit girth, number of primary branches/vine and node bearing the first male flower appearance.

IHS/T-1/OP-104

Estimation of genetic variability and heritability in snake gourd [*Trichosanthes anguina* (L.)] genotypes

Yogambal. C, J. Sherly, B. Jeyaswetha, V. Kanthaswamy and D. Umamaheswari

Pandit Jawaharlal Nehru College of Agriculture and Research Institute,
Puducherry, Karaikal
Corresponding author: yogambal26@gmail.com

Abstract

The experiment was conducted to magnitude the genetic variability, heritability and genetic advance in snake gourd for identifying desirable parents. Thirty genotypes were evaluated for twenty-five characters through RBD during 2025. The phenotypic coefficient of variance (PCV) was slightly higher than their corresponding genotypic coefficient of variance (GCV) for all characters. Relatively higher estimates of genotypic and phenotypic coefficient of variation were observed for number of primary branches/vines, number of male flowers/vines, fruit length, fruit girth, individual fruit weight, number of seeds/fruits, estimated fruit yield, total soluble solids, mucilage, crude fibre and fruit yield/vine. Moderate genotypic and phenotypic coefficient of variation was observed for number of female flowers/vines, number of fruits/vines, fruit yield/plot and protein. Moderate genotypic and phenotypic coefficient of variation indicated the presence of moderate variation among the genotypes under study. High heritability and genetic advance were observed for characters *viz.*, vine length at final harvest, number of primary branches/vine, node at first male flower appearance, node at first female flower appearance, number of male flowers/vine, number of female flowers/vine, fruit length, fruit girth, pericarp thickness, individual fruit weight, number of fruits/vine, number of seeds/fruit, fruit yield/vine, fruit yield/plot, estimated fruit yield, total soluble solids, protein, mucilage and crude fibre.

IHS/T-1/OP-105

Variation in morpho-agronomic and seed traits among leafy genotypes of *Brassica campestris* L.

Pallvi, Deepak Arora, Manpreet Singh, Kamalpreet Singh, Nirmal Singh and Navjot Singh Brar

Department of Vegetable Science, PAU, Ludhiana, India
Corresponding author: pallvisalaria35@gmail.com

Abstract

This study evaluated 15 genotypes of *Brassica campestris* L., including leafy morphotypes such as pakchoi and Chinese cabbage, to assess phenotypic variation using 33 traits based on DUS guidelines and 25 agro-morphological and seed-related parameters. The experiment was conducted during *rabi* season of 2024–25 at two locations using a randomized block design with three replications. Significant differences were observed among genotypes for plant architecture, leaf characteristics, head formation, and seed quality traits. Principal component analysis of DUS traits indicated that the first two components accounted for 54.06% of total variation and grouped the genotypes into three distinct clusters. Genotype VI-060647-01 exhibited superior head traits, while 'Chini saro' recorded the highest seed yield (12.00 g), germination (91.83%), and seedling vigour indices. Wide variability was also noted for key quantitative traits such as plant height (13.73–109.61 cm), leaf width (6.05–15.52 cm), and 1000, seed weight (1.81–4.00 mg). The phenotypic diversity reflects a broad genetic base, offering potential for selection of superior parental lines. This study highlights utility of DUS descriptors and agro-morphological traits in identifying promising genotypes, which can be harnessed in breeding programmes aimed at enhancing yield, seed quality, and adaptability in leafy *Brassica campestris* L.

IHS/T-1/OP-106

Plant genetic resources and improvement of onion and garlic for varietal development

Amar Jeet Gupta, V Mahajan, Hem Raj Bhandari, Ashwini P Benke and Yogesh P Khade

ICAR-Directorate of Onion and Garlic Research, Rajgurunagar, Pune, Maharashtra
Corresponding author: guptaaj75@yahoo.co.in

Abstract

Extensive surveys across 16 states of India, in collaboration with ICAR-NBPGR, along with introductions from several countries, have resulted in a diverse and representative genepool. Currently, 1,151 onion accessions (335 dark red, 521 light red, 219 white, 5 yellow, 9 rose-type and 62 multiplier types), 799 garlic accessions and 118 wild *Allium* accessions have been collected from different parts of the country. IC numbers for 856 onion and 625 garlic accessions were obtained from NBPGR, and seeds/planting materials of these germplasms have been submitted for long-term storage. Among these, 564 onion accessions (319 red and 245 white) and 625 garlic accessions have been characterized and documented. Additionally, several trait-specific elite lines have been developed and are maintained for common onion (red and white), multiplier onion and garlic. This extensive germplasm serves as a critical resource for evaluating growth, yield, quality and climate-resilient traits. Genetic improvement has led to the release of twenty-two varieties at the national level, including sixteen onion varieties, two multiplier onion varieties and four garlic varieties. Among these, onion varieties Bhima Super, Bhima Red, Bhima Raj, Bhima Dark Red, Bhima Shakti, Bhima Kiran, Bhima Light Red, Bhima Shweta, Bhima Shubhra and Bhima Safed, and the garlic varieties Bhima Omkar and Bhima Purple are in seed chain and remain in high demand among farmers. Four unique genetic stocks DOGR-1203-DR (very early maturity and uniform neck-fall), DOGR-1549-Agg (early, dual-season cultivation), DOGR-1666 (waterlogging tolerance) and DOGR-1656 (drought tolerance) registered with NBPGR further enrich the breeding programme. This well-characterized and diverse collection demonstrates the transformative potential of *Allium* plant genetic resources in developing high-yielding, trait-specific and climate-resilient varieties, thereby supporting sustainable horticulture and national food security.

IHS/T-1/OP-107

Morphological and molecular characterization of oriental pickling Melon

Supriya Jaiswal and Manjunatha Gowda D.C

ICAR-ICAR-Indian Institute of Horticultural Research, Bangalore, Karnatka
Corresponding author: supriyajaiswal821@gmail.com

Abstract

Oriental pickling melon (*Cucumis melo* L. subsp. *agrestis* var. *conomon*) is an underutilized cucurbit predominantly cultivated in Southern India and valued for its nutritional and functional food attributes. However, comprehensive information on its morphological and molecular trait variability and diversity is limited. Hence, the study on "Morpho-molecular characterization of oriental pickling melon was carried out at ICAR–IIHR, Bengaluru during 2024–25 to assess genetic variability, heritability, genetic advance, and trait associations in a diverse set of germplasm. Significant genetic variability was observed for morphological growth, yield, and seed traits. High heritability coupled with high genetic advance as percentage of mean was recorded for fruit weight (94.02%; 67.64%), fruit length (95.21%; 69.89%), fruit shape index (91.31%; 63.68%), and plot yield (99.53%; 77.73%), indicating predominance of additive gene action and high potential for genetic improvement through direct selection. Genotype IIHR-OPM-13 emerged as the superior performer for yield-related traits, recording fruit weight of 1124.67 g and yield per hectare of 23.38 t/ha. Several check varieties, including Mudikode Local and KAU Vishal, were statistically comparable with the best-performing genotypes, indicating their stable performance across traits. Based on morphological traits, 24 genotypes were grouped into four distinct clusters, reflecting substantial phenotypic diversity. SSR-based molecular characterization further delineated the genotypes into two major clusters with distinct subgroups, revealing both close genetic relationships and wide divergence among the accessions. The integration of morphological and molecular data provided a clearer understanding of the genetic architecture of the germplasm and helped in identifying genetically diverse and agronomically superior genotypes.

IHS/T-1/OP-108

Comparative evaluation of seed testing procedures for accurate determination of germination and vigour in isabgol

Kalyanrao and Durgesh Yadav

ICAR-National Institute of Seed Science and Technology, Mau, Uttar Pradesh
Corresponding author: patil.kalyanrao2829@gmail.com

Abstract

The seeds of isabgol varieties (GI-2, GI-3 and GI-4) were evaluated using a factorial completely randomized design (CRD) with three replications. Treatments consisted of two substrata [top of paper (TP) and between papers (BP)], three temperatures (20°C, 25°C and 30°C) and two final count durations (14 and 21 days). The results revealed that maximum germination percentage (94.66%) was recorded in GI-3 at 20°C using TP method with a final count of 21 days. The highest seedling length (7.22 cm) and seedling vigour index-I (601.63) were observed in GI-3 at 20°C under the BP method with a final count of 21 days, while the maximum seedling vigour index-II (601.48) was recorded in GI-3 using the TP method at same final count duration. Overall, 20°C with a final count of 21 days was identified as the most suitable condition for seed testing in Isabgol, with GI-3 performing superior for seed quality parameters. Forty genotypes were evaluated for morphological traits using a seed grain analyzer. The highest seed length (2.75 mm), seed surface area (3.03 mm^2) and seed perimeter (7.04 mm) were recorded in IGP-47, while the maximum seed width (1.32 mm), length-to-width ratio (2.20), seed test weight (1.91 g), seed compactness (0.97) and seed roundness (0.61) were observed in IGP-11, IGP-61, IGP-13, IGP-31 and IGP-21, respectively. The IGP-3 exhibited the highest germination (76%), shoot length (3.35 cm), seedling length (5.68 cm), fresh weight (105.23 mg), dry weight (5.15 mg), seedling vigour index-I (432) and seedling vigour index-II (391.33).

IHS/T-1/OP-109

Screening of Pea genotypes under high temperature for crop phenology under Bundelkhand conditions

Upasna Choudhary, S.V. Dwivedi, Jyoti Devi, Neetu, Ajeet Singh and R.K.

Banda University of Agriculture & Technology, Banda, Uttar Pradesh
Corresponding author: upasnachoudhary806@gmail.com

Abstract

The investigation was undertaken to identify heat-tolerant garden pea (*Pisum sativum* L.) genotypes under varying thermal regimes. A total of 68 genotypes were evaluated using an augmented block design with two check varieties, Arka Uttam and Kashi Samridhi. The crop was sown at four different dates, extra-early, early, normal and late sowing, to expose the genotypes to differential temperature conditions. Phenological and biochemical parameters were recorded to assess the performance of genotypes under heat stress. The results revealed significant variation among genotypes for heat tolerance. Genotypes such as PD-89, Kashi Uday, Kashi Poorvi, AP-1 and Arka Chaitra exhibited better adaptability and stable performance under high temperature conditions. In contrast, DVP-8, Vivek Matar and Matar Tokyo were identified as heat-sensitive due to marked reduction in productivity under elevated temperatures. The identified heat-tolerant genotypes may be utilized in breeding programmes aimed at improving heat tolerance in garden pea.

IHS/T-1/OP-110

Assessing genetic diversity in Brinjal genotypes for resistance against *Fusarium oxysporum* f. sp. *melongenae*

Ananya P Kumar, Jeetendra Kumar Ranjan, Bhoopal Singh Tomar, Suman Lata, Jogendra Singh, Gyan Prakash Mishra, Jameel Akhtar, Pragya Ranjan and Gayacharan

Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding author: jkranjan2001@yahoo.co.in

Abstract

The experiment was conducted to identify Fusarium wilt-resistant brinjal (*Solanum melongena* L.) genotypes by screening under three growing conditions (sick-plot, pots and hydroponics) and validating disease reactions using molecular markers. A total of 90 diverse genotypes, comprising released varieties, local landraces, exotic collections and related wild *Solanum* species, were evaluated for resistance in a Fusarium wilt-endemic field. The causal agent isolated from infected plants was identified as *Fusarium oxysporum* f. sp. *melongenae*, through morpho-cultural characterization, molecular sequencing and pathogenicity assays. The isolate was then used for artificial inoculation in pots and hydroponic systems for confirmatory evaluation of disease reactions using different scoring techniques. Nine genotypes (Swarna Mani, G-17, Pink, CH-151, Sidhasar Local, Special Muktakeshi, H-183, *S. sisymbriifolium*, *S. torvum*) were identified resistant under all three growing conditions. Additionally, distinct variations in disease progression patterns, changes in host phenotypic traits, and delayed infection in vascular tissues were observed in resistant genotypes using the hydroponic phenotyping approach. This underscores its applicability for efficient and rapid screening against Fusarium wilt. Furthermore, molecular marker analyses using SCAR and SSR markers validated the observed resistant reactions. With good polymorphism and phenotypic variation rates, the three SSR markers hold significant potential for marker-assisted selection within the germplasm. Phenol estimation also indicated differential responses among resistant and susceptible accessions upon infection. The identified resistant genotypes, along with the phenotypic, anatomical, molecular and biochemical insights, will contribute to advancing brinjal improvement programs aimed at enhancing resistance to Fusarium wilt.

IHS/T-1/OP-111

Genetic diversity studies in teasle gourd (*Momordica subangulata blume* subsp. *renigera*)

Sangay Golay, Subhamoy Sikder and Subom Rai

Corresponding author: subomrai99@gmail.com

Abstract

The experiment was conducted during 2021 and 2022 for framing breeding strategy through morpho-physicochemical characterization using twenty-five genotypes of teasle gourd. All the 25 genotypes were grouped into four clusters. The highest inter-cluster distance was observed between cluster I (1234.72) and cluster IV (4060.28). The maximum character contribution was observed in characters such as total chlorophyll in fruits (mg/100 g) (40.5 %), seeds per fruit (13.7 %), individual fruit weight (g) (11.4 %), first male flower (days) (8.9 %) and total chlorophyll content in leaf (mg/100 g) (6.9 %). Thus, the genotypes from cluster I and cluster IV should be used as the parents to obtain heterotic recombinants and characters such as chlorophyll content, seeds/fruit, individual fruit weight and first male flowers should be considered for future crop improvement.

IHS/T-1/OP-112

Comprehensive assessment of G × E interaction in ridge gourd adopting eberhart and russell, AMMI and GGE biplot model for identification of stable genotypes.

Safal Rai, R.K. Sarkar, S.K. Roy, S. Datta, R. Chatterjee, J.C. Jana and A. Das

Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal
Corresponding author: safalrai93@gmail.com

Abstract

Ridge gourd (*Luffa acutangula* Roxb.) is an important warm season cucurbitaceous vegetable crop grown in different parts of India and in the tropical countries of Asia and Africa for its tender fruits. Immature fruits of ridge gourd are used as a vegetable and considered healthy food. Besides their use as vegetables, ridge gourd also possesses enormous medicinal properties for human wellbeing. However, despite its high nutritional value, high acceptability among growers and consumers and wide genetic variability, ridge gourd has received comparatively limited research attention to date, particularly with respect to the development of high yielding stable varieties. A variety is only considered as stable when it exhibits uniform performance across varying environments. Thus, it becomes essential to evaluate and identify phenotypically stable genotypes for yield and other important traits that can exhibit consistent performance across varying environmental conditions. Considering scientific facts, a multi-environment trial (MET) was conducted across four different environments to assess the stability performance of thirty-four ridge gourd genotypes for three major characters viz. fruit yield/hectare, vitamin A and crude fibre content.

IHS/T-1/OP-113

DUS characterization of palak (*Beta vulgaris* var. *bengalensis*) germplasm based on various agro-morphological traits

Partik Sharma, Hira Singh and Dharminder Bhatia

Department of Vegetable Science
Punjab Agricultural University, Ludhiana, Punjab
Corresponding author: partiksharma919@gmail.com

Abstract

The experiment was conducted to assess genetic diversity among palak (*Beta vulgaris* var. *bengalensis)* genotypes based on agromorphological traits. Forty genotypes were evaluated across two consecutive seasons for a set of morphological traits. Substantial variability was observed across seasons, with several genotypes exhibiting stability and superior expression for key attributes. Using a multidimensional analytical framework, study examined 13 quantitative traits and 9 qualitative descriptors. Distinct genotypes were identified as outstanding for specific morphological characteristics, reflecting high yield potential, robust plant growth, and interseason consistency. These elite lines hold strong promise for breeding programs targeting yield improvement, enhanced crop quality, and improved consumer appeal. They also represent valuable genetic resources for developing nutrient-rich functional foods aligned with nutritional security and sustainable development goals. Overall, the findings establish a solid foundation for future breeding initiatives utilizing high-performing genotypes identified through morphological evaluation.

IHS/T-1/OP-114

Characterization of guava genetic resources using qualitative descriptors and quantitative traits

Daya Shankar Mishra, Vikas Yadav, Prakashbhai Ravat, V. V. Appa Rao and Jagadish Rane

ICAR-Central Horticultural Experiment Station, Vejalpur, Panchmahals, Gujarat, India
Corresponding author: dsmhort@gmail.com

Abstract

Quantitative evaluation of 19 traits revealed wide ranges for fruit weight (77.29–559.96 g), number of seeds per fruit (9.67–490.67), ascorbic acid (93.10–308.10 mg 100 g^{-1}), total phenolics (114.14–644.24 GAE 100 g^{-1}), flavonoids (10.17–68.22 CE 100 g^{-1}), and total antioxidant activity (193.89–840.46 AAE 100 g^{-1}), with highly significant genotypic differences ($p < 0.001$). (*Psidium guajava* L.) estimates of genetic parameters indicated high heritability coupled with high genetic advance for fruit weight, number of seeds/fruit, ascorbic acid, total phenolics, flavonoids, and antioxidant activity, suggesting the predominance of additive gene action and good prospects for direct selection. Correlation analysis and trait interaction networks identified fruit weight, fruit length, fruit width, and pulp thickness as central yield-driving traits, while phenolics, flavonoids, and antioxidant activity formed a tightly linked quality module. Hierarchical clustering grouped the genotypes into four major clusters with distinct yield–quality profiles, and multidimensional scaling confirmed moderate to high genetic divergence with clearly identifiable outlier genotypes (Lalima, H-2/20, and CHG30). Overall, the study provides a robust trait-based foundation for selecting elite guava genotypes combining high productivity with superior nutraceutical quality and supports their strategic use in breeding programmes.

IHS/T-1/OP-115

Development of dual disease resistant breeding lines in watermelon

Shruti Soni, Manjunathagowda D.C, Gurjar P.K.S. and Naruka I.S.

College of Agriculture, Gwalior, Madhya Pradesh
Corresponding author: sonishruti652@gmail.com

Abstract

Watermelon (*Citrullus lanatus* L.) production is greatly affected by watermelon bud Necrosis Virus (WBNV) and Fusarium wilt caused by *Fusarium oxysporum f. sp. niveum* (*Fon* race 0, 1, 2, 3). The *Fon* races poses prominent threat for watermelon production, mainly *Fon* race 2, and it is most virulent race, most of cultivars. To address this research issue, the parental lines with dual disease-resistance profiles were selected to breed the combined disease resistance lines. The parental breeding line BIL-53 has resistance to WBNV, line with white – fleshed fruits was selected as female parent, and line IIHR-392 (RS-3) is an exotic collection EC794455, it is source for *Fon* race 2 resistance, which is collection from United State Department of Agriculture, was selected as the male parent. A directed cross BIL-53 × EC794455 and Backcross was carried out to combine the resistance genes. This hybridization enables the development of segregating populations for subsequent selection and marker–trait validation with Fon race 2 and WBNV linked markers. The deliberate crossing strategy supported the development of Dual-disease-resistant watermelon breeding lines with red flush colour background.

IHS/T-1/OP-116

Cytokinin-primed auxin surge and transient ABA stress response enable parthenocarpic fruit set in sweet pepper

Arpita Srivastava, Sikha Manoharan, Manisha Mangal, Hemlata Bharati, Anjali Anand, Aditi Kundu and Ashish Khandelwal

Division of Vegetable Science, ICAR-IARI, New Delhi-110012

Abstract

Parthenocarpic (seedless) fruit set is a valuable trait for stable yield in sweet pepper (*Capsicum annuum* L.) under suboptimal temperatures that impair pollination. To elucidate the underlying physiological mechanisms, we investigated the dynamics of key phytohormones, viz., gibberellin (GA_3), auxin (IAA), abscisic acid (ABA), trans-zeatin (tZ), cis-zeatin (cZ) and dihydrozeatin (DHZ) and sucrose in ovaries/young fruits of parthenocarpic and non-parthenocarpic genotypes at 0, 5, 10 and 20 days after anthesis under optimum and low-temperature regimes. Three-way ANOVA revealed highly significant effects of temperature, genotype, developmental stage and their interactions on all hormones. Under optimum temperature, both genotypes exhibited successful fruit set with high early GA and moderate cytokinin levels in parthenocarpic plants supporting rapid initial growth. In contrast, low temperature dramatically reprogrammed hormone profiles in parthenocarpic genotype: an immediate and massive cytokinin surge (especially DHZ and tZ at 0-5 days), followed by an explosive ovary-autonomous IAA peak at 5-10 days (up to 30-fold higher than non-parthenocarpic), while GA remained suppressed. ABA showed a strong but transient spike at 5 days that was rapidly downregulated in parthenocarpic plants, unlike the prolonged elevation in non-parthenocarpic genotypes. Sucrose mobilisation mirrored this pattern, with early massive influx under low temperature (peaking at 5 days in parthenocarpic) likely fueling auxin-driven expansion, followed by near-zero levels at ripening in cold-exposed fruits. Multivariate analyses and correlation networks identified a robust cytokinin+auxin+sucrose module positively linked under cold in parthenocarpic ovaries, antagonised by ABA. Predictive modelling confirmed IAA and DHZ as the strongest drivers of sucrose accumulation highlighting a phased relay where cytokinins initiate commitment, auxin sustains growth and transient ABA prevents abortion. These findings demonstrate that parthenocarpy in sweet pepper relies on a hormone-metabolite network that bypasses pollination dependency through autonomous cytokinin priming, massive auxin synthesis and efficient ABA suppression, providing a physiological blueprint for breeding resilient cultivars under climate variability.

IHS/T-1/OP-117

Elite Persian walnut selections from Kashmir

Amit Kumar Khokher

SKUAST-Kashmir, Shalimar campus
Corresponding author: khokherak@rediffmail.com

Abstract

The study aimed to identify elite genotypes which have superior quality nuts from the existing germplasm established at SKUAST-Kashmir, Shalimar campus. A total of 80 genotypes were evaluated based on morphological and biochemical traits, leading to the identification of five superior genotypes viz. SKAU-W-24, SKAU-W-28, SKAU-W-34, SKAU-W-41, and SKAU-W-42 based on nut and kernel characters. The nut weight and kernel weight recorded as SKAU-W- 41 (14.44 g and 7.60 g), SKAU-W-42 (13.88 g and 8.08 g), SKAU-W-24 (12.72 g and 7.44 g), SKAU-W-34 (12.12 g and 7.18 g) and SKAU-W-28 (11.96 g and 7.22 g), respectively. The kernel percentage was notably high across these genotypes, with SKAU-W-28 exhibiting the highest value (60.71%), followed by SKAU-W-34 (59.56%), SKAU-W-24 (59.09%), SKAU-W-42 (58.51%) and SKAU-W-41 (52.58%). Kernel protein and kernel fat content in elite genotypes was SKAU-W-34 (17.35 % and 59.84 %), SKAU-W-24 (17.05 % and 55.89 %), SKAU-W-42 (16.82 % and 57.64 %), SKAU-W-41 (15.79 % and 60.06 %) and SKAU-W-28 (15.55 % and 62.28 %). These genotypes further subjected to multiplication and for integration into breeding programmes, may aid in the development of improved cultivars with enhanced yield potential.

IHS/T-1/OP-118

Role of antioxidative enzyme activities in polyethelene glycol-mediated osmotic stress tolerance in sweet potato (*Ipomoea batatas*)

Ananya Mishr, Hanume Gowda Krishnappa, Madhumita Dasgupta, Rameshkumar Arutselvan, Satyapriya Singh, Nityamanjari Mishra, Pradyumna Tripathy and Manas Ranjan Sahoo

ICAR–Central Tuber Crops Research Institute, Regional Centre, Bhubaneswar, Odisha, India
Corresponding author: ananyamishra.rs25@ouat.ac.in

Abstract

In-vitro study was conducted at ICAR-CTCRI, Regional Centre, Bhubaneswar, Odisha, to understand the response of five advanced sweet potato breeding lines to Polyethylene Glycol (PEG-6000)-mediated osmotic stress conditions. Sweet potato nodal explants were exposed to three levels of osmotic stress (0, 0.1 MPa and 0.2 MPa) by incorporating PEG-6000 into Murashige and Skoog Medium. The results revealed significant variations among the advanced lines with respect to vegetative growth behaviour, stress-linked morphological traits and functioning of antioxidative defence enzymes. The activities of key antioxidant enzymes (AOEs), Superoxide dismutase (SOD, EC 1.15.1.1), catalase (CAT, EC 1.11.1.6), ascorbate peroxidase (APX, EC 1.11.1.1), guaiacol peroxidase (GPX, EC 1.11.1.7) and monodehydro ascorbate reductase (MDAR, EC 1.6.5.4) induced noticeably compared to the untreated control. The induction of AOEs was more prominent in tolerant genotypes than in susceptible ones. Among the antioxidant enzymes, CAT showed a strong positive correlation with GPX, whereas MDAR showed strong positive correlation with APX. Significant increase in AOE associated with lower growth retardation, which was evident from the correlation study. Genotypes SP–30 followed and SP–18 with high AOE accumulation possessed high principal component (PC1) scores. Based on these combined physiological, biochemical and statistical indicators, genotype SP–30 emerged as the most promising line, showing superior osmotic stress resilience. The results support its advancement for further evaluation, potential inclusion in crop improvement programmes and consideration for formal release following established varietal testing protocols.

IHS/T-1/OP-119

Pear improvement: Retrospect, current advances and future opportunities with modern breeding tools

Paramjeet Singh, Nav Prem Singh, Gurupkar Singh Sidhu and Harjeevan Kaur

Department of Fruit Science, Punjab Agricultural University (PAU), Ludhiana, Punjab, India
Corresponding author: paramjeet-24101001@pau.edu

Abstract

Pear (*Pyrus* spp.) improvement through conventional breeding is not given significant importance in the past due to various constraints like long juvenility, heterozygosity, non-availability of compatible dwarfing rootstocks and tolerant varieties against fire blight, black spot, scab, canker etc. Pear crop improvement work carried out in Japan, US and India has resulted in the development of superior varieties like 'Nijisseiki', 'Kosui', 'Hosui', 'Bartlett' 'Golden Nijisseiki', Punjab Beauty, Punjab Nectar, Punjab Gold etc. Similarly, selection of elite strains of *Cydonia* spp. and the development of OHF and Pyrodwarf interspecific hybrid series exhibit wider graft compatibility and adaptability to cold tolerance. Pear genome sequencing in selective germplasm and the availability of authenticated genomic databases has advanced the scope for crop improvement studies. The integration of conventional breeding with modern molecular tools (MAS, transcriptomics, metabolomics, genome editing etc.) offers a robust, multi-layered strategy for rapid and predictable genetic improvement in pear. However, the practical realization of these technologies, especially in developing countries, requires strengthening of genomic resources, new breeding initiatives and long-term research strategies.

IHS/T-1/OP-120

Assessment of morphological, yield and quality attributes in elite genotypes of cardamom (*Elettaria cardamomum*)

Honnappa Asangi, Sivaranjani R, Ankegowda S. J, Rajanna G. A, Akshitha H. J. and Shiva kumar M. S.

ICAR - Indian Institute of Spices Research, Regional Station, Appangala, Kodagu, Karnatka
Corresponding author: hdasangi@gmail.com

Abstract

The investigation was conducted at the ICAR-Indian Institute of Spices Research, Regional Station, Appangala, Kodagu, Karnataka, to evaluate and characterize 21 elite cardamom genotypes, comprising collections and hybrids for morphological, yield and quality traits. Considerable variability was recorded among the genotypes for all characters. Genotype IC349627 exhibited superior performance, recording the highest plant height (322.47 cm), number of bearing tillers (35.16), number of panicles (38.18), capsules plant (248.56), highest fresh capsule yield (1502.72 g/plant) and dry yield (313.83 g/plant). Quality analysis revealed significant variation in essential oil and oleoresin contents, with essential oil ranging from 6.48% (NKE12 × MB5) to 8.28% (RR1 × CCS1) and oleoresin content ranging from 1.71% (MB5 × GG) to 3.00% (GG × NKE12). GC-MS analysis of volatile constituents indicated marked differences in aroma profiles among genotypes. The concentration of 1,8-cineole varied from 28.97% to 45.27%, with IC653022 recording the highest level, while α-terpinyl acetate ranged from 31.68% to 48.64%, with maximum content in GG × CCS1. The wide genetic variability among the elite genotypes highlights their potential for selection and utilization in breeding.

IHS/T-1/OP-121

Screening cowpea genotypes for high phosphorus-use efficiency under low-input conditions

S. K. Meena, B. K. Mehta, M. Rana and M. Prasad

ICAR- Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh
Corresponding author: surendra.meena@icar.org.in

Abstract

In summer and *kharif* season of 2023, a diverse set of cowpeas comprising 250 genotypes was evaluated in field conditions under low phosphorus (P) (10.2 Kg P/ha) and sufficient P (19.71 Kg P/ha) regimes. The phenotypic variation of the morpho-physiological parameters viz., early plant vigour, SPAD chlorophyll meter readings, no. of branches, no. of nodes, plant height, stem diameter and dry matter yield (DMY) were observed under two P levels. Marked increases in plant height, no. of branches, stem diameter and dry matter were recorded at sufficient P as compared to low P conditions. Subsequently, a sand culture experiment was conducted with selected 54 cowpea genotypes to evaluate the seedling traits under low P and sufficient P conditions. The performance was recorded for Seedling traits viz., shoot dry weight, root dry weight, total seedling dry weight, and root-to-shoot ratio were recorded under both P regimes. The results indicated that P-efficient genotypes showed a dry matter reduction ranging from 5.8% to 11.9% under low P conditions, whereas P-inefficient genotypes exhibited reductions between 45.5% and 60.3%. P accumulations were significantly reduced in the plants under low P condition compared to sufficient P condition, while some genotypes increased total root length, root volume, surface area and root dry weight under low P conditions. During the summer season of 2024, 14 selected contrasting cowpea genotypes were grown under both sufficient and low P regimes in field conditions. P-use efficient cowpea genotypes (IC 202781, IC202789 and IC 202790) exhibited a smaller reduction (4.5-5.9%) in dry biomass under low P conditions compared to P-use inefficient genotypes (EC 390281 and IC 42955), which showed reductions of 23.1-29.1%. Across both field trials (Summer-2023, *Kharif*-2023 and Summer-2024) and sand culture experiment, three genotypes (IC 202781, IC 202789, IC 202790 and EC 99573) consistently exhibited high phosphorus use efficiency, as evidenced by least reduction in biomass under low-P condition compared to sufficient-P condition.

IHS/T-1/OP-122

Assessment of diversity in Sugar apple (*Annona squamosa* L.) using morphological and biochemical traits

Shivam Kumar Rajpoot, Mahesh Kumar Dhakar, Vishal Nath, Chavlesh Kumar, P. Bhavana and Sujit Kumar Bishi

ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka
Corresponding author: skrajpoot7388@gmail.com

Abstract

Seventy custard apple germplasm accessions were assessed using a range of morphological and biochemical traits to explore the extent of genetic variability. The results revealed substantial variation among genotypes, highlighting the presence of a broad genetic base. Pearson's correlation analysis showed a strong positive association between total sugars and reducing sugars (r = 0.98), indicating their close biochemical relationship. A highly significant negative correlation was observed between peel percentage and pulp percentage (r = −0.99), suggesting an inverse relationship between these economically important traits. Hierarchical cluster analysis based on Ward's D^2 method grouped the seventy genotypes into five distinct clusters. Clusters II and III comprised the largest number of accessions, while genotypes in cluster V exhibited superior mean values for key fruit attributes such as fruit size, fruit weight, rind thickness, number of seeds per fruit, pulp weight, pulp-to-seed ratio, and titratable acidity. Principal component analysis further clarified trait contribution to overall variability.

The first eight principal components, each with eigenvalues greater than one, together explained 77.38% of the total variation. PC1 corresponds to pulp weight, fruit weight, Fruit diameter, fruit length, pulp percent and total antioxidant content contributed maximum variability in the first principal component. Traits including pulp weight, fruit weight, leaf dimensions, seed number, peel percentage, pulp percentage, and pulp-to-seed ratio showed high vector loadings, indicating their major role in genetic divergence among custard apple genotypes.

IHS/T-1/OP-123

Evaluation of local potato landraces for yield, quality and late blight resistance at Meghalaya

Yvonne Angel Lyngdoh, Janani P, Ngursangzuala Sailo, Clarissa Challam and Brajesh Singh

ICAR – Central Potato Research Institute, Regional Station Shillong, Peak View Road, 5th Mile, Upper Shillong, Meghalaya
Corresponding author: yvonnelyngdoh@yahoo.com

Abstract

Potato forms an important part of the prevailing cropping system as well as the dietary food habit of the people of the north-eastern region. Meghalaya is one of the north eastern states where potato is being grown extensively as a major tuber vegetable crop throughout the year owing to its varying climatic conditions. Although a number of released varieties have been introduced and grown in Meghalaya, there are however, a few local landraces which are widely being cultivated at present due to the slow rate of degeneration, keeping quality, better taste and customer preference. Keeping this in mind an experiment was laid out to evaluate the sixteen locally available local landraces from the East and West Khasi hills, Meghalaya,which are the major potato growing area of the state. The analysis of variance revealed significant differences among the various traits under study. The highest tuber yield was observed in Megh landrace 8 (15.31 t/ha) which was followed by Megh landrace 16 (14.44 t/ha) and Megh landrace 4 (13.52 t/ha). Megh landrace 9 recorded the highest number of tubers and also the average tuber weight per plant. The landraces were also characterized to different qualitative traits which revealed varied significant differences in terms of tuber shape, eye depth, predominant skin and flesh colour. Megh landrace 12 was found to be moderately resistance to late blight disease. The findings from this study emphasizes the importance of these local landraces for varietal selection in order to optimize the productivity and quality and also to identify germplasm resistant to late blight disease.

IHS/T-1/OP-124

Class B and C genes regulate petal and stamen development in marigold (*Tagetes erecta*)

Labdhi Dedhia, Tejaswini P. and Shamina Azeez

ICAR- Indian Institute of Horticultural Research, Bengaluru-560089
Corresponding author: labdhidedhia@gmail.com

Astract

The study evaluates molecular basis of male sterility by quantifying the expression of class B MADS-BOX genes: PISTILATA (PI) and APETALA (AP) and class C gene AGAMOUS (AG) across four distinct genotypes: maintainer line, apetaloid (degenerated petals and stamens) and petaloid (degenerated stamens) sterile lines and a mutant apetaloid line. Comparative expression analysis revealed strong expression levels in flag leaf and bud stages in petaloid male sterile plant when compared to maintainer line. Conversely, apetaloid male sterile line showed a complete absence of expression of these genes in flower bud stage. The mutant apetaloid line displayed aberrant transcriptional activity, evidenced by the detection of the APETALA 3-2 transcript in the flag leaf stage. These findings suggest the differential expression of Class B and C genes mediate the homeotic conversion of stamens into petaloid structures. In petaloid lines, high expression leads to the double type of flower where stamens transform into petal-like structures, resulting in male sterility. In apetaloid lines, the lack of expression of these genes results into the degeneration of both petals and stamens, producing a more simplified inflorescence conducive to pollination. Thus, the study contributes to the understanding of class B and C gene function in floral

development of *T. erecta* and provides a basis for manipulating floral organ structures for developing male sterile lines for hybrid seed production in a cost-effective way.

IHS/T-1/OP-125

Genomic dissection of multi-flowering trait in vegetable pea (*Pisum sativum*) using qtl-seq for yield enhancement

Jyoti Devi, Vidya Sagar, RK Dubey, Shivaprasad KMS, N Rai and Rajesh Kumar

ICAR–Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh
Corresponding author: jyoti17iivr@gmail.com

Abstract

The study employed QTL-seq approach to identify genomic regions governing multi-flowering trait in pea using a RIL population derived from the cross VRP-500 ×VRP-386 and its contrasting double- and multi-flowered bulks. Whole-genome resequencing of parental line VRP-500 and two bulks (BSP-double flower and BSP-triple flower bulk) generated high-quality datasets suitable for QTL-seq analysis. VRP-500 produced 312.53 million total reads, of which 250.01 million were high-quality reads, and 249.85 million (99.94%) successfully mapped to the reference genome, yielding an average depth of 9.6× and 243.66 million (97.46%) properly paired reads. BSP-double flowered bulk generated 475.18 million total reads, including 420.98 million high-quality reads, with 420.45 million (99.88%) mapped, an average depth of 15.8×, and 424.35 million (97.39%) properly paired reads. BSP-triple flower bulk yielded 551.80 million reads, of which 500.29 million were high-quality; 499.73 million (99.89%) mapped to the reference, producing an average depth of 18.7× and 485.78 million (97.10%) properly paired reads. The QTL-seq analysis identified three genomic regions associated with the number of flowers per peduncle (NFP). The QTL PsqNFP2.1 spanned 15 Mb (313–328 Mb), PsqNFP2.2 covered 9 Mb (343–352 Mb), and PsqNFP2.3 comprised 3 Mb (383–386 Mb). Altogether, these regions represented a total genomic span of 27 Mb, indicating the presence of multiple loci contributing to NFP variation.

IHS/T-1/OP-126

Genetic variability and correlation studies in peach (*Diospyros kaki* Thunb.) genotypes under temperate conditions of Kashmir valley

Amit Kumar, Sachin Kumar*, Bisma Maqbool, Bhavesh, Devesh Attri and Mujeeb Altaf Shah

1ICAR-CITH, Rangreth, Srinagar, Jammu and Kashmir
Corresponding author: scahin.kumar2@icar.org.in

Abstract

Eighteen peach genotypes were investigated during 2024 to study the genetic variability and correlation among growth foliage, floral and yield contributing characters growing under temperate conditions of Kashmir valley. Significant variations were observed for all the parameters studied. High phenotypic coefficient variation and genotypic coefficient variation were recorded for fruit yield, fruit weight, pulp weight, TSS and total sugars. High heritability coupled with moderate genetic gain was obtained for yield, fruit volume, fruit weight, sugar:acid ratio, non-reducing sugars and titratable acidity. Hence, selection can prove effective for improvement in fruit yield and other traits. A highly significant and positive phenotypic and genotypic correlations of yield were found with trunk girth, flower density, fruit set and fruit weight. Maximum positive direct effect cited towards yield were contributed by fruit set, followed by average fruit volume, fruit weight, trunk girth, stone weight, tree volume and duration of flowering. Genotype Glohaven and Florida Prince recorded highest yield and performed better for other important horticultural traits among different genotypes and may be suggested for commercial cultivation in temperate climatic conditions of Kashmir valley.

IHS/T-1/OP-127

Headspace volatile emission during oil palm (*Elaeis guineensis*) anthesis: implications for pollinator attraction

Neema M, Ramesh Kumar KB, Subbanna ARNS and Somasundaram G

ICAR Indian Institute of OilPalm Research, Research Centre, Palode, Kerala
Corresponding author: Neemaiiopr@gmail.com

Abstract

The study aims to identify, profile, and functionally evaluate VOCs emitted by male and female inflorescences at different floral stages across selected genotypes in Oil palm (*Elaeis guineensis* Jacq.). Dynamic headspace sampling coupled with Gas Chromatography–Mass Spectrometry (GC–MS) will be used for VOC collection and analysis. Headspace analysis of oil palm (*Elaeis guineensis*) flowers revealed dynamic changes in volatile organic compounds (VOCs) during anthesis and colour transition. In female flowers, estragole dominated (~90%) on the day of anthesis but declined sharply with flower age, replaced by ethanol as the major volatile. Colour transition from pale yellow to brownish black showed a similar shift from estragole to ethanol dominance. Male inflorescences exhibited high estragole (or its isomer) at anthesis, which later decreased as ethene-2-d-ol became predominant. These results suggest that estragole serves as the primary pollinator attractant during the receptive phase, while ethanol and other volatiles may function in post-receptive signaling. The floral stage selected were 0,1,2 and 3 day of opening. The study provides a comprehensive VOC profile of oil palm inflorescences, identify major semiochemicals responsible for pollinator attraction, and establish correlations between volatile composition and pollination success. The findings may further contribute to developing VOC-based strategies and breeding approaches for improving pollination efficiency and productivity in oil palm.

IHS/T-1/OP-128

Wild edible fruit trees of northeast India: conservation and future prospects

Vartika Srivastava, Subarna Hajong, Monika Jha, P.K. Singh, Anju Mahendru Singh, Monika Singh and G. P. Singh

ICAR-National Bureau of Plant Genetic, New Delhi
Corresponding author: vartika.srivastava@icar.org.in

Abstract

To evaluate their potential for long-term conservation, seed desiccation and freezing sensitivity studies were carried out at the ICAR–NBPGR, New Delhi. All studied species exhibit recalcitrant seed storage behaviour, characterized by sensitivity to both drying and low temperatures, thereby ruling out conventional seed banking as a viable conservation strategy. Notably, embryos of *Prunus napaulensis* and *Eriobotrya angustissima* displayed partial tolerance to desiccation, with critical moisture contents of 11% and 20%, respectively, which enabled their successful cryobanking. Given the predominance of recalcitrant seeds among these wild fruit trees, development of effective cryopreservation techniques is essential for their long-term conservation. Cryopreservation in liquid nitrogen at ultra-low temperatures (196 °C) offers a promising approach for safeguarding these valuable genetic resources. However, survival and regeneration following cryostorage are highly species-specific, necessitating the standardization of tailored protocols. Establishing reliable cryobanking protocols will play a crucial role in conserving these threatened wild edible fruit trees, maintaining genetic diversity, enhancing ecosystem resilience, and securing alternative food resources for future generations.

IHS/T-1/OP-129

Identification of elite accessions through multi-trait characterization of conserved coconut germplasm

Diwakar, Y and Niral, V.

ICAR-CPCRI Research Centre, Kidu ICAR-Central Plantation Crops Research Institute, Kasaragod, Kerala
Corresponding author: diwakar.y@icar.org.in

Abstract

The study encompassed 17 coconut accessions, planted during 1996-1997 in the International Coconut Gene Bank for South Asia and Middle East and National Coconut Gene Bank at ICAR–CPCRI Research Centre, Kidu. The accessions were evaluated for important vegetative, reproductive and fruit traits. Highly significant differences among accessions for most traits revealed the presence of wide and exploitable genetic variability. Vegetative traits showed substantial variation, with plant height ranging from 539 cm in Pattukottai Green Dwarf to 1312 cm in Malayan Tall, accompanied by marked differences in trunk girth, internode length and crown architecture. Reproductive traits also exhibited pronounced variability, particularly for number of spikelets inflorescence-1 (16.6-33.2), number of female flowers inflorescence-1 (12.3-27.1), and total fruits palm-1 (60.7-164.4), indicating differential yield potential among accessions. Fruit component traits also varied significantly, with fruit weight ranging from 733.5 g (Standard Kudat Tall) to 1181.3 g (Borneo Tall), volume of fruit cavity from 106.75 mL (Standard Kudat Tall) to 251.60 mL (Borneo Tall), and copra yield /palm/year from 9.62 kg (Kalpawangi Tall) to 23.30 kg (Seychelles Tall). Accessions such as Seychelles Tall, Zanzibar Tall, Guam I and Car Nicobar Tall consistently exhibited superior performance for yield and nut quality traits. The substantial variation observed across trait groups highlights the richness of the evaluated germplasm and its strong potential for direct selection, parental choice in hybridization, and trait-based improvement programmes aimed at enhancing productivity, nut quality and adaptability.

IHS/T-1/OP-130

Conservation and utilization of *Syzygium cumini* (L.) skeels genetic resources using droplet vitrification–based cryopreservation

Sushma Kumari and Vartika Srivastava

Department of Fruit and Fruit Technology, BAU, Sabour, Bhagalpur, Bihar
Corresponding author: sushma230119@gmail.com

Abstract

In the study, a droplet vitrification–based cryopreservation protocol was standardized using in vitro–derived shoot tips of *Syzygium cumini* accession IC656829. The protocol involved osmotic dehydration of explants in a loading solution (LS) for 20 minutes, followed by osmoprotection using plant vitrification solution 2 (PVS2) for 20 minutes. Subsequently, the treated explants were exposed to liquid nitrogen (–196 °C) and rapidly thawed in a recovery solution (RS) for 20 minutes. Post-thaw recovery was initiated on a culture medium supplemented with 2.22 µM 6-benzylaminopurine (BAP), followed by transfer to regeneration media for shoot multiplication and rooting. Comparative evaluation of explant types revealed that apical shoot tips performed significantly better than axillary shoot tips, recording highest post-thaw survival (67.99%) and regeneration (46.46%). The successful recovery and regeneration of cryopreserved explants demonstrate the feasibility of long-term conservation of jamun through shoot tip cryopreservation. This protocol ensures the preservation of genetically stable, true-to-type planting material and provides a robust strategy for conserving S. cumini genetic resources.

IHS/T-1/OP-131

Harnessing neglected and underutilized fruits and vegetables of Bundelkhand for nutrition security and sustainable livelihoods

Ashok Yadav, Vinita Yadav, Asha Ram, Ronak Yadav, H. Anuragi, Naresh Kumar, A.K Handa and A. Arunachalam

Corresponding author: ashokcafrihort1@gmail.com

Abstract

Prominent underutilized fruit species in Bundelkhand region are include bael (*Aegle marmelos*), wood apple (*Feronia limonia*), mahua (*Madhuca longifolia*), chironji (*Buchanania lanzan*), ankol (*Alangium salvifolium*), wild karonda (*Carissa spinarum*), jamun (*Syzygium cuminii*), tendu (*Diospyros melanoxylon*), tamarind (*Tamarindus indica*), khirni (*Manilkara hexandra*), mulberry (*Morus alba*), and wild date palm (*Phoenix sylvestris*). Important indigenous vegetables are bathua, kakoda, kachri, chench, poi saag, and nonia. These species are rich sources of vitamins, minerals, antioxidants, dietary fiber, and bioactive compounds and exhibit strong tolerance to abiotic stresses such as drought and high temperatures. In addition, extensive indigenous technical knowledge exists regarding their use in traditional medicine, food preparation, and cultural practices. However, their potential remains largely underexploited due to inadequate scientific validation, limited germplasm conservation, poor value addition, and weak market linkages. This paper reviews the status, nutritional and medicinal importance, indigenous knowledge, and conservation needs of major neglected and underutilized fruits and vegetables of Bundelkhand and proposes strategic approaches for their sustainable utilization through agroforestry integration, value chain development, and policy support. Harnessing the potential of these species can significantly contribute to dietary diversification, livelihood enhancement, biodiversity conservation, and sustainable development goals in vulnerable regions.

IHS/T-1/OP-132

Effect of pollen-pistil interaction and incompatibility in interspecific crosses of luffa species

Arvind Nagar, Ravi Gowthami, Amish Kumar Sureja, Manjusha Verma, Jogendra Singh, Awani Kumar Singh, Subramani Rajkumar and Roop Singh

College of Agriculture, Kota, Rajasthan
Corresponding author: arvind@auk.org

Abstract

This study investigated the fruit and seed set in various interspecific crosses of *Luffa* species and examined the pollen-pistil interaction to understand the level and nature of incompatibility between *Luffa acutangula* and *Luffa echinata*. Crosses involving different combinations of *Luffa* species exhibited varying fruit and seed set percentages, with some combinations showing higher rates compared to others. Notably, crosses between *Luffa acutangula* and *Luffa echinata* showed substantial fruit set percentages, but seed set varied across different cross combinations. Pollen-pistil compatibility studies revealed differences in pollen germination and tube penetration between selfed pistils of *Luffa acutangula* and *Luffa echinata*. In interspecific crosses, although pollen germination percentages were relatively high, percentage of pollen tubes reaching the ovules was significantly lower, indicating incongruity in pollen tube behavior. Observations also revealed abnormalities such as pollen tube coiling and breakage near micropyle end of ovule in certain cross combinations. Additionally, delayed embryo development and subsequent embryo abortion were observed in some ovules, suggesting post-fertilization barriers. These findings contribute to our understanding of reproductive biology in *Luffa* species and provide insights into strategies for improving interspecific hybridization success in breeding programs.

IHS/T-1/OP-133

In-vitro multiplication and rooting of an endangered endemic wild species of banana (*Musa indandamanensis*)

Renu Chauhan

Corresponding author: renuchauhan170225@gmail.com

Abstract

The study was carried out to develop an *in-vitro* multiplication, and rooting protocol to safeguard endemic wild species of banana (*Musa indandamanensis* L.J. Singh) to develop an effective propagation protocol for its *ex-situ* conservation. Various sources of cytokinins, including 6-Benzylaminopurine (BAP), Thidiazuron (TDZ), and Metatopolin (mT), were tested either alone or in combination with 1-Naphthalene Acetic acid (NAA) and Indole-3-acetic acid (IAA) at different concentrations to evaluate their effects on number of shoots, shoot length, and time required for shoot induction. The highest number of shoots per explant (5.71±0.21) were recorded on Murashige and Skoog (MS) media containing 6 mg/L BAP + 1 mg/L IAA as compared to other media combinations. Maximum shoot length (5.69±0.24 cm) was recorded on MS media containing no hormones as compared to other media combinations. Minimum number of days for shoot induction (5.33±0.33 days) were recorded on MS media containing 6 mg/L BAP + 1 mg/L IAA and 8 mg/L BAP + 1mg/L IAA as compared to other media combinations for earliest shoot initiation. Maximum number of roots per explant (6.25±0.62) were observed on half-strength MS medium supplemented with 1 mg/L NAA. Maximum root length (3.72 ± 0.14 cm) was achieved on full-strength MS medium with 1.5 mg/L NAA. The shortest time for root initiation (5.50±0.28 days) was recorded on half-strength MS medium containing 1.5 mg/L NAA, in comparison to other media combinations. The genetic fidelity of the *in-vitro* multiplied plantlets was assessed using 20 SSR markers, demonstrated no differences between mother plants and the in vitro multiplied plantlets, confirming their genetic stability during the tissue culture process.

IHS/T-1/OP-134

Genetic divergence studies in chilli (*Capsicum annuum* L.)

Nisha Kumari

Department of Vegetable Science, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh
Corresponding author: nishakajla9@gmail.com

Abstract

The current research entitled, “Genetic divergence studies in chilli (*Capsicum annuum* L.)” was carried out to evaluate thirty four genotypes of chilli along with DKC-8 as a standard check variety for yield and various yield attributing traits at the Experimental Farm, Department of Vegetable Science, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh during Kharif season 2023.The experiment was planted in Randomized Complete Block Design (RCBD) with three replications and the parameters examined were recorded for various traits in green chilli, Days to 50 per cent flowering, days to maturity, plant height (cm), number of fruits per plant, fruit weight (g), fruit length (cm), fruit breadth (cm), green fruit yield per plant (g), flowering habit, fruiting habit, fruit blossom end, ascorbic acid content (mg/100g), total capsaicinoids content (%) and disease incidence of Phytophthora root rot. Whereas, in red chilli days to maturity, number of fruits per plant, fruit weight (g), fruit length (cm), fruit breadth (cm), red fruit yield per plant (g), number of seed per fruit, thousand seed weight, ascorbic acid content (mg/100g), total capsaicinoids content (%) and dry yield as percentage of fresh ripe (%). Analysis of variance for these traits reported significant differences among all the genotypes under investigation. Out of thirty four genotypes, IC-545654 was found best in terms of yield and other horticultural traits followed by IC-208518, LS-1 and EC-599977. Fruit weight recorded high phenotypic and genotypic coefficient of variation. High heritability linked with high genetic gain was recorded in in fruit weight, number of fruit per plant and fruit breadth. A highly positive and significant genotypic association of fruit length, number of fruit, number of seed per fruit, thousand seed weight, dry yield as percentage of fresh ripe, ascorbic acid content, fruit weight and fruit breadth however, it showed a negative and significant correlation with

days to 50% flowering, days to maturity. In addition, fruit length exerted the maximum positive direct effect on fruit yield per plant followed days to 50% flowering. Based on analysis of genetic divergence, all the genotypes accommodated in 5 clusters and cluster I accommodated maximum number of genotypes (25) followed by cluster II (6) and other three clusters having only one genotype respectively. The genotypes from cluster III and V can be further used in hybridization programmes and in improvement of different horticultural attributes in chilli.

IHS/T-1/OP-135

Genetic analysis of *Fusarium* wilt resistance using crop wild relatives in vegetable pea

Brij Bihari Sharma, Gowthami, Vinod Kumar Sharma, Harshawardhan Choudhary and B.S. Tomar

College of Horticulture & Forestry, Rani Lakshmi Bai Central Agricultural University, Jhansi, Yttar Oradesg
Corresponding author: brij9851@gmail.com

Abstract

The investigation was conducted at the ICAR–Indian Agricultural Research Institute (IARI), New Delhi, during 2020 and 2022, for identifying resistant sources and validating a functional co-dominant CAPS marker linked to *Fw* gene conferring resistance to Fusarium wilt race 1 in *Pisum* species. A total of 114 genotypes comprising 98 genotypes of *P. sativum* var. *hortense*, two genotypes of *P. elatius*, 10 genotypes of *P. sativum* ssp. *elatius*, and four genotypes of *P. fulvum* were screened under artificially created wilt-sick pot conditions (fop-1) under natural environments. Among cultivated *P. sativum* var. *hortense*, only 12 genotypes (GP2230, GP2239, GP2208, GP2215, M1, M6, M7, M8, M9, M11, M12, and M13) exhibited resistance. Strong resistance was observed in two genotypes of *P. fulvum* (N-3, N-13), one genotype of *P. elatius* (M2), and four genotypes of *P. sativum* ssp. *elatius* (N-6, N-8, N-11, and N-14). These resistant genotypes were further validated using a breeder-friendly, functional, co-dominant CAPS marker (THO) linked to *Fw* gene located on linkage group III.Genetic analysis of Fusarium wilt resistance was carried out in *P. sativum* ssp. *elatius* genotype N-8 using F_2 (VRP-6 × N-8) and BC_1 populations. Chi-square analysis revealed a 1:1 segregation ratio in the backcross population and a 3:1 ratio in the F_2 population, confirming the presence of a single dominant gene governing resistance to fop-1. The identification and CAPS-based validation of novel resistance sources in cultivated and wild *Pisum* species provide valuable genetic resources and demonstrate the feasibility of transferring Fusarium wilt resistance into susceptible early garden pea varieties through marker-assisted backcross breeding.

IHS/T-1/OP-136

Genetic evaluation of muskmelon hybrids using performance, correlation and path analysis for yield and quality traits in Kashmir

Mohd Faruk, Sumati Narayan, J.K. Ranjan, Jogendra Singh, Anil Kumar and Dhaneshvari Arya

Division of Vegetable Science, ICAR-IARI, New Delhi
Corresponding author: mohdfaruk7286@gmail.com

Abstract

The present investigation on mean performance and correlation studies for growth, yield and quality attributing traits in muskmelon (*Cucumis melo* L.) hybrid was laid out in randomized complete block design (RCBD) with 3 replications of twenty F1 hybrids from across the country for different yield and quality contributing traits under temperate conditions of Kashmir valley. Analysis of variance revealed significant differences among genotypes for all the traits. The highest average fruit weight was recorded in F1-Sawarna Hybrid (1.63 kg) followed by Madhusree (1.45 kg). The highest fruit yield per plant was recorded in Madhusree (11.52 kg/plant) followed by, F1-Tipu-50 (8.62 kg/plant). The highest TSS content was recorded in Madhuri-2 (11.57 0Brix) followed by F1-Sawarna hybrid (10.58 0Brix) and Madhusree (10.50 0Brix). The highest Vitamin C content (mg/100g) was recorded in Madhuri-2 (91.44mg/100g) followed by Madhura Diamond (90.86mg/100g). The highest moisture content (%) was recorded in F1-Madhuraj (13.11%) followed by LHM-Madhura (12.66%) and lowest

moisture content (%) was observed in Muskmelon Madhuri-2 (8.55%) followed by Madhura diamond (9.13%). The highest shelf life (days) was recorded in F1-Sawarna Hybrid (10.86 days) followed by Madhusree (10.27 days). Correlation coefficient disclosed that the economically important trait i.e, fruit yield per plant exhibited significant positive association with days from last fruit harvest, number of primary branches per plant, number of nodes per vine, node number at which first branched tendril appeared, flesh thickness, fruit length, average fruit weight, number of fruits per plant, fruit yield per plant, vitamin C and shelf life at both genotypic and phenotypic levels. Days to first male flower anthesis, node number at which first male flower appeared and node number at which first female flower appeared exhibited negative and significant association with fruit yield per plant. On the basis of overall mean performance Madhusree hybrid followed by F1-Tipu-50 and Punjab hybrid had shown highest fruit yield per plant or fruit yield per hectare and significantly superior in quality attributes therefore these hybrids were found suitable to grow in Kashmir conditions.

IHS/T-1/OP-137

Unlocking biochemical variability and bioactive compound richness in chilli with implications for human health and suitability for breeding

Partha Saha, Namita Das Saha, Anindita Paul, Sarala, K, Nandita Sahana, Bishal Gurung and M Sheshu Madhav

ICAR-National Institute for Research on Commercial Agriculture, Research Station Dinhata, Cooch Behar, West Bengal, India
Corresponding author: parthaicar@gmail.com

Abstract

To assess biochemical diversity and identify nutritionally superior genotypes, 38 chilli accessions comprising cultivars, landraces, breeding lines, and wild relatives were evaluated for ten biochemical and antioxidant traits. Highly significant genotypic variation ($p \leq 0.0001$) was observed for all traits. Total carotenoids ranged from 27.7–1388.9 µg g^{-1}, phenolics from 1618–14939 mg 100 g^{-1}, flavonoids from 300–3422 mg 100 g^{-1}, and vitamin C from 19–147 mg 100 g^{-1} FW, indicating wide biochemical diversity. Northeastern accessions, including Naga Bhut Jolokia, Ukhrul King Chilli, and Tamenglong King Chilli, exhibited exceptionally high pungency and phenolic content. LC–MS profiling of Ukhrul King Chilli, Tamenglong King Chilli, and Dalle Khursani revealed substantial variation in capsaicinoid composition, with dihydrocapsaicin as the predominant compound and maximum accumulation in Ukhrul King Chilli. Prominent chromatographic peaks of capsaicin and dihydrocapsaicin at 13.0–13.5 min largely determined pungency and high SHU potential. Antioxidant traits (DPPH, TAC, FRAP) were strongly and positively correlated ($r = 0.90–0.99$), whereas capsaicin showed weak or negative associations with antioxidant indices, suggesting largely independent biosynthetic regulation. Multivariate analyses (PCA, HCA, heat-map) grouped the accessions into five major clusters, with PC1 (38.3%) and PC2 (20.5%) explaining 58.8% of the total variation. The MGIDI index identified six superior accessions Tamenglong King Chilli, Ukhrul King Chilli, Dalle Khursani, Mhyco Yasaswini, Kakchai (KC), and a local Manipur market type as promising genetic resources for enhancing bioactive compounds and human health oriented chilli breeding programs.

IHS/T-1/OP-138

Sustainable fruit systems: enhancing livelihood and nutritional security through the adaptability and productivity of underutilized fruit crops in Bundelkhand

Neetu Saroj, Ranjit Pal, Sukanya Misra, Manoj Kundu, Ghan Shyam and Manish Srivastav

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India
Corresponding author: ranjit_pal2@yahoo.com

Abstract

The study evaluated the adaptability, phenology, productivity, market potential, and nutritional significance of fourteen underutilized fruit crops grown in Bundelkhand, viz. aonla, bael, jamun, ber, karonda, wood apple, lasoda, custard apple, jackfruit, tamarind, phalsa, carambola, mulberry, and chironji.

Observations were recorded on flowering and fruit harvesting periods revealed staggered fruit availability across seasons, supporting the concept of year-round fruit availability on the market. Significant variation was recorded in fruit weight and yield per plant, with jackfruit, aonla, bael, and tamarind identified high yield potential, while chironji recorded as a high-value niche crop due to its premium kernel price. Nutritional evaluation highlighted the richness of these fruits in bioactive compounds such as ascorbic acid, anthocyanins, flavonoids, tocopherols, and essential minerals, contributing significantly to dietary diversity and nutritional security. Market analysis indicated high to moderate economic viability for several crops, particularly aonla, bael, jamun, ber, and chironji, even under minimal agricultural input conditions.

IHS/T-1/OP-139

Dissecting the genetic architecture of tuber yield, quality, and nutritional traits in potato through genome-wide association analysis

Paresh Chaukhande, Bhoopal Singh Tomar, Satish Kumar Luthra, Manisha Mangal, Jeetendra Kumar Ranjan, Rakesh Bhardwaj, Amol Solanke, Gyan Mishra, Pooja Mankar, Dwijesh Mishra and R.N.Patel

ICAR-Indian Agriculture Research Institute, New Delhi
Corresponding author: bst_spu_iari@rediffmail.com

Abstract

An association mapping panel of 192 potato genotypes (Indian cultivars/advanced breeding lines and exotic germplasm) was evaluated during *rabi* 2022-23 at two locations: ICAR-CPRS, Modipuram (Uttar Pradesh) and Potato Research Station, Deesa (Gujarat). Genotyping-by-sequencing on Illumina NovaSeq 6000 generated >2.0 million raw polymorphisms; after quality control, 20,566 high-quality biallelic SNPs were retained for downstream analyses. GWAS was performed location-wise using the BLINK model with kinship and the first three principal components as covariates, and significance was assessed using trait-wise Bonferroni thresholds (alpha = 0.05) with BH-FDR support. Across locations and trait groups, a recurrent region on chromosome 4 (~10.19 Mb; candidate gene Soltu.DM.04G009800, RuBisCO-related) showed consistent associations with total yield, tuber eye depth, iron content and tuber general impression indicating a shared genomic basis for market and micronutrient components. High-effect, trait-specific signals were detected for pigmentation and quality traits, including anthocyanin on chromosome 5 (39.41 Mb; Soltu.DM.05G016780), total carotenoids on chromosome 3 (22.19 Mb; Soltu.DM.03G008900.1), dry matter on chromosome 4 (47.64 Mb; Soltu.DM.04G020670), tuber eye depth on chromosome 8 (42.16 Mb; Soltu.DM.08G014930), total soluble solids on chromosomes 1 and 9, and vitamin C on chromosome 4 (61.14 Mb; Soltu.DM.04G029790). Phenotypic variance explained by lead QTNs ranged from ~5.8% to 36.7%, with maxima for iron (36.7%) at Modipuram, anthocyanin (35.1%) and tuber eye depth (30.6%) at Deesa. These results nominate a focused set of recurrent and high-effect regions for conversion into breeder-ready assays and multi-environment validation to enable simultaneous selection for tuber appearance, yield and nutritional quality.

IHS/T-1/OP-140

Exploiting pummelo in interspecific hybridization for enhancing fruit quality and nutritional traits in citrus

Narendra Singh, R. M. Sharma, A. K. Dubey, O. P. Awasthi, Supradip Saha, C. Bharadwaj, Amitha Mithra Sevanthi, Nimisha Sharma, and Amrender Kumar

ICAR-Indian Agricultural Research Institute, Hazaribagh, Jharkhand
Corresponding author:narendra.singh8@icar.org.in

Abstract

The investigation evaluated sixteen new interspecific citrus hybrids derived from pummelo (*Citrus maxima* [Burm. f.] Merr.) × sweet orange (*Citrus sinensis* (L.) Osbeck cv. Mosambi). Newly developed interspecific

hybrids exhibited transgressive segregation for the fruit quality traits and nutritional values. The fruit weight, peel thickness, core diameter, seed number, and juice content in new citrus hybrids varied from 296.73 to 562.45 g, 4.01–9.14 mm, 6.31–24.61 mm, 10–64.83, and 22.91–48.24 % (w/w), respectively. The total soluble solids (TSS), titratable acidity (TA), TSS/TA ratio, and total sugar content in new hybrids ranged from 8.80 to 11.72◦Brix, 0.77–1.81 %, 5.74–12.28, and 5.77–8.97 %, respectively. Ascorbic acid, total phenol, total flavonoids, total carotenoid, and antioxidant activity in fruit juice of studied genotypes varied from 37.8 to 72.02 mg/100 mL, 19.63–112.59 GAE mg/100 mL, 1.09–2.39 QE mg/100 mL, 34.6–519.81 µg/100 mL, and 1.99-2.62 TE µmol/mL, respectively. Hybrids SCSH-11-15/12, SCSH-11-9/13, SCSH-9-10/12, and SCSH-17-19/13 proved superior for fruit quality and health-promoting properties. The bitterness properties were studied by quantifying naringin and limonin content in the fresh and stored juice (24 h storage at 4 ◦C) in addition to the sensory evaluation. The new hybrid SCSH-9-2/12, SCSH-9-10/12, and SCSH-11-9/13 have very low limonin content. A wide range of mineral nutrient concentrations in the citrus fruit juice was observed, including Fe (1.65-7.37 mg/L), Zn (1.28-2.97 mg/L), Mn (0.51-1.24 mg/L), and Cu (0.46-0.84 mg/L). Hybrids SCSH-9-6/12, SCSH-9-10/12, SCSH-11–9/13, and SCSH-7-2/12 were found to have superior micronutrient levels in fruit juice. The study showed that pummelo is a potential parent for improving fruit quality, nutritional value, and reducing bitterness in citrus, offering valuable genetic resources for citrus scion improvement.

IHS/T-1/OP-141

Genetic variability studies in garden type of Indian bean (*Lablab purpureus* var. typicus L.) for nutritional security under rainfed semi-arid conditions

Gangadhara K, L.P.Yadav, V.V. Appa Rao, A.K. Singh, Anil, A.K.Verma and J.Rane

ICAR-Agricultural Technology Application Research Institute(ATARI), Bengaluru
Corresponding author: vandna27du@gmail.com

Abstract

A field experiment was conducted during 2023–2025 at the Central Horticultural Experiment Station (ICAR–CIAH), Vejalpur, Godhra, Gujarat, under rainfed semi-arid conditions to evaluate genetic diversity among Indian bean (Lablab purpureus L.) genotypes for yield and quality attributes. Sixty genotypes were assessed to identify superior lines and key yield-contributing traits using principal component analysis (PCA) and Mahalanobis' D^2 statistics. Substantial variability was observed for pod yield, pod colour, and quality parameters, particularly protein content, anthocyanins, and antioxidant activity. PCA revealed that the first four principal components explained 77.33% of the total variation, with PC-I contributing the highest (34.84%), followed by PC-II (18.24%), PC-III (13.73%), and PC-IV (10.52%). Based on D^2 analysis, the genotypes were grouped into eight distinct clusters, indicating a wide genetic divergence. The maximum inter-cluster distance was recorded between clusters V and VIII, followed by clusters IV and VIII, suggesting substantial genetic diversity among these groups. Cluster VIII exhibited the highest divergence, as evidenced by its maximum inter-cluster distances with several other clusters, followed by cluster VII. Genotypes from clusters exhibiting higher inter-cluster distances are genetically more diverse and hold greater potential for hybridization to generate superior segregants. Greater emphasis should be placed on clusters II and I for selection of inbred lines and varietal development in future breeding programs. Highly divergent and promising genotypes such as CHESDB-7 (Thar Kiran), CHESDB-50 (Thar Ganga), CHESIB-31 (IC-631578), CHESIB-10 (IC-631577), CHESIB-40 (IC-631579), CHESDB-01, CHESDB-56, and CHESDB-54 were identified based on superior mean performance for yield and quality traits, particularly protein and anthocyanin content. These genotypes are well-suited for commercial cultivation and can be effectively utilized in breeding programs aimed at genetic improvement of Indian bean under dryland semi-arid conditions of western India.

IHS/T-1/OP-142

Genetic variability, heterosis and evaluation of advance breeding lines of okra (*Abelmoschus esculentus* L.) for enhanced yield and nutritional quality under eastern indian conditions

Krishna Prakash, Vasavi Devi, Sonakshi Sinha, Saheb Pal, Narendra Singh and RK Yadav

ICAR- Indian Agricultural research Institute, Gauria Karma, Hazaribagh, Jharkhand
Corresponding mail: kprakash.iarijh@gmail.com

Abstract

Okra (*Abelmoschus esculentus* L.) is a nutritionally important vegetable crop with wide adaptability across Eastern India. The present study integrates genetic diversity analysis, heterosis breeding, and evaluation of advanced breeding lines to identify superior genotypes for yield, quality, nutritional traits and disease tolerance under the Eastern Plateau Region of India. A diverse set of okra germplasm comprising released varieties, wild and cultivated accessions, experimental hybrids, and advanced breeding lines was evaluated across multiple seasons. Significant genetic variability was observed for morphological, yield, biochemical, and nutritional traits, including fruit yield, dietary fibre, vitamin C, phenols, antioxidant activity, and micronutrients such as zinc, copper, and iron. Yield per plant showed strong positive correlations with number of fruits, fruit weight, and plant height, while YVMV incidence exhibited a significant negative association with yield. High heritability coupled with high genetic advance was observed for yield, dietary fibre, zinc (99.45%), and copper (88.81%), indicating predominance of additive gene action and potential for direct selection. Cluster and molecular marker-based analyses revealed wide genetic divergence among genotypes, enabling effective parental selection. Heterosis and combining ability studies identified superior parents and hybrid combinations exhibiting significant heterosis for yield and yield-attributing traits, largely governed by non-additive gene action. Evaluation of advanced breeding lines further identified high-yielding and early-maturing lines (SNO-40, SNO-61, SNO-47, SNO-6, and SNO-18) along with nutritionally superior genotypes rich in micronutrients with stable performance across seasons. In conclusion, the integrated approach demonstrated that simultaneous exploitation of genetic diversity, heterosis, and advanced breeding line selection is highly effective for developing high-yielding, nutritionally superior, and disease-tolerant okra cultivars. Further, Biofortification-oriented breeding targeting zinc, iron, and dietary fibre, along with consumer-preferred quality traits, should be prioritized. Additionally, exploration of climate-resilient traits such as heat and moisture stress tolerance, coupled with participatory varietal selection, will accelerate the development and adoption of superior okra cultivars.

IHS/T-1/OP-142

Marker-assisted selection (MAS) in developing nutrient-dense vegetable varieties

Shrawan Singh, Vinay Verma, Bhagchand Shivran and Vinit Sharma

Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, New Delhi-110012
Email: singhshrawan@rediffmail.com

Breeding nutrient dense cultivars in vegetable crops is one of the sustainable way to tackle micronutreint deficiencies viz-a-viz contributing in public health system. However, breeding of such such varieties is a big challenge due to genetic complexities of the trait(s) and costly/cumbersome biochemical analyses. Marker-assisted selection (MAS) is a crucial, high-precision, and efficient tool in modern plant breeding, enabling the acceleration of the development of nutrient-dense biofortified vegetable varieties. The DNA-based markers helped in identifying the individuals with desired nutritional traits at the seedling stage while bypassing the need for environment- and stage-specificity and complex biochemical analyses. The MAS has been used to target health-compounds such as anthocyanin, glucoraphanin, and beta-carotene (pro-vitamin A) in crops like cauliflower, broccoli, sweet potato and tomatoes. MAS has supported the breeding of tomatoes for lycopene, Vitamin C, and tomatine. The use of gene specific makers helped in rapid introgression of Pr gene (anthocyanin) and Or gene (b-carotene) in Indian cauliflower. The markers also helped in pyramiding of multiple metabolites such as OrPr cauliflower. The markers were also deployed to reducing anti-nutritients in vegetables such as spinach (SNPs for low-nitrate/low-oxalate concentrations) and beans (SCAR markers for zt-1 gene for low tannins, KASP for v-c for vicine-convicine

factors) to develop healthy varieties. The MAS helped in introgression of two QTLs for higher glucoraphanin from Brassica villosa to broccoli. The MAS is advantageous for speed and efficiency (10–12 years to 5–6 years), precision selection for target gene(s) (foreground selection), the rapid recovery of the recurrent parent's genome while minimizing linkage drag (recurrent selection) in developing improved varieties. Further, it allows early stage selection (seedling-stage screening) and pyramiding of multiple genes. However, the application of MAS faces challenges particularly due to high initial costs for infrastructure, specialized expertise to design/develop markers, mapping population developments, trait-specific donors and handling of breeding materials. However, the utilization of genomic resources from orthologos species, metabolite pathway gene analogs, Next-Generation Sequencing (NGS), Genomic Selection (GS) and colloborative approach highlights better prospect of MAS in breeding vegetable varieties with higher nutritional values.

IHS/T-1/PP-101

Analysis of nutritional and phytochemical composition Saba and Kanchi Kela banana flowers

Avnish Kumar Pandey, Kajal, Susheel Singh, Ankur Patel, Tulsi Gurjar, and Devraj

Department of Fruit Science, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat, India
Corresponding author: avnish.hort2010@gmail.com

Abstract

The nutritional and phytochemical composition of banana flowers from two cultivars, Kanchi Kela and Saba, was studied. Results revealed that the flower of Kanchi Kela had higher contents of crude fat (2.97%), ash (2.09%), moisture (90.17%) and crude protein (14.05%), whereas total dietary fibre (27.91%) and carbohydrates (18.18%) were higher in Saba. The potassium was most abundant macronutrient, while iron was predominant micronutrient in both cultivars. The banana flower of Saba exhibited the highest levels of phenolic compounds, including hydrolysable polyphenols (0.47%) and non-extractable proanthocyanidins (4.44%), whereas Kanchi Kela was higher in extractable polyphenols (4.38%).

IHS/T-1/PP-102

Assessment of diversity in karonda (*Carissa carandas* L.) genotypes

Saurabh Singh, Santosh Kumar Verma, Kuldeep Pandey, Jagveer Singh, Shivali Verma and Vedant Singh

Department of Fruit Science, CHF, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, India
Corresponding author: saurabhsinghnduat@gmail.com

Abstract

The experiment was conducted during 2023-25 at ANDUAT, Kumarganj, Ayodhya. Fifteen genotypes were evaluated for different horticultural attributes. CISH Kar-5 exhibited maximum plant height (3.63 m) and plant girth (65.87 cm), while greatest plant spread (4.77 m) was observed in CISH Kar-11. Leaf characteristics varied significantly; leaf length (7.53 cm) and width (5.23 cm) were highest in CISH Kar-11, whereas minimum was recorded in CISH Kar-2. Total chlorophyll content was highest in CISH Kar-5 (2.11 mg/g), carotenoids in CISH Kar-8 (28.35 mg/g), and proline content in ND Kar-2 (0.14 µmoles/g^{-1}). Flowering initiated mostly in March, except in CISH Kar-2, Kar-4, Kar-5, Kar-8, and Kar-11, which started in early February. Significant variation was noted in fruit traits; CISH Kar-11 recorded the largest fruit size and weight. Quality traits varied widely: TSS ranged from 4.08 to 8.84 °Brix, with maximum TSS and ascorbic acid (26.28 mg/100g) in CISH Kar-12, and total sugars (10.52%) in CISH Kar-6. The highest yield was recorded in CISH Kar-11 (53.7 t/ha) with yield per plant of 27.71 kg. Overall, CISH Kar-11 emerged as the most promising genotype for yield and quality characteristics.

IHS/T-1/PP-103

Potential of kharif onion in Bundelkhand region of Uttar Pradesh

R. K. Singh, A. L. Ola, B. B. Sharma, Saurabh Singh and Manish Shrivashtva

Department of Vegetable Science, Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh
Corresponding author: *rksrlbcau@gmail.com*

Abstract

The Rani Lakshmi Bai Central Agricultural University, Jhansi conducted the experiment and data revealed that the highest gross yield (223.99 q/ha) and marketable yield (220.41q/ha) were recorded in L-883 and was at par with check variety Agrifound Dark Red and Phule Samarth. The above variety L-883 can be recommended to the farmers of Bundelkhand region of Uttar Pradesh.

IHS/T-1/PP-104

Nutritional profiling analysis in Amaranth germplasm

Srija Priyadarsini, Gobinda Chandra Acharya, Pradyumna Tripathy, Nityamanjari Mishra, Saurabh Singh and Alok Nandi

Department of Vegetable Science, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar, India
Corresponding author: srijapriyadarsini1226@gmail.com

Abstract

We evaluated 30 accessions indigenous and exotic of Amaranth (*Amaranthus* spp.) along with two vegetable checks for mineral nutrients (N, P, K, Ca, Mg, S, Fe, Zn, Cu, Mn, B) and heavy metals (As, Pb, Cd, Ni, Cr). Plants were grown in an augmented block design, and nutrient profiling was performed using digestion-based methods with microwave plasma atomic emission spectroscopy (MP-AES). Significant variation was observed for most macronutrients (N, P, Ca, Mg, S) and micronutrients (Fe, Zn, Cu, Mn, B). Exotic accession, EC519523 exhibited superior N and P content, while indigenous collections, IC42356 and IC47434, showed promise for K-related nutritional quality. Vegetable checks, Arka Neelachal Bainshi and Arka Neelachal Ruchita, along with accessions under study, displayed potential for Fe and Mn biofortification. The accessions IC95247, IC47434, and IC42402 recorded zero accumulation of As, Pb, and Cr, underscoring their food safety value. Multivariate analyses revealed five principal components explaining >80% of total variation, while cluster analysis grouped accessions into five nutritional clusters. Strong correlations between macro- and micronutrients indicated shared uptake pathways. High heritability with genetic advance for several traits suggested scope for improvement through selection. The results demonstrate the value of amaranth germplasm as a rich reservoir of nutritional diversity and highlight the role of multivariate tools in identifying elite lines for future cultivar development.

IHS/T-1/PP-105

Crop diversification with star gooseberry (*Phyllanthus acidus*) in dryland region of Madhya Pradesh for nutritional and livelihood security

Parul Mehra and Rashmi Pandey

Department of Horticulture, PGI, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra
Corresponding author: parulmehra1995@gmail.com

Abstract

Star gooseberry (*Phyllanthus acidus* L.) in hindi recognised as *harfarori*, member of Phyllanthaceae family, is an underutilized fruit crop known for its aesthetically pleasing foliage and potential nutraceutical actions. In Southern India, this fruit tree is commonly found but also has rich diversity in north-east India. This deciduous tree thrives well under warm, humid and tropical conditions but can't tolerate frost. The climatic conditions of

dryland region of Madhya Pradesh (Bundlekhand, Panna, Chhatarpur, Sagar and Tikamgarh) are also favourable for the cultivation of star gooseberry as intercrop along with other commercial crops *viz*., turmeric, ginger, colocasia, radish, spinach, marigold, citrus, papaya, safed musli, and aloe vera etc. It can be easily grown in kitchen gardens, as it is small tree, possess branches with alternate leaves, hermaphrodite flowers, densely clustered tart and tangy fruits. This fruit can be eaten raw or processed as pickle, candied chutney, syrup, juice, sweet preserves, jam, and vinegar etc. Fruits contain vitamin-C (4.6-8 mg), dietary fibres (0.8 g), beta carotene (0.019 mg), carbohydrates (5.12-6.4 g), protein (0.155 g), TSS (5.75 ^{O}Brix), phosphorus (17.9-25 mg), calcium (5-5.4 mg), manganese (1.31-2.32 mg), potassium (223.4 -727 mg), iron (0.4-3.25 mg), zinc (1.44-1.63 mg), copper (0.2-0.6 mg) per 100 g and various bioactive compounds *viz*., polyphenols, terpenoids and flavonoids contributing to its numerous health benefits. It flowers twice a year in February-March and August- September and bears fruits throughout the year, which creates good opportunities for income generation. Laden with immense health benefits and ornamental value, star gooseberry is gaining popularity and will soon be exploited on commercial level.

IHS/T-1/PP-106

Assessment of genetic variability in garden pea for yield and yield attributing traits under Bundelkhand region

Upasna Choudhary, S.V. Dwivedi, Neetu, Ajeet Singh, R.K. Singh, A.C. Mishra, Shweta Soni, M.K. Singh, A.K. Sharma and Kaushal Kumar Maurya

Department of Vegetable Science, Banda University of Agriculture & Technology, Banda, Uttar Pradesh
Corresponding author: satyakvk@gmail.com

Abstract

An experiment was conducted to assess the genetic variability of Garden pea (*Pisum sativum* L.) for yield and yield-attributing traits. A total of 68 genotypes were evaluated during the cropping season using an augmented block design, with standard check varieties repeated across blocks. Data were recorded on days to 50% flowering, plant height, number of primary branches/plants, number of pods/plants, pod length, number of seeds/pods, 100-seed weight and pod yield/plant. Analysis of variance revealed significant variation among genotypes for most of the traits, indicating the presence of substantial genetic variability. The phenotypic coefficient of variation was higher than genotypic coefficient of variation for all characters, suggesting environmental influence on trait expression. High estimates of heritability coupled with high genetic advance as per cent of mean were observed for number of pods/plants, pod yield/plant and 100-seed weight, indicating the predominance of additive gene action and effectiveness of selection. The study revealed ample scope for yield improvement in garden pea through selection of superior genotypes.

IHS/T-1/PP-107

Genetic variability, morphological diversity, and antioxidant potential in *Gynoecious coccinia* accessions.

Lalu Prasad Yadav, Gangadhara K, A. K. Singh, V. V. Apparao and Jagadish Rane

ICAR- Central Horticultural Experiment Station (CIAH RS,) Godhra, Gujarat, India
**Corresponding author: yadavlaluprasad682@gmail.com*

Abstract

This study investigates genetic variability, morphological diversity, and biochemical traits in gynoecious *Coccinia* accessions using multivariate analysis. ANOVA showed consistent variation in vine length (VL), internode length (IL), leaf length (LL), and leaf width (LW), while other important parameters showed significant variance ($p<0.01$). Fruit-related traits including fruit diameter (FD), fruit length (FL), and average fruit weight (AFW) as well as reproductive traits like the number of female flowers per plant (NFFP) showed

significant variability, highlighting the possibility of selection. Opportunities for bioactive enhancement were indicated by the considerable variation in quality attributes (ascorbic acid (AsA) and titratable acidity (Ac)) and antioxidant-related qualities (TPC, TFC, CUPRAC, and FRAP). Strong positive correlations between yield traits were found by correlation analysis, and both trade-offs and synergies were seen between biochemical and morphological variables. Principal Component Analysis (PCA) highlighted genotype-specific trait relationships and explained 50.8% of the total variation. Cluster and network analyses further illustrated genetic diversity, with Thar Dipti (CHESIG-7) and Thar Sadabahar (CHESIG-2) emerging as genetically distinct accessions. These findings provide valuable insights for improving yield, antioxidant content, and fruit quality in *Coccinia* accessions.

IHS/T-1/PP-108

Evaluation of coconut varieties for growth attributes in the Bastar region of Chhattisgarh

Beena Singh, Bhujendra Kumar, B. Augustine Jerard and Sumitha S. and Scientist

All India Coordinated Research Project on Plantation Crops, ZARS, Jagdalpur,
Corresponding author: beena.nair1985@gmail.com

Abstract

The experiment was conducted under ICAR-AICRP on Plantation Crops at the Zonal Agriculture Research Station, Jagdalpur, Indira Gandhi Krishi Vishwavidyalaya, Raipur, with the objective of demonstrating performance of released coconut cultivars across diverse agro climatic conditions, during 2012, Ten genotypes with ten palms each were studied. This was clear variation among cultivars, reflecting differential adaptability to local soil and climatic environment. The trial also included an assessment of major insect pest incidence in coconut helping to identify relatively tolerant and susceptible cultivars under field conditions. Kalyani Coconut-1, Kera Bastar and Gauthami Ganga recorded minimum rhinoceros beetle and red palm weevil incidence. However RSW incidence was maximum in Gauthami Ganga. Field observations supported the overall performance trends of Gauthami Ganga, Kera Bastar, Kalyani Coconut-1 and Konkan Bhatye, which exhibited distinct morphological and adaptive characteristics under Bastar region. Gauthami Ganga recorded maximum number of nuts and dehusked nut weight while tender nut water, kernal thickness and copra content were maximum in Kalyani Coconut. The results contribute valuable baseline information for recommending suitable coconut varieties for cultivation in tribal regions, Bastar along with adjoining areas in Chhattisgarh plains.

IHS/T-1/PP-109

Evaluation of Dolichos bean germplasm for vegetative and seed related traits under Bundelkhand region

Arjun Lal Ola, Saurabh Singh, Sonia Devi, D, B.B. Sharma and R.K Singh

RLBCAU, Jhansi, Uttar Pradesh
Corresponding author: arjunola11@gmail.com

Abstract

The study was conducted during 2024–2025 at the Vegetable Research Farm, RLBCAU, Jhansi, to evaluate 45 genotypes (42 test entries and 3 checks) for vegetative and seed-related traits Dolichos bean [*Lablab purpureus* (L.) under Bundelkhand conditions. The experiment followed an augmented design, and data were recorded on nine morphological and phenological traits. Analysis of variance revealed significant variability for most traits, indicating the presence of substantial genetic diversity. Traits such as internode length, leaf area, leaf petiole length, and total leaf length exhibited high heritability and genetic advance, suggesting strong additive genetic control and high potential for improvement through selection. In contrast, days to 50% and 100% germination showed low heritability, highlighting strong environmental influence. Correlation and principal component

analyses identified leaf morphological traits and seed dimensions as key contributors to genetic divergence. Genotypes RLBDL-10, RLBDL-S-UN-1, and Arka Visthar performed better for vegetative traits, underscoring their potential as promising parents in breeding programmes. The study highlighted rich variability among germplasm, offering valuable insights for genetic enhancement and sustainable utilization.

IHS/T-1/PP-110

Survey and selection of elite genotypes of persimmon (*Diospyros kaki*) from Ganderbal district of Kashmir valley

Amit Kumar Khokher

Corresponding author: khokherak@rediffmail.com

Abstract

Thorough survey was conducted in five different villages of Ganderbal district of Kashmir valley and ninety-three persimmon accessions were marked to study their physio-chemical parameters. The results revealed vast diversity among accessions. The highest fruit weight, fruit length and fruit breadth were recorded in accessions GRP-05 (199.63 g), GSP-19 (84.57 mm) and GSP-08 (77.61 mm) whereas minimum was recorded in GKP-17 (48.41 g), GRP-23 (52.31 mm) and GLP-14 (38.29 mm), respectively. Fruit firmness varied between 6.94 (GRP-16) to 11.74 lb/inch2 (GKP-15). Fruit shape was observed as elliptic (36), ovate (31) and circular (26) in different accessions whereas fruit skin colour observed was light yellow (20), yellow (17), yellow orange (25), red orange (12) and orange (19). Maximum total soluble solids, titratable acidity, total sugars, ascorbic acid, tannins and astringency index was observed in GRP-05 (18.00oB), GKP-15 (0.38 %), GRP-08 (13.90 %), GKP-15 (31.83 mg/100g), GLP-19 (0.77 mg/g DW) and GSP-06 (3.74), respectively. However minimum total soluble solids, titratable acidity, total sugars, ascorbic acid, tannins and astringency index were observed in GRP-19 (12.0oB), GKP-04 (0.12 %), GLP-09 (8.30 %), GRP-15 (25.37 mg/100 g), GSP-10 (0.22 mg/g DW) and GRP-08 (0.320). Number of seeds per fruit varied between 2.67 (GSP-06) to 4.67 (GSP-24). Based on fruit weight, total soluble solids, astringency index and tannins, accessions GSP-04, GSP-09, GSP-14, GLP-03, GLP-04, GKP-03 and GRP-08 were identified as promising.

IHS/T-1/PP-111

Genetic improvement in tuberose through mutation

Mallika Sindha and S. L. Chawla

Department of Horticulture, KIASRC, Uka Tarsadia University, Bardoli, Gujarat
**Corresponding author: mallika.sindha@utu.ac.in*

Abstract

The genetic improvement in tuberose (*Polianthes tuberosa* L.) Through mutation was conducted at the ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat. The study aimed to harness the potential of induced mutations, using both physical (gamma rays) and chemical (colchicine) mutagens, to diversify the genetic makeup of Tuberose var. BRH 19. The objective was to develop novel varieties exhibiting superior ornamental traits such as enhanced flower size, increased number of florets, and improved colour vibrancy by inducing variations in the genotype. The research focused on generating a wider genetic base to introduce new and improved cultivars for commercial floriculture. Minimum days to 50 % sprouting was recorded in treatment T_{13} (0.11 % colchicine) whereas, least days to first flower opening, maximum survival percentage and number of florets open at a time noted in T_{14} (control). Maximum plant height and spike longevity were recorded in T_{11} (0.07 % colchicine) while, number of leaves per clump noted maximum in T_{10} (0.05 % colchicine). Maximum leaf area, spike length, rachis length, length of floret, floret diameter, number of spikes per clump, number of bulbs per clump and weight of bulbs per clump were noted in T_6 (3.5 kR gamma rays). Maximum number of florets per spike was recorded in T_1 (1.00 kR gamma rays) whereas, maximum number of bulblets per clump and weight of bulblets per clump were found maximum in treatment T_8 (0.01 % colchicine).

IHS/T-1/PP-112

Assessment of genetic diversity in ridge gourd (*Luffa acutangula*) by using (ISSR) molecular markers

Yogesh Kumar, Tribhuvan Chaube, Devi Singh, S.K. Tiwari, Jaydeep Halder, N. Rai and Rajesh Kumar

ICAR-Indian Institute of Vegetable Research, Jakhini (Shahanshahpur), Varanasi, Uttar Pradesh
Corresponding author: tchaubeyiivr@gmail.com

Abstract

The study was conducted at ICAR IIVR, Varanasi to assess the genetic diversity of ridge gourd genotypes (Luffa acutangula Roxb. L.) using Inter Simple Sequence Repeat (ISSR) markers. A total of 65 genotypes, including local ridge gourd accessions, advanced VRRG breeding lines, and check varieties, were evaluated. The genomic DNA was isolated and amplified using eight ISSR primers. The amplicons were scored in a binary format and analyzed using Jaccard's similarity coefficient, followed by cluster analysis employing the UPGMA method. The ISSR markers disclosed a wide range of genetic similarity values, varying from approximately 40% to 100%, indicating substantial genetic diversity among the genotypes. The UPGMA dendrogram grouped the genotypes into five distinct clusters. Cluster I consisted of highly divergent ridge gourd accessions, representing the maximum genetic variability. Cluster II included moderately diverse ridge gourd genotypes, forming a transitional group between local accessions and breeding lines. Cluster III comprised divergent VRRG breeding lines with moderate relatedness, while Cluster IV represented a mixed group of VRRG selections and a few ridge gourd accessions. Cluster V contained highly similar VRRG lines along with the check varieties Kashi Shivani and Kashi Nanda, indicating high genetic uniformity. The high effective multiplex ratio, polymorphism information content, and marker index values confirmed the efficiency of ISSR markers in discriminating ridge gourd genotypes. Overall, the study provides valuable insights for selecting genetically diverse parents to broaden the genetic base in future breeding programmes.

IHS/T-1/PP-113

Performance of chrysanthemum (*Chrysanthemum morifolium* ramat.) varieties for growth, flower quality and yield parameters under Malwa Plateau conditions

Saroj, Anuj Kumar, K.C. Meema and Priyamvada Sonkar

RVSKVV- College of Horticulture, Mandsaur, Madhya Pradesh
Corresponding author: dranuj333@gmail.com

Abstract

A field experiment was conducted at Department of Floriculture and Landscaping, K.N.K. College of Horticulture, Mandsaur Madhya Pradesh to see the performance of chrysanthemum (*Chrysanthemum morifolium* ramat.) varieties for growth, flower quality and yield parameters under Malwa plateau conditions of Madhya Pradesh Experiment was laid out in Randomized Block Design (RBD) with three replications. There were fifteen varieties of chrysanthemum. Study shown that the varieties exposed significant variance with respect to growth, flower quality and yield parameters. Among the varieties, Pusa Uday showed best performance with respect to plant height, number of branches per plant, plant spread and stem diameter, while, highest number of leaves per plant and number of flowers per plant was recorded in. Pusa Chitraksha. The earliest bud initiation and first flower opening was observed in Cherabu, while maximum flower diameter, fresh weight of flower, dry weight of flower and yield per plant was recorded in Pusa Lohit.

IHS/T-1/PP-114

Studies on variability and character association in brinjal (*Solanum melongena*)

Chetna Shaktawat, S. K. Pandey, B. R. Pandey, A. K. Mehta and U. K. Chanderiya

Department of Horticulture, Vegetable Science
Swami Keshwanand Rajasthan Agricultural University, Bikaner
Corresponding author: chetnashaktawat91@gmail.com

Abstract

The present investigation was conducted during *rabi* 2014–15 at the Department of Horticulture, College of Agriculture, JNKVV, Jabalpur, during *rabi* 2014–15 to assess genetic variability and character associations among 20 brinjal genotypes, including four checks, under a randomized complete block design with three replications. Twenty-three quantitative and qualitative traits covering growth, phenology, yield, disease incidence and fruit morphology were recorded and analyzed using ANOVA, genetic parameters (PCV, GCV, heritability, genetic advance), correlation and path coefficient analysis. Highly significant genotype effects for all characters indicated ample diversity; high heritability with high genetic advance was observed for number of fruits per plant, fruit size traits, fruit weight and yield, suggesting predominance of additive gene action and good scope for selection. Fruit yield showed strong positive associations with number of fruits per plant, fruit size and fruit weight and path analysis identified number of fruits per plant, number of flowers per cluster, fruit length, fruit width, average fruit weight and crop duration as major direct contributors to yield. On the basis of overall quantitative performance and distinct morphological traits, genotypes 2013BRBWRES-1 and 2013BRBWRES-2 were identified as high-yielding and suitable for cultivation in Kymore Plateau and Satpura hills agro climatic region of Madhya Pradesh.

IHS/T-1/PP-115

In-situ characterization and genetic diversity in custard apple (*Annona squamosa*) germplasm

Shivam Kumar Rajpoot, Mahesh Kumar Dhakar, Vishal Nath, Chavlesh Kumar, P. Bhavana and Sujit Kumar Bishi

Division of Fruit Crops, ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka
Corresponding author: skrajpoot7388@gmail.com

Abstract

To assess genetic diversity and characterize local germplasm of custard apple, extensive survey, DUS testing, and data collection were conducted in three districts of Jharkhand, i.e. Chaibasa (West Singhbhum), Khunti, and Ranchi. A total of 70 wild and semi-wild genotypes from the Eastern Plateau region were evaluated in situ for morphological and fruit quality traits. High variability was found in the morphological traits of fruits, seeds, leaves, and plants. Spreading plant habit with ovate leaf shape, acute leaf apex, green leaf colour and crimson, green petiole colour was recorded as predominant traits. The fruit length recorded ranged 4.95 to 7.04 cm, fruit diameter 5.24 to 7.59 cm, fruit weight 70.67 to 216.00 g, pulp weight from 29.53 to 150.07 g, pulp 41.14 to 77.48 %, seeds per fruit 5 to 36, and T.S.S from 12.60- 29.37 oB. Thus, it is concluded that KCA03 is a very promising genotype out of 70 genotypes and had the highest fruit diameter, fruit weight and pulp weight among all the genotypes. The genotypes CCA03 (highest pulp percent and low peel per cent), KCA21 (high pulp per cent), CCA04 (high TSS) and RCA14 (low seed per cent and highest TAC) were found superior.

IHS/T-1/PP-116

Performance of genotypes for their quality parameters in fenugreek (*Trigonella foenum graecum*)

Gursharan Singh, R.K. Yadav, Preeti Verma1 M.C Jain, A. Nagar, V.K. Yadav, Rajendra Kumar Yadav, P. Sharma and M.K. Gora

College of Agriculture, Ummedganj, Kota (Agriculture University, Kota)
Corresponding author: rakeshyadav635@gmail.com

Abstract

The investigation was carried out at Agricultural Research Station, Ummedganj, Agriculture University, Kota, and Rajasthan to evaluate "performance of genotypes for their quality parameters in fenugreek (*Trigonella foenum graecum* L.). During Rabi 2022-2023. This consisted of 30 genotypes (IC 255546, IC 264840, IC 266803, IC 391327, IC 396625, IC 397447, IC 572849, IC 572875, IC 585601, IC 595312, FGK 84 (LFC-90), FGK 125, FGK 127, FGK 135, KFG 1, KFGK 4, KFG 12, KFG 17, KFGK 18, KFG 24, Afg 1, Afg 2, Afg 3, Hisar Sonali, Pusa Early Bunching, PNF 1, PNF 6, PNF 7, NDM 21 and NDM 16). Observations on diosgenin, total phenol, protein and oil content in seed (%). The genotypes, viz. Afg-3 (22.5 %), PNF-7 (21.64%) and KFG-17 (21.09%), showed found superior for protein content recorded in this experiment. The essential oil content was higher in FGK-135 (7.80%), KFG-1 (7.60%) and KFGK-4 (7.20%).

IHS/T-1/PP-117

Effect of Stress relieving enzymatic activities in buds of Manjari Medika grapevine under semi-arid condition of Pune

Pradip kakade

ICAR-NRCG, Pune, Maharashtra
Corresponding author: pradipkakade1234@gmail.com

Abstract

The two year study carried out at ICAR-NRCG, Pune (Maharashtra), Manjari Medika grapevine grafted on Dogridge, 110R, 140Ru and 1103P were sampled at 0, 2, 4, 6 and 8 days after fruit pruning to represent phenophases from dormancy to budburst, bud extracts were analyzed for catalase (CAT), peroxidase (POD), polyphenol oxidase (PPO) and ascorbic acid oxidase (AAO), total phenol, protein and phosphorus content. In Manjari Medika grapevine during dormancy to budbreak CAT and POD peaked at early dormancy stages and declined toward budburst. The 110R rootstock recorded highest CAT and POD activity, while Dogridge showed the lowest CAT and POD activity. PPO activity declined from dormancy to budburst, the Dogridge rootstock was consistently recorded highest and 110R and 140Ru lowest activity at later stages, this suggests higher PPO activity led to delay or uneven sprouting. AAO increased toward budburst and was highest at Stage V in Dogridge rootstock. Bud phosphorus and protein increased toward budburst with 110R consistently higher and Dogridge resulted lower which enhances metabolic activation and nutrient support in 110R rootstock. The total phenol content increased toward budburst and were highest in Dogridge while lowest in 110R rootstock. Different rootstock significantly impacted in biochemical and enzymatic content of Manjari Medika buds from dormancy to budburst. 110R resulted higher CAT, POD, lower PPO and AAO activity while more phosphorus and protein accumulation consistent with advanced and more uniform budburst under semi-arid double-pruning single cropping pattern whereas Dogridge maintained higher phenolics, PPO and lower CAT and POD activity which resulted into delayed or less synchronized budbreak.

IHS/T-1/PP-118

Droplet vitrification-based cryopreservation of jamun (*Syzygium cumini*)

Sushma Kumari, Vartika Srivastava, Jai Prakash, Nripendra Vikram Singh, Kumar Durgesh, Kanhaiya Singh, Jeetendra Kumar Ranjan, Rakesh Singh and Monika Singh

ICAR-NBPGR, New Delhi, India
Corresponding Author: vartika.srivastava@icar.org.in

Abstract

A droplet vitrification protocol was optimized using *in-vitro–derived* shoot tips of accession, IC656829 of jamun. The protocol involved osmoprotection in loading solution for 20 minutes, dehydration with chilled PVS2 for 20 minutes, vitrification in liquid nitrogen using droplet vitrification technique, and storage at cryogenic temperature for at least 24 hours. This followed by rapid thawing, and recovery on 2.2 µM BAP-supplemented medium for initial recovery, followed by transfer to established regeneration medium for elongation and rooting, resulted in efficient survival and shoot regeneration. Apical shoot tips proved superior to axillary ones, achieving highest post-thaw survival (≈68%) and regeneration (≈46%). Genetic fidelity analysis of both *in-vitro*–raised and cryo-regenerated plants, in comparison with the respective mother plant, revealed no detectable genetic variation. This confirms the absence of somaclonal variation in tissue-cultured and cryo-retrieved plantlets, indicating a high degree of genetic uniformity essential for preservation of desirable traits in clonally propagated, economically important crops. The true-to-type nature of regenerated plantlets validates the suitability of protocol for large-scale micropropagation and conservation programmes. Moreover, established cryopreservation system provides an effective approach for the long-term conservation of *Syzygium cumini* genetic resources and can be extended to other recalcitrant woody fruit species.

IHS/T-1/PP-119

Evaluation of genetic variability in gladiolus (*Gladiolus grandiflorus*) cultivars under agro climatic conditions of Prayagraj

Ronanki Srinidhi

Corresponding Author: rsrinidhi0101@gmail.com

Abstract

The analysis of variance for different quantitative characters reviled significant differences among varieties for growth, spike yield and vase life with corms weight/plant (g) of gladiolus. The highest corm yield (g/plant) was observed in Friendship (106.72), followed by Chandini and Sunayana. The PCV was higher than GCV for all traits studied. Highest GCV and PCV were recorded as weight of daughter corm (21.30 and 22.17). The heritability estimates in broad sense were classified into 3 groups such as high (>75%), moderate (60% - 75%), low (75%), moderate (60% - 75%), low (<60%). The heritability estimates were high (more than 75%). Genotypic and phenotypic correlation coefficient analysis revealed that corms weight/plant (g) showed positive significant association with plant height, number of leaves/plant, number of shoots/plant, rachis length (cm), number of floret per spike, number of spike per plant, floret diameter (cm), spike length (cm), vase-life, corm weight per plot (g), weight of mother corm per plot, weight of daughter corm, corm diameter (cm), number of corm per hectare, number of cormels per hectare and corm yield/plant at both levels genotypic and phenotypic.

IHS/T-1/PP-120

Pangalo germplasm for morphological, growth and yield traits

Ankit Kumar Yadav, S.S. Kushwah, R. K. Sharma and R. Gallani

Department of Vegetable Science, College of Horticulture, Mandsaur, Madhya Pradesh
Corresponding author: kushwahhort@gmail,com

Abstract

An experiment was carried out to study the growth and yield characteristics in round melon germplasm. Ten germplasm along with two varieties were evaluated during summer season, 2022-23 at, College of Horticulture, Mandsaur (MP). The characterization of all the lines on the basis of qualitative traits indicated appreciable variation for different parameters. Degree of secondary lobbing of leaf blade was the most diverse trait among all the traits. Three germplasm had weak lobbing, 8 germplasm exhibited intermediate lobbing, whereas 1(RMG-2) expressed strong lobbing of leaf blade. Four germplasm (Arka Tinda, Tinda Ludhiana, RMG-2 and RMG-4) had large leaf size. Seven germplasm had green leaf colour, 2 germplasm (RMG-3 and RMG-10) had light green and 3 (RMG-1, RMG-7 and RMG-8) dark green. Germplasm (RMG-6) had cordate leaf shape whereas all other germplasm had lobed leaves. All the germplasm had hairy fruit surface. The earliest fruit picking was noted with Arka Tinda followed by Tinda Ludhiana and RMG-1. Germplasm RMG-4 has registered maximum number of fruits per plant followed by RMG-2 and RMG-7. Highest fruit yield was recorded with RMG-4 which, followed by RMG-2 and RMG-7. Highest TSS (°Brix) content was estimated with RMG-8, followed by RMG-2, Tinda Ludhiana and RMG-6.

IHS/T-1/PP-121

Buchanania lanzan: an underutilized and valuable tropical fruit tree native to Indian forests

Sonu Nagar, S Patra, A K Panda, and D K Sharma

Department of Fruit Science, ASPEE College of Horticulture, NAU, Navsari
Corresponding author: dksharma@nau.in

Abstract

This review synthesizes peer-reviewed studies and technical reports covering taxonomy, phytochemical profiles, biological activities, propagation methods, post-harvest processing, value-addition, and conservation concerns of Chironji (*Buchanania lanzan* Spreng). We collate and critically analyze phytoconstituents, emphasizing phenolics, flavonoids, essential fatty acids, sterols, and triterpenoids, and relate these compounds to demonstrated antioxidant, anti-inflammatory, antimicrobial, and metabolic regulatory activities. Agronomic and propagation studies are examined to identify effective seed handling, nursery practices, micropropagation and grafting approaches that enhance establishment and genetic conservation. Post-harvest processing, kernel oil extraction, and value-added product development are reviewed with respect to yield optimization and nutritional retention. We highlight socio-economic dimensions including market chains, non-timber forest product governance, and the role of chironji in supporting livelihoods in dry tropical and subtropical regions. Gaps identified include limited clinical validation of pharmacological claims, fragmentary germplasm characterization, inadequate propagation protocols for large-scale restoration, and weak integration between conservation policy and community-based management.

IHS/T-1/PP-122

Multi-environment evaluation for downy mildew disease incidence revealed the prevalence of multiple pathotypes and need for region-specific breeding strategies in cucumber

Vikrant, Avinash Tomer, Pragya Ranjan, Chithra Devi Pandey and S. S. Dey

ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding author: vikranttomar91197@gmail.com

Abstract

The experiment, a multilocation evaluation was undertaken to identify stable sources of downy mildew (DM) resistance and to elucidate genotype × environment interactions in cucumber. A total of 131 accessions were assessed across three contrasting agro-climatic regions of India—New Delhi (ICAR-IARI), Bengaluru (ICAR-IIHR), and Varanasi (ICAR-IIVR). Field screening was carried out under natural epiphytotic conditions, complemented by artificial inoculation to ensure uniformity. Disease severity was quantified using percent disease index (PDI) and area under the disease progress curve (AUDPC). Cluster analysis revealed substantial genetic diversity for DM resistance and differential genotype responses across environments. At IIHR, 29 accessions, including IC523700, IC421752, and IC314341, displayed high levels of resistance (mean PDI ≤ 17.3 and AUDPC < 700), whereas 35 accessions were classified as highly resistant at IIVR, with an average PDI of 13.8 and AUDPC of 487.8. Several landraces, particularly IC588146 and IC421752, exhibited consistent resistance across two or more locations, indicating their suitability as donors of broad-based resistance. The pronounced location-specific variation in disease reaction suggests the presence of diverse DM pathotypes and underscores the need for region-specific breeding approaches. The findings highlight the importance of indigenous germplasm in breeding climate-resilient, disease-resistant cucumber cultivars and demonstrate the utility of multi-environment screening combined with genomic tools.

IHS/T-1/PP-123

Screening of sweet orange and mandarin genotypes grown under Bundelkhand region against granulation

Divya Meena, Manish Shrivastav, Manoj Kundu, Ranjit Pal, Ghan Shayam Abrol and Sukanya Misra

Department of Fruit Science, College of Horticulture & Forestry, Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India.
Corresponding author: divyameenakota2003@gmail.com

Abstract

In India, the Bundelkhand region is emerging as a promising zone for citrus cultivation due to its favourable agro-climatic conditions characterized by hot summers (often exceeding 40°C) and mild winters. Considering this, Bundelkhand offers significant potential for the commercial cultivation of sweet orange and mandarin. But the primary challenge for citrus cultivation in this region is the high incidence of granulation which ultimately hampering the fruit quality attributes significantly. Therefore, identifying cultivars with lower susceptibility to granulation is essential for ensuring sustainable and profitable citrus production in the region. Under the current experiment, eight sweet orange cultivars viz. Mosambi, Blood Red, Katol Gold, Sathgudi, Pusa Sharad, Pusa Round, Early Gold, Cutter Valencia and five mandarin cultivars viz. Kinnow, Daisy, William Murcott, Nagpur mandarin, NRCC – 4 were investigated for physic-chemical attributes as well as for granulation incidence. Among the cultivars, maximum fruit weight was recordedin sweet orange cv. Pusa Sharad (256 g) and mandarin cv. Daisy(212g). Similarly, maximum fruit size was also recorded in sweet orange cv. Pusa Sharad (Length-86.27 mm, Breadth- 78.12 mm, Volume- 244.67 cc) and mandarin cv. Daisy (Length-52.91 mm, Breadth-62.32mm, Volume-199.67cc). However, the peel percent was recorded maximum in mandarin cv. William Murcott (0.62%) and sweet orange cv. Pusa Sharad (7.27%) andminimumin mandarin cv. Daisy(0.32%) and

sweet orange cv. Mosambi (4.12%). Themaximumnumber of segments per fruit was observed in mandarin cv. Daisy (13) and sweet orange cv. Sathgudi (12), whereas granulation affected segmentswas found highest in mandarin cv. William Murcott (11/11) and sweet orange cv. Pusa Sharad (9/11). Across the groups, William Murcott mandarin and Pusa Sharad sweet orangeexhibited highest percentageof area affected by granulation (55% and 64%, respectively). Juice content and total soluble solids (TSS) also vary considerably among the cultivars of both mandarin and sweet orange group and are influenced by granulation incidence. In mandarin maximum TSS is recorded in Daisy (7.8˚ Brix) and maximum juice content in Nagpur mandarin (54ml), whilein sweet orange, maximum TSS is observed in Cutter Valencia (8.53˚ Brix) and maximum juice content in Pusa Sharad (123 ml).

IHS/T-1/PP-124

Evaluation of bottle gourd germplasm for different growth and yield traits

Vikash Meena and Arjun lal Ola

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh
Corresponding author: vkrahuwas05072002@gmail.com

Abstract

Bottle gourd (Lagenaria siceraria (Mol.) Standley) is an important vegetable crop of the family Cucurbitaceae, valued for its high nutritional quality and diverse utility. The crop exhibits wide genetic variability owing to its monoecious and andromonoecious floral nature, which can be effectively exploited through systematic germplasm characterization. The present investigation was conducted during kharif 2025 at the Vegetable Research Farm, Rani Lakshmi Bai Central Agricultural University, Jhansi. A total of 63 bottle gourd genotypes, including three standard checks (Kashi Ganga, Pusa Sandesh, and Pusa Santusti), were evaluated under field conditions using an augmented block design with five blocks. Observations were recorded on 25 morphological and yield-related traits. The results revealed that the maximum vine length was recorded in RLBBG- 31 (11.2 m), while the minimum vine length was observed in RLBBG-4 (4.0 m). The genotype Thar Samardhi recorded the earliest flowering, fruiting, and harvesting among all genotypes. The earliest appearance of the first male flower was observed in Kashi Ganga (29 days), whereas the first female flower appeared earliest in RLBBG-39 (34 days). The highest fruit yield per plant was recorded in PLR-2 (3.4 kg plant^{1}), while the maximum individual fruit weight was observed in RLBBG-12 (1.26 kg). Notably, PLR-2 and RLBBG-37 outperformed the standard checks with respect to yield and quality attributes. The study highlights the presence of substantial genetic diversity among bottle gourd genotypes and provides a strong basis for the selection of superior genotypes for future breeding and crop improvement programmes.

IHS/T-1/PP-125

Morpho-biochemical profiling of jamun (*Syzygium cumini*) germplasm available in Bundelkhand region

Neetu Saroj, Manoj Kundu, Ranjit Pal, Jitendra Kumar Tiwari, Ghan Shyam and Sukanya Misra

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India
Corresponding author: neetusaroj177@gmail.com

Abstract

In our study, jamun germplasm available in Bundelkhand region were evaluated for morpho-biochemical attributes. The morpho-biochemical profiling revealed that the fruit weight of jamun germplasm varied from 3.13 to 16.20 g, fruit length - 18.50 to 34.00 mm, fruit width - 15.00 to 26.10 mm, seed weight - 0.78 to 3.61 g, seed length - 11.72 to 23.00 mm, seed width - 7.63 to 12.41 mm, TSS - 8.8 to 18.9 °B, titratable acidity - 0.48 to 1.92%, ascorbic acid - 20.81 to 83.20 mg/100g FW, reducing sugar - 8.60 to 17.43%, non-reducing sugar - 0.10 to 1.50%, total sugar - 9.1 to 17.77%, total phenol content - 70.33 to 180.20 mg GAE/ g FW, antioxidant activity - 40.58 to 92.76%, anthocyanin content - 195.58 to 1575.97 mg /100 g FW and total flavonoid content - 55.64 to

107.12 mg QE/100 g. From the study, it can be concluded that wide range of variation in morpho-biochemical attributes is available in the jamun under Bundelkhand region which are very useful in breeding programme for developing bioactive- rich jamun cultivars.

IHS/T-1/PP-126

Exploring genetic variability for root yield and its component traits in ashwagandha (*Withania Somnifera* L. Dunal)

Babulal Dhaka, Amit Dadheech, Manohar Ram, Raju Ram Choudhary, Mukesh Kumar Poonia and Sarita Choudhary

Department of Genetics and Plant Breeding, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India
Corresponding author: bdhaka707@gmail.com

Abstract

The study titled "Exploring genetic variability for root yield and its component traits in Ashwagandha [*Withania somnifera* (L.) Dunal]" evaluated 74 genotypes alongside three standard checks in late kharif 2019-20 at the Instructional Farm of Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan. Observations were recorded for eleven characters, including days to 50 percent flowering, plant height, number of primary and secondary branches, leaf area index, root length, root diameter, fresh and dry root yield, fresh and dry plant weight, 100 seed weight, harvest index, and alkaloid content. High genetic variability was observed in secondary branches, harvest index, and dry root yield, while low variability was seen in days to 75% maturity reveals significant potential for crop improvement. Substantial variability among genotypes underscores diverse genetic backgrounds, offering opportunities for selective breeding. High heritability was noted in secondary branches, fresh plant weight, and days to 50% flowering. Fresh plant weight exhibited high heritability and genetic advance, indicating its potential for improvement through selection. Overall, the study highlights significant genetic variability and potential for improvement in Ashwagandha traits, guiding future breeding efforts for enhanced crop performance and quality.



Theme

2

Genomics for improvement of indigenous and underutilized horticultural crops



IHS/T-2/OP-201

Impact of climatic factors on incidence of jelly seed and dynamics of fruit hormones in mango

Israr Ahmad, Dhireendra Rastogi, Dinesh Kumar, P. L. Saroj and Akhat Singh

ICAR-Central Institute for Subtropical Horticulture, Rehmankhera, P.O. Kakori, Lucknow, Uttar Pradesh, India
Corresponding author: israr15ahmad@gmail.com

Abstract

We analyzed impact of climatic factors on the occurrence of jelly-seed with increasing harvesting time in fruit of mango (*Mangifera indica* L.) 'Dashehari'. Mature, unripe fruits were randomly harvested at different time point from last week of May to third week of June and kept at room temperature for ripening. Data indicates that, climatic factors positively impact incidence of jelly seed disordered. Moreover, we also found that the fruit quality and some of hormones were also altered in jelly and nonjelly pulp. This study will enhance our understanding of this physiological disorder and help in developing management practices to minimise the effect of this malady.

IHS/T-2/OP-202

Pyramiding durable multi-pathogen wilt resistance in eggplant: high-yielding heterotic hybrids with near-immunity to bacterial and fungal wilt complex

Shailesh K. Tiwari, Akanksha, Vijay Bahadur, Sarvesh Kumar Mishra, Atmanand Tripathi and Subhash Chandra

ICAR-Indian Institute of Vegetable Research, Varanasi
Corresponding author: tiwarishailu@gmail.com

Abstract

Eggplant (*Solanum melongena* L.) cultivation in tropical and sub-tropical Asia is severely hampered by a soil-borne wilt complex involving *Ralstonia solanacearum* (bacterial wilt), *Sclerotium rolfsii* (southern blight), and *Fusarium oxysporum* f. sp. *melongenae* (Fusarium wilt), often co-occurring and causing 50–100% crop loss. Achieving stable, multi-pathogen resistance remains a critical breeding goal. Twenty-nine diverse accessions were screened under high-inoculum triple-pathogen challenge (*R. solanacearum* 1×10^8 CFU g^{-1}, *S. rolfsii* 5 sclerotia g^{-1}, *F. oxysporum* 1×10^6 chlamydospores g^{-1}) in controlled environments across three seasons. Six genotypes (Kashi Taru, Kashi Uttam, Kashi Manohar, Kashi Sandesh, Selection-10, and PR-5) showed consistent broad-spectrum resistance (DSI ≤ 20%). Biochemical analysis at 15 and 30 days post-inoculation revealed distinct defense mechanisms: fungal resistance correlated strongly ($r = 0.81–0.94$, $P < 0.001$) with elevated phenolics (3.1–4.2-fold), flavonoids (2.8–3.8-fold), and antioxidative enzymes (SOD, POD, CAT; 2.5–4.1-fold); bacterial resistance involved higher soluble solids (42–68%) and proline (2.1–2.9-fold). These lines were crossed in a 19-line × 3-tester design, yielding 57 F_1 hybrids. Eight hybrids exhibited near-immunity (DSI < 10%) with enhanced defense profiles. Marker-assisted selection using 11 markers (SSR, CAPS, SCAR) showed >92% phenotype-genotype concordance, with three bacterial-wilt markers explaining 41.3–52.1% variance. Five hybrids (IVBHLW-12, IVBHLW-13, IVBHLW-14, IVBHRW-2, and IVBHRW-11) pyramided 7–8 favorable alleles. Line × tester analysis under disease-free conditions indicated dominant non-additive effects ($\sigma^2SCA/\sigma^2GCA = 0.01–0.05$), with heterosis for yield reaching 112.4–202.3% over checks. These hybrids combine durable resistance and superior yield, providing deployable resources for wilt-endemic regions and a model for multi-pathogen resistance in horticultural crops.

Oral Presentation

IHS/T-2/OP-203

Discovery of KASPar SNP marker assays for early blight resistance in tomato

Ramesh K. Singh, Major Singh, Satyendra P. Singhc, Vikas K. Singhe, Neeraj Dwivedif and D. N. Singha

Division of Vegetable Crops, Research and Development Centre, Eagle Seeds and Biotech Pvt. Ltd., Indore, Madhya Pradesh
Corresponding author: rk.singhveg@gmail.com

Abstract

Early blight is a serious disease affecting tomato crops. The advent of new marker systems in next-generation sequencing (NGS) technologies has provided unparalleled opportunities for high-throughput functional genomics research. *K* Bioscience's oriented *Kompetitive Allele Specific PCR* (KASPar) amplification is one of the most prevalent methods for high-throughput single-nucleotide polymorphism (SNP) genotyping. Phenotypic screening for early blight was performed on 21 tomato germplasm lines and 163 recombinant inbred lines (RILs) of the F8 generation. In the results, 'EC-520061', 'Swarna Naveen', and 'H-88-78-1' showed symptomless, highly resistant and resistant, respectively. Among the 163 RILs, only 44.75 genotypes were resistant to early blight disease. A set of 14 SNP assays was identified and mapped on different chromosomes, as validated with germplasm lines. Out of them, three assays (SAG_T_EB_4, SAG_T_ST11, and SAG_T_ST12) showed homozygosity and absence of polymorphism. These three assays were further used for validation in the RILs and parental lines. The highest number of polymorphic markers were found between 'Swarna Naveen and EC-520061', and 'Punjab Chhuhara and H-88-78-1'. The identified SNP KASPar marker assays were found to be robust and highly reliable in detecting the resistance allele and separating heterozygotes from homozygotes. These assays can be used for high-throughput marker-assisted selection of early blight resistance in tomato breeding programs.

IHS/T-2/OP-204

Genome assembly and annotation to construct a high-quality reference genome in okra (*Abelmoschus esculentus*)

Parna Chatterjee, R.K Yadav, J.K Ranjan, Sarika Sahu, G.P. Mishra, Krishan Kumar, Deepak Singh Bisht and Suman Lata

Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, New Delhi. ICAR -Indian Agricultural Statistics Research Institute, New Delhi.
Corresponding author: sumanlata3@gmail.com

Abstract

We presented whole genome sequencing of *Abelmoschus esculentus* cv. Pusa Sawani, employing a hybrid sequencing approach that integrates Onso short reads with Nanopore long reads for assembly and annotation purposes. The whole genome Onso short read sequencing generated approximately 232.47 million reads, while Nanopore long read sequencing produced approximately 9.58 million reads, resulting in 74.47 GB of data for the sample. The raw reads from Onso and Nanopore sequence data were utilized to generate a hybrid assembly using the Maryland Super-Read Celera Assembler (MaSuRCA), yielding a genome assembly of approximately 1.17 GB with 387 contigs and an N50 value of 7.46 Mb. Automated assembly scaffolding using Ragtag provided the foundation for identifying novel genes through subsequent annotation and comparative genomics pipelines. Pathway analysis was conducted for sample using the KEGG Automatic Annotation Server (KAAS) database. This study aims to elucidate the complex genome of okra, facilitating the identification of novel genes, metabolic pathways and SSR markers which will serve as foundational resource for functional genomics studies and accelerated molecular breeding in okra.

IHS/T-2/OP-05

Processing tomato breeding: strategies and constrains

Jagesh Kumar Tiwari and Nagendra Rai

ICAR-Indian Institute of Vegetable Research, Varanasi
Corresponding author: jageshtiwari@gmail.com

Abstract

Tomato improvement requires a combination of classical breeding and modern genomic tools. The recent progress in marker-assisted selection coupled with modern genomics tools and emerging CRISPR/Cas-based genome editing has enabled targeted genetic improvement of tomato. Strengthening the use of wild relatives (*S. pennellii, S. pimpinellifolium and S. habrochaite*s) for trait introgression, integrating multi-environment testing, and deploying genomic selection can accelerate breeding gains. Moreover, genome-wide association studies (GWAS) using diverse panels have identified novel alleles/ QTLs in tomato breeding. Overall, the convergence of conventional breeding and modern genomics is reshaping the landscape of processing tomato improvement. The identification of robust QTLs, trait-specific candidate genes and predictive genomic markers would form the foundation for developing next-generation processing tomato cultivars with better fruit quality and fitting to industrial standards. These innovations will be pivotal to develop resilient, high-quality processing tomato varieties that can support sustainable growth of India's processing sector.

IHS/T-2/OP-206

Efficient in-vitro regeneration of cucumber cv. kalyanpur green (*Cucumis sativus* L.) tailored for CRISPR-based genome editing

Vidya Sagar, Jyoti Devi, Shubhra N. Kujur, Sunita Dhar, Pargat Singh, Suhas Gorakh Karkute, N. Rai, T. K. Behera, Sudhakar Pandey, Rajesh Kumar and A. K. Singh

ICAR-Indian Institute of Vegetable Research, Varanasi 221 305, Uttar Pradesh, India
Corresponding Author: vidya.sagarkaushal@gmail.com.

Abstract

Cucumber (*Cucumis sativus* L.) exhibits strong recalcitrance to in vitro culture, which hampers its genetic improvement and limits the application of modern breeding tools. This study aimed to develop a reliable, high-efficiency regeneration system for the cultivar 'Kalyanpur Green' that can serve as a platform for transformation and genome-editing. A stepwise optimisation protocol was employed, addressing (i) callus induction, (ii) shoot organogenesis, and (iii) rooting. Explants (cotyledons, hypocotyls, and cotyledonary nodes) were cultured on Murashige and Skoog medium supplemented with different concentrations and combinations of plant growth regulators (PGRs). Statistical analysis (ANOVA, $p < 0.001$) revealed highly significant effects of the treatments on all in vitro parameters except shoot length. A 100 % callus induction was obtained on MS medium containing 1.0–2.0 mg L^{-1} 6-benzylaminopurine (BAP) together with either 0.3–0.5 mg L^{-1} α-naphthaleneacetic acid (NAA) or 0.2–0.5 mg L^{-1} indole-3-acetic acid (IAA). Shoot regeneration was confined to cotyledonary nodes and reached 100 % efficiency on media with 1.5–2.0 mg L^{-1} BAP; the addition of 4.5 mg L^{-1} $AgNO_3$ further enhanced shoot proliferation. The optimal rooting medium comprised 2.0 mg L^{-1} indole-3-butyric acid (IBA) and 0.5 mg L^{-1} kinetin, producing a 100 % rooting rate with an average of 5.33 roots per explant. Genetic fidelity of the regenerated plantlets was confirmed with 13 inter-simple sequence repeat (ISSR) primers; all regenerated lines displayed monomorphic banding patterns identical to the mother plant, indicating the absence of somaclonal variation. The protocol provides a robust, reproducible micropropagation system that maintains clonal uniformity and is readily applicable for genetic transformation and CRISPR-based genome editing in cucumber. To demonstrate its utility, the system was employed for *Agrobacterium*-mediated transformation of cotyledonary-node explants aimed at editing the *CsMLO8* gene. The pORE-4 vector, carrying two gRNAs targeting the first exon of *CsMLO8*, was introduced, and T_0 transformants were screened using primers specific for *Cas9* and the U6 promoter. Positive T_0 plants were self-pollinated, and the resulting T_1 seeds were harvested for downstream analysis.

IHS/T-2/OP-207

Optimization of a protocol for efficient callus induction and in vitro plant regeneration in okra (*Abelmoschus esculentus* (L.) Moench)

Manu A. N., Anshul Sharma, Ramesh Kumar Yadav, J. K. Ranjan, Krishan Kumar, G. P. Mishra, Reeta Bhatia, Deepak Singh Bisht, Abhishek Jha, Reshav Naik, S. Bhargav Kiran, and Suman Lata

Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, New Delhi, India
Corresponding author: sumanlata3@gmail.com

Okra is a vital vegetable crop known for its nutritional benefits and economic significance. However, its genetic improvement has been hindered by the lack of efficient tissue culture and transformation protocols. In this investigation, a reproducible in vitro regeneration protocol was established for three okra cultivars Pusa Sawani, Pusa Bhindi-5 and Pusa Lal Bhindi-1 using hypocotyl and cotyledonary leaf explants. The explants were cultured on Murashige and Skoog medium (MS) supplemented with various auxin-cytokinin combinations. MS media containing 2.0 mg/L 6-benzylaminopurine (BAP), 0.5 mg/L α-Naphthalene acetic acid (NAA) and 200 mg/L activated charcoal (AC) was found most responsive (73.79%), followed by 1.0 mg/L BAP + 0.5 mg/L NAA + 200 mg/L AC (66.50%) and 2.0 mg/L Zeatin + 0.2 mg/L NAA + 200 mg/L AC (65.29%) for organogenic callus induction from hypocotyl for all the three varieties. Cotyledonary leaves achieved a maximum of (66.73%) callus induction under the same hormonal combination. Lowest callus induction was obtained in 1.0 TDZ + 0.1 NAA + 200 AC (24.28% to 23.18%) respectively for both the explants. 2.0 mg/L BAP, 0.5 mg/L NAA and 200 mg/L activated charcoal produced the maximum shoot induction (71.17%) with the earliest shoot bud emergence (13.25 days), whereas MS medium supplemented with 0.2 mg/L NAA and 200 mg/L activated charcoal resulted in the best rooting performance in Pusa Lal Bhindi-1 (91.14% rooting, 14.82 days to initiation and longest roots of 4.96 cm). To our knowledge, this is the first study to establish a robust in vitro callus induction and regeneration protocol for okra cultivars Pusa Sawani, Pusa Bhindi-5 and Pusa Lal Bhindi-1.

IHS/T-2/OP-208

Molecular insights into charantin and -carotene biosynthesis in bitter gourd (*Momordica charantia* L.): Gene expression dynamics and metabolite profiling

Banoth Tharun, Gograj Singh Jat, Manisha Mangal, Vishal Sunartiya, Sachin Kumar,

Rakesh Bhardwaj, Naveen Singh, Jeetendra Kumar Ranjan, Avinash Tomer, Deepak Singh and Tusar Kanti Behera
Corresponding author: singhgograj@gmail.com

Abstract

The considerable variation was observed in both the accumulation and gene expression patterns associated with charantin and β-carotene biosynthesis across diverse genotypes of bitter gourd.. PVGy-201 exhibited the strongest gene expression profile, with the highest transcript levels for five key genes, including *McIDI* (~16,493-fold), *McPMK* (~694-fold), and *McSE* (~466-fold), which corresponded with the maximum charantin content (38.53 µg/g FW). Similarly, DBGS-2 showed elevated expression of *McHMGR1* (~271-fold) and *McMK* (~13-fold), supporting its high charantin accumulation (35.27 µg/g FW). The wild species *Momordica balsamina* demonstrated strong expression of *McHMGR2* and *McSE*, consistent with charantin content of 29.36 µg/g FW. For β-carotene, DBGS-21-06 recorded peak expression of *McPSY* (~17.2- fold), *McZDS* (~4.9-fold), and *McCHXB* (~2.8-fold), aligning with high carotenoid levels at both edible (18.46 µg/g FW) and ripening (52.31 µg/g FW) stages. Pusa Rasdar showed elevated expression of *McZEP* (~6.9-fold) and McPDS (~10.8-fold), correlating with maximum carotenoid content (19.49 µg/g FW at edible stage and 55.66 µg/g FW at ripening). DBGS-100-0 expressed *McLCYE1* (~2.9-fold) and *McLCYE2* (~3.1-fold), with high carotenoids (15.91 µg/g FW) at the edible stage. Collectively, PVGy-201 and DBGS-2 were identified as promising candidates for charantin enrichment, while DBGS-21-06 and Pusa Rasdar emerged as superior for β-carotene accumulation. These genotype-specific insights provide a molecular framework to support marker-assisted selection, transcriptome-based screening, and metabolic engineering for the development of nutritionally enhanced bitter gourd cultivars with stable metabolite profiles.

IHS/T-2/OP-209

Molecular mapping of gynoecy and development of diagnostic markers for breeding in underutilized sponge gourd

Jaswant Prajapati, Mohinder Kaur Sidhu, Navraj Kaur Sarao, Inderjit Singh Yadav, MonishaThangavel and Akanksha Kumari

Department of Vegetable Science, Punjab Agricultural University, Ludhiana
Corresponding author: jaswant-22102010@pau.edu

Abstract

Whole-genome resequencing–based bulked segregant analysis (BSA-seq) was conducted using gynoecious and monoecious F_2 bulks along with the parental lines. Downstream analysis using MAPtools with the reference genome P93075 identified a major quantitative trait locus (QTL), designated *qSG_gy11*.1, spanning 0.33–8.40 Mb on chromosome 11. Within this region, 29 single nucleotide polymorphisms (SNPs) were converted into kompetitive allele-specific PCR (KASP) markers, of which 17 showed polymorphism and were subsequently used for genotyping the F_2 population. Integration of phenotypic and genotypic data using QTL IciMapping enabled validation and fine mapping of qSG_gy11.1 to a 1.42 Mb interval flanked by markers SGJP_1854186 (1.16 cM) and SGJP_3281262 (4.73 cM). Notably, the tightly linked marker SGJP_1854186, located 1.16 cM from qSG_gy11.1, harbored a non-synonymous SNP resulting in a threonine-to-isoleucine substitution in the coding region of a two-component response regulator ARR14-like gene. This study represents the first report identifying a QTL associated with gynoecy and developing diagnostic KASP markers for this trait in sponge gourd. These findings provide valuable genomic resources and demonstrate strong potential for marker-assisted selection (MAS) to introgress gynoecy into elite sponge gourd genotypes.

IHS/T-2/OP-210

Genotyping-by-Sequencing: An efficient approach for the rapid discovery of genome-wide single nucleotide polymorphisms (SNPs) in marigold

Sapna Panwar and Chetan Chauhan

Division of Floriculture and Landscaping
ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding author: sapna.panwar8@gmail.com

Abstract

Genotyping-by-sequencing (GBS) is a high-throughput, sequence-based genotyping approach that enables the rapid discovery of genome-wide single nucleotide polymorphisms (SNPs) in diverse germplasm of crop plants. The availability of high-density SNP markers has strengthened genome-wide association studies (GWAS) as a powerful tool for dissecting complex quantitative traits in many plant species. In the present study, a total of 100 marigold genotypes belonging to Tagetes erecta, Tagetes patula, and Tagetes minuta were studied. Genomic DNA was extracted from leaf tissues using the Qiagen Plant DNA Kit, and DNA quantification was done through agarose gel electrophoresis and NanoDrop analysis. Further, GBS libraries were prepared using restriction enzyme Apek I and sequenced on the Illumina NovaSeq 6000 platform. Sequencing data generated 467.9 million raw reads, of which 449.7 million high-quality reads were retained after filtering, achieved an alignment rate of 95.28% against the Tagetes erecta reference genome (GCA_030867185.1). Using the GATK HaplotypeCaller within the SNPArcher pipeline initially identified approximately 31.7 million variants. After rigorously filtered, a total of 12,357 high-quality biallelic SNPs were retained based on minor allele frequency (MAF) ≥ 0.05, $\leq$ 30% missing data, and high mapping quality. The results revealed that the filtered SNPs were evenly distributed across the marigold genome, with several high-density regions reflecting greater genetic variability among marigold genotypes. In addition, Population Structure Analysis and Principal Component Analysis revealed clear genetic stratification among marigold genotypes and identified four major ancestral groups with varying levels of admixture. Phylogenetic analysis further supported the observed genetic differentiation. The high-quality SNP

dataset generated in this study provided a valuable genomic resource for assessing genetic diversity, understanding population structure, and conducting GWAS to identify loci associated with flower yield and quality traits in marigold. The identified marker–trait associations will facilitate marker-assisted selection and the development of genomic selection strategies aimed at improving yield and quality attributes in marigold breeding programs.

IHS/T-2/OP-211

Molecular characterization of flowering locus T (FI) genes in diverse bolting cultivars of onion genotypes

Raj Kumar, Vivekanand L. Hembade, Krishna Prakash, Yogesh P. Khade, S. Anandhan and V. Mahajan

ICAR-Indian Agricultural Research Institute, Hazaribagh, Jharkhand
Corresponding author: rajk2384859@gmail.com

Abstract

The bolting behaviour is controlled by flowering locus I genes. FT proteins are produced in the phloem companion cells of the leaf and are transported to the apical meristem cells, where it forms a complex with 14-3-3 proteins and the bZIP transcription factor FD. This complex, known as the florigen activation complex, is thought to translocate to the nucleus where it activates the floral meristem identity genes, thereby inducing flowering. Bulbing in onion is a photoperiodically driven process depicting similar mechanism as the photoperiodic control of flowering in other plant species. Earlier genomic studies have identified seven FLOWERING LOCUS T (FT) genes regulating flowering and bulb formation in onion; however, their precise chromosomal localization remains unclear. FLOWERING LOCUS T is a multicopy gene involved in flowering. In the present study we have identified 7 paralogs in onion genome. These paralogs were identified by using protein sequences reported in previous studies and were used to search against onion genome using tBLASTn tool. These identified FI genes were located on chromosome 1, 2, and 4. Chromosome 1 had 4 paralogs while chromosome 2 had 2 copies and a single copy on chromosome 4. Gene structure was studied using various bioinformatics tools like FGENESH and ExPaSy. Primers were designed specific for each paralog and screened using genomic DNA and cDNA. Amplicon size reduced as expected in cDNA than genomic DNA indicating successful cDNA synthesis and absence of genomic DNA contamination. Expression analysis of the FI locus gene was carried out in onion cultivars with varying bolting responses to understand its role in bolting regulation. The outcomes from this study will generate valuable genomic resources for functional analysis and facilitate the development of FI gene based molecular markers for bolting resistance in onion breeding programmes.

IHS/T-2/OP-212

Identification and expression analysis of *1-SST* Gene(s) involved in fructan biosynthesis in onion (*Allium cepa*)

Gourab Saha, Vivekanand L. Hembade, Saheb Pal, Yogesh P. Khade, S. Anandhan and V. Mahajan

ICAR-Indian Agricultural Research Institute, Hazaribagh, Jharkhand
**Corresponding author: anandhans@gmail.com*

Abstract

Fructan accumulation within onion bulbs represents a major form of storage carbohydrate and contributes substantially to total soluble solids (TSS), which is a key indicator of bulb quality and an important determinant of storage life. Within the bulb, sucrose acts as the primary substrate for fructan biosynthesis. Among the fructosyltransferases, 1-SST catalyzes the first committed and regulatory step of fructan biosynthesis, thereby playing a key role in controlling fructan accumulation. The present study focuses on the genomic identification and functional characterization of *1-SST* and its paralogs to elucidate the molecular mechanisms underlying fructan accumulation in onion. The nucleotide sequence and annotation information for *1-SST* in onion (*Allium cepa* L.) were retrieved from the NCBI database. The complete coding sequence of cultivar Polestar (protein ID:

BAU46555.1) was used as a query for tBLASTn analysis against the onion genome assembly ASM3076508v1. A total of sixteen hits were identified, of which those showing ≥50% query coverage and an E-value ≤1e-10 were selected. Corresponding genomic regions spanning from chromosomes 2.2 to 3.1 were extracted and extended by 8 kb upstream and downstream, followed by gene prediction using FGENESH. The predicted proteins (500–600 amino acids) were validated using BLASTp. Phylogenetic analysis using MEGA and ClustalW, along with 1-SST, invertase and exohydrolase protein sequences, identified chromosomes 2.2 and 5.2 as 1-SST loci with multiple paralogs, which were consolidated as a single locus. The mRNA sequences from these loci were used for designing locus-specific qPCR and full-length primers using Primer Quest and Primer3. The PCR product with the expected amplicon sizes was obtained from both genomic DNA and cDNA. Overall, the identification and characterization of fructan biosynthesis genes, coupled with comparative expression analysis in genotypes differing in TSS content, will facilitate the genetic improvement of indigenous and locally adapted onion germplasm, contributing to sustainable horticultural production, reduced post-harvest losses, and enhanced economic resilience.

IHS/T-2/OP-213

Genetic analysis and QTL-seq–based mapping of fruit bearing habit in brinjal

Sulochana K.H., Partha Saha, B.S. Tomar, T.K. Behera, Chandrika Ghoshal, V.K. Verma, Gopala Krishnan S.

ICAR-National Institute for Research on Commercial Agriculture, Research Station Dinhata, Cooch Behar, West Bengal, India
Corresponding author: parthaicar@gmail.com

Abstract

In the study, classical genetic analysis combined with a QTL-seq approach was employed to dissect the inheritance and identify genomic regions associated with fruit bearing habit in eggplant. An F_2 population was developed from a cross between cluster-bearing Pusa Safed Baingan-1 and solitary-bearing Pusa Hara Baingan-1. Phenotypic evaluation revealed solitary fruit bearing to be dominant, with F_2 segregation fitting a 9:3:4 ratio (solitary: mixed: cluster), indicating the involvement of recessive epistasis and non-Mendelian inheritance. To identify underlying genomic regions, two DNA bulks were constructed from 20 F_2 individuals each representing extreme cluster and solitary bearing phenotypes and subjected to whole-genome resequencing along with the parents. A total of 122.06 GB of high-quality sequence data were generated and aligned to the eggplant reference genome. QTL-seq analysis using SNP-index and G′ (G-prime) statistics identified four significant QTLs associated with fruit bearing habit, distributed across chromosomes 4, 10, and 11. The concordance between genetic segregation patterns and QTL-seq results indicates polygenic control with epistatic interactions governing fruit bearing habit in brinjal. The identified QTLs provide a valuable resource for fine mapping, candidate gene identification, and development of molecular markers for marker-assisted selection to enhance yield potential in eggplant.

IHS/T-2/OP-214

Breeding superior guavas: decoding genotypes and fruit quality traits

Amit Kumar Goswami, Chavlesh Kumar, Suneha Goswami, Shalini Gaur Rudra, Rana V. S., Kritidipta Pramanik, M.R. Chandana, Shikha Saini, M.K. Sushravya, Parth Jadhav, Pooja Bishnoi and Lhingneivah Chongloi

Division of Fruits and Horticultural Technology, ICAR-IARI, New Delhi
Corresponding author: amit.tkg@gmail.com

Abstract

The investigation elucidates the phenotypic and biochemical diversity among guava germplasm, with a focus on identifying superior genotypes based on key fruit quality parameters, including total soluble solids (TSS), titratable acidity, total and reducing sugars, ascorbic acid content, total phenolic content (TPC), total flavonoid content (TFC), and postharvest shelf-life. Comprehensive phenotypic screening revealed notable genotypic variation: ‘Punjab Pink’ exhibited the highest TSS; genotypes ‘8F’ and ‘Pant Prabhat’ demonstrated elevated titratable

acidity; 'Pant Prabhat' and 'Shweta' were superior in total sugar content; while '7A' showed the highest reducing sugar levels. Antioxidant profiling identified '8A' (white pulp) and '2B' (pink pulp) as top-performing genotypes for ascorbic acid, phenolics, and flavonoids. Shelf-life evaluations indicated that 'Thai Guava' possessed the most extended postharvest longevity among white-pulp accessions, whereas '8F' was the most durable among pink-pulp types. Volatile metabolite profiling via headspace gas chromatography–mass spectrometry (HS-GC-MS) revealed genotype-specific differences in aroma-active compounds such as caryophyllene, L-cubebene, and limonene, which were associated with differential shelf-life performance. Transcriptomic analysis through RNA sequencing identified differentially expressed genes (DEGs) implicated in delayed fruit senescence and extended shelf stability. An integrative multi-omics approach encompassing physiological, biochemical, metabolomic, and transcriptomic datasets facilitated the identification of 35 elite genotypes as potential candidates for cultivar development and donor lines in molecular breeding programs. These genotypes represent immediate targets for precision breeding and biotechnological interventions aimed at synergizing superior fruit quality traits with enhanced agronomic robustness.

IHS/T-2/OP-215

In-vitro axillary shoot meristem targetted transformation in potato c.v. kufri jyoti by injecting *Arobacterium tumefaciens* culture

Vandna Patial, Ramawatar Nagar and Anil Dahuja.

**Corresponding author: vandna27du@gmail.com*

Abstract

Beyond being the third most important food crop for human consumption, after rice and wheat, the potato is the most efficient producer of edible energy per unit of land on Earth. As a nutrient-dense food, the potato is a rich source of carbohydrate and vitamins. The potato starch is equally prized for its functional properties in industrial applications, acting as a key component in the production of chemical additives and as a vital sizing agent in the textile and paper industries. Climate change and population growth necessitate the development of highly resilient, enhanced nutritional value and high-yielding crops to ensure global food security. Plant genetic transformation strategies serve as a pivotal tool for genetic engineering and advanced molecular breeding, yet the recalcitrant nature of many elite crop genotypes continues to be a major bottleneck for advanced engineering. Current research aims to make potato transformation more efficient, genotype-independent and accessible, which is critical for accelerating crop improvement. In potato, regeneration through callogenesis (indirect regeneration) is highly genotypic dependant. Therefore, present study described an optimised, unconventional transformation system by injecting axillary meristem of in-vitro plants in potato c.v. kufri jyoti. This unconventional transformation system utilizes direct organogenesis to bypass the traditional callogenesis phase. In this method, Agrobacterium tumefaciens is delivered to plant meristems that actively divide by mitosis to induce transfected nascent tissues. Unlike indirect regeneration, this direct regeneration mechanism has many advantages as it is genotype independent, short duration, overcome somaclonal variations and uses hormone-free medium for regeneration. Owing to strong vegetative propagation ability of potato, direct regeneration method can be successfully used in this crop. This protocol resulted in much higher genetic transformation efficiency as compared to indirect regeneration mechanism. The rate of chimeric mutants is also potentially reduced by regeneration from positive shoot apex and subsequent vegetative propagation of these positive shoots allows for the recovery of stable transgenic plants.

IHS/T-2/OP-216

Mining host whole-genome resequencing data for viral genome reconstruction and characterization in resistance breeding

Garima Verma, Madhu Sharma, Abhishek Sharma, Jiffinvir Singh Khosa and A S Dhatt

Department of Vegetable Science, Punjab Agricultural University, Ludhiana
Corresponding author: madhusharma@pau.edu

Abstract

Virus genome reconstruction methods, including PCR-based amplification, primer walking, and rolling circle amplification, are labor-intensive and frequently fail to recover complete viral genomes due to primer dependency and amplification bias. Even in our earlier attempts to recover complete begomovirus genomes using these approaches, only partial genome sequences could be obtained. To overcome these limitations, whole-genome resequencing (WGRS) datasets of two *Cucurbita moschata* inbred lines, P-135 (begomovirus-susceptible) and PVR-1343 (begomovirus-resistant), originally produced for mapping virus-resistance gene(s), were repurposed for complete viral genome reconstruction. Unmapped reads obtained during reference-guided host genome alignment, which likely contained virus-derived sequences following inoculation, were extracted and *de novo* assembled. Taxonomic classification of assembled contigs revealed 29 viral contigs in the susceptible line P-135, including long contigs supported by high read coverage, whereas only 20 short viral contigs with very low read depth were recovered from the resistant line PVR-1343, consistent with restricted viral accumulation due to host-mediated resistance. Three near full-length viral contigs (>2 kb) recovered from P-135 were validated by BLAST analysis and identified as bipartite begomovirus components (DNA-A and DNA-B). Circular genome reconstruction and read mapping confirmed complete, gap-free viral genomes with conserved begomovirus open reading frames. The availability of complete begomovirus genome sequences in *C. moschata* facilitates targeted begomovirus resistance breeding. Overall, this study establishes host resequencing data as a scalable, cost-effective and broadly applicable framework for large-scale virome analysis across plant species.

IHS/T-2/PP-201

Development of novel long non-coding RNA based SSR markers in relation to fruit cracking tolerance in pomegranate

Prakash G. Patil, Pinky Raigond, Shilpa P, Deepali Kulkarni, Sonali Gaikwad, Chandrakant Awchare, Dhinesh Babu K and R. A. Marathe

ICAR-National Research Centre on Pomegranate, Solapur (M.S), India
Corresponding author: patilbt@gmail.com

Abstract

A total of 2,520 LncRNAs reported during fruit cracking stages in pomegranate were deployed for in silico SSR motif search. As a result, total 5,397 motifs were identified and hexa-nucleotides repeats were found more dominant (55.6 %), followed by di-nucleotide (17.3%). The tri, tetra and mono represented equal proportions (7.8-8.3%), least percentage was observed for penta- nucleotides (2.76%). We designed a total of 2,212 novel pomegranate specific long non-coding RNA based SSR (PgLnRNA-SSR) primers. The ePCR validation of all these markers on Tunisia genome revealed single locus amplifications for 634 (3.64%) markers that are part of 530 LnRNA sequences. These markers were then mapped onto Tunisia chromosomes to develop a saturated physical linkage map. Further, 634 LnRNA-SSRs were ePCR confirmed on multiple genomes, i.e. Dabenzi, Taishanhong, Bhagawa and Tunisia, and identified 421 polymorphic markers with an average PIC value of 0.36. To assign functional roles to these novel LnRNA-SSRs, we carried out target analysis for 530 LnRNA against 93 unique genes that are known to be expressed during fruit cracking stages. This leads to identification of 19 candidate genes that are multiplely targeted by these LnRNAs. Out of 19 tragets, 13 genes had functional role during fruit development viz., probable pectin esterase 15, MYB1, MYB44, SAMT, BAMT, 16.9 kDa class I HSP, CyP450, CKI-SMR6, O-FUT19 and WUSCHEL homebox 4 etc. LnRNAs and their target gene family-based network graphs were developed for nine gene families showing multiple LnRNA targets. Finally, 65 LnRNA-SSRs were selected for wet lab validation and genetic studies.

IHS/T-2/PP-202

Genome-wide SSR identification and marker development in makhana (*Euryale ferox* Salisb.) an underutilized aquatic crop

Avantika Anand, Anil Kumar, Ravi Kesari, Samik Sengupta, Saurav Guha and Saurabh Kumar Choudhary

Department of Horticulture (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India
Corresponding author: 18bscagh199@gmail.com

Abstract

The present investigation focused on genome-wide identification and characterization of Simple Sequence Repeats (SSRs) in Makhana (*Euryale ferox* Salisb.), an economically important but underutilized aquatic horticultural crop, with the objective of developing SSR markers. A publicly available reference genome assembly of makhana (Genome Warehouse Accession No. GWHBFHH00000000) spanning 873.33 Mb was mined for microsatellites using the MISA bioinformatics pipeline. A total of 223,700 SSR loci were identified across 29 chromosomes and 1,069 contigs, with an average density of 254.69 SSRs per Mb. Among the six SSR classes, dinucleotide repeats were predominant (48.06%), followed by mononucleotide (42.66%) and trinucleotide repeats (6.27%), whereas tetra-, penta- and hexanucleotide repeats collectively accounted for less than 3%. The SSR landscape exhibited a strong A/T nucleotide bias, with 95.5% of mononucleotide SSRs composed of A/T motifs. AT/AT was the most abundant dinucleotide motif, while CG/CG was extremely rare, indicating selective motif enrichment and genome composition bias. Trinucleotide motifs such as AAG/CTT and AAT/ATT were highly represented, suggesting potential functional relevance in genic regions. Using Primer3, 196,328 SSR primer pairs were designed with optimal annealing temperatures (57.0–62.98 °C) and expected amplicon sizes ranging from 100 to 280 bp. Experimental validation of ten randomly selected primer pairs confirmed successful amplification, with polymorphism detected in two loci. The genomic SSR resource generated in this study provides a robust molecular marker platform for genetic diversity analysis, linkage mapping, marker-assisted selection, and conservation-oriented breeding of *Euryale ferox*, reinforcing the role of genomics in improving indigenous and underutilized horticultural crops.

IHS/T-2/PP-203

Molecular studies on line × tester mating design in ridge gourd (*Luffa acutangula* (L.) Roxb) using SSR markers

Hardat Kaswan, P. K. Yadav, B. R. Choudhary, Chet Ram, Pawan Kumar and Bhanwar Lal

Department of Horticulture, SKRAU, Bikaner, Rajasthan
Corresponding author: kaswanhardat6@gmail.com

Abstract

Checking of fidelity of F_1-hybrids generated through crosses between line and tester genotypes is important for validation of the true hybridity. The present investigation was carried out to elicit information regarding molecular characterization of ridge gourd line x tester mating design. To conduct the study, five lines and 3 testers were crossed in line × tester mating design to produce 15 hybrids. The plants were grown in the field and leaf samples were collected for DNA isolation. The molecular fidelity of ridge gourd hybrids was assessed using SSR markers to confirm their true hybridity and genetic integrity. Out of 49 screened SSR markers, fourteen markers were found polymorphic and effectively differentiated the parents from their hybrids. These polymorphic markers exhibited heterozygosity in hybrids compared to their respective parents, confirming successful hybridization and genetic distinctness. The allele patterns of hybrids matched the expected parental combinations, indicating that the developed hybrids were genetically true and authentic recombinants of their parental lines. The validated planting materials can be used for future breeding programme in ridge gourd crop improvement.



SOCIETY FOR HORTICULTURAL RESEARCH AND DEVELOPMENT
SHRD

Theme 3

Conventional breeding for crop improvement



IHS/T-3/OP-301

Development of temperate radish MAGIC populations for anthocyanin-rich root improvement.

Raman Selvakumar and Pritam Kalia

Centre for Protected Cultivation Technology, ICAR-Indian Agricultural Research, New Delhi
Corresponding author: selvakumarsingai@gmail.com

Abstract

A temperate radish (*Raphanus sativus* L.) MAGIC population was developed using multiple diverse parental lines contrasting for root skin and flesh colour, anthocyanin content, root shape, earliness and yield. A structured crossing scheme involving successive two-way, four-way and multi-parent inter-crosses, followed by intermating and selfing, was employed to generate highly recombined, near-homozygous MAGIC lines. The developing population was evaluated under temperate field conditions for root yield, earliness, root morphology, marketable quality and pigmentation traits. Anthocyanin content and related colour parameters were quantified using spectrophotometric and colourimetric approaches to identify lines with enhanced pigment concentration and attractive root appearance. Parallel genotyping with molecular markers will be used to characterize genetic structure of the population and to map genomic regions associated with anthocyanin accumulation and key agronomic traits. The resulting anthocyanin-rich MAGIC lines and linked markers will serve as a valuable pre-breeding resource for developing nutritionally enhanced, visually attractive temperate radish cultivars, contributing to diversified vegetable consumption and improved functional food options.

IHS/T-3/OP-302

Mutagenesis driven morpho-physiological responses to drought in Fennel

Arvind K. Verma, R.S. Meena, Sharda Choudhary and C.B. Harisha

ICAR- National Research Centre on Seed Spices, Ajmer- 305 206, Rajasthan
Corresponding author: arvindiari@gmail.com

Abstract

Gamma-ray irradiation at 150–250 Gy was used to induce genetic variability in fennel. The treated seeds were used to raise M_1 generation, and in M_2 generation, plants showing dwarf stature, early maturity, and multiple branching were identified as putative mutants. These selected lines were evaluated across M_3 to M_7 generations to confirm the stability of dwarf and early-maturing traits and to assess improvements in yield and quality. After mutant lines exhibited consistent performance, they were screened for tolerance to moisture-deficit conditions. Controlled stress was imposed by shielding the crop from rainfall using rain shelters, regulating irrigation based on the ETo method, and applying water-deficit treatments from flowering to seed-setting stages. Photosynthetic efficiency was examined using photosystem II analysis, infrared thermal imaging, and canopy temperature depression to identify drought-tolerant genotypes. Under moisture stress, the highest seed yield was recorded in line M-1 (24.5 q/ha), followed by M-25 (23.3 q/ha) and M-14 (22.3 q/ha). Yield reductions ranged from 21.5% in M-35 and M-26 to 23.4% in M-11. Overall, these results demonstrate that the selected genotypes possess strong adaptive potential and are well suited for cultivation in arid and semi-arid regions facing unpredictable climate patterns and limited water availability.

IHS/T-3/OP-303

Elucidating genetic architecture for horticultural and quality traits in onion (*Allium cepa*)

Ieshan Sharma, Anil Bhushan and Sandeep Chopra

Division of Vegetable Science, FoH&F, SKUAST, Jammu, Jammu and Kashmir
Corresponding author: anilbhushan2008@gmail.com

Abstract

The experiment was laid at Division of Vegetable Science, SKUAST Chatha, Jammu during winter season of 2024-25. Twenty five onion genotypes were raised in Randomized Complete Block Design with three replications. Based on the mean performance, two genotypes, Bhima Light Red and Bhima Shakti, were found to be statistically superior as compared to all other genotypes for most of the yield and yield contributing traits. Genetic variability analysis revealed high heritability coupled with genetic gain for bolting percentage, bulb neck thickness, bulb yield per plot, total bulb yield, bulb polar diameter, bulb shape index and average bulb weight. Correlation matrix for total bulb yield showed positive and significant correlation with eight traits i.e. plant height, pseudo-stem length, bulb neck thickness, bulb polar diameter, bulb equatorial diameter, average bulb weight, days to bolting and bulb yield per plot whereas, it showed negative and significant correlation with days to maturity. The cause-effect analysis revealed that bulb yield per plot had the highest direct effect on total bulb yield followed by average bulb weight, days to maturity, bulb shape index, pseudo-stem length, plant height, number of leaves per plant and ascorbic acid content. D^2 analysis of the 25 genotypes grouped them into 6 clusters, i.e. cluster I, II, III, IV, V and VI. The maximum number of genotypes were present in cluster I followed by cluster IV. Maximum inter cluster distance was observed between cluster II and cluster VI (7136.24), whereas maximum intra cluster distance was observed in cluster I (223.85). Moreover, Cluster V recorded maximum mean values for horticultural traits namely plant height, pseudo-stem length, bulb neck thickness, bulb equatorial diameter, total soluble solids, days to bolting, bulb yield per plot and total bulb yield thus, indicating that genotypes from these clusters can be selected for specific horticultural traits for further utilization in hybridization programme(s).

IHS/T-3/OP-304

Evaluation and identification of novel powdery mildew resistance in (*Cucumis melo* var.) *flexuosus* germplasm

Keshav K. Gautam, Abhinay, Vikas Singh, D.R. Bhardwaj, S. Maurya, VBS Chauhan, Sandeep Kumar, N. Rai and Rajesh Kumar

ICAR-Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh, India
Corresponding author: keshav.gautam@icar.org.in

Abstract

Powdery mildew (PM), caused by *Podosphaera xanthii*, is one of the most destructive foliar diseases affecting melons (*Cucumis melo* var. *flexuosus*), leading to a significant reduction in photosynthetic activity and marketable yield. This study aimed to identify stable, novel genetic resistance to powdery mildew in cultivated long melon for further use in melon breeding programs. Thirty-three germplasm/lines, were evaluated under natural and artificial epiphytotic conditions for powdery mildew resistance. In the field, disease scoring was performed at regular intervals, including at 85 days after sowing, which revealed a significant difference among the germplasm. VRLM-39 showed a very low PDI of 3.6% and an AUDPC of 46, indicating delayed symptom development, sparse mycelial growth, and strong field resistance, classified as a resistant line. In contrast, line VRLM-24-1 exhibited a high PDI of 82.7% and a significantly elevated area under the AUDPC of 2676, indicating early infection, dense white mycelial patches, and rapid disease development, classified as susceptible. Moreover, field screening results were highly correlated with values from the greenhouse evaluation using artificial inoculum. The substantial variation observed between resistant and susceptible genotypes underscores the value of VRLM-39 as a donor in breeding programs to develop powdery mildew-resistant longmelon varieties. This study also

emphasizes the relevance of the area under the disease progression curve as a reliable indicator for comparing disease dynamics among genotypes. These identified germplasm/lines may be used in development of PM resistant varieties/hybrids.

IHS/T-3/OP-305

Heterosis and hybrid performance in onion for earliness, yield and quality traits

Amar Jeet Gupta, Kavya V Aribenchi, V Sairam and V Mahajan

ICAR-Directorate of Onion and Garlic Research, Rajgurunagar-410 505
Pune (Maharashtra)
Corresponding author: guptaaj75@yahoo.co.in

Abstract

During *rabi* 2023-24, 43 F_1 hybrids and their checks were evaluated, among which four hybrids MS1600A × RGP-5, MS111A × 1606, MS111A × 1657, and MS222A × 1672 recorded >25% heterosis for marketable yield over the best check Bhima Light Red (30.30 t/ha). These hybrids also exhibited desirable traits such as bulb uniformity and free from doubles and bolters. Earliness was observed in MS1600A × RGP-5 and MS222A × 1672 (109 days to harvest) compared with Bhima Light Red (127.67 days). However, these promising hybrids require further molecular confirmation to validate cytoplasmic background and fertility restoration for their use in hybrid breeding programs. Recent advances in molecular markers that differentiate cytoplasm types and are linked to the restorer locus (*Ms*) provide new opportunities to accelerate hybrid development. Incorporating male sterility into elite germplasm and integrating molecular and biotechnological tools can reduce breeding cycles and enhance hybrid efficiency. Future efforts must focus on region- and season-specific hybrids to ensure greater farmer adoption and bridge India's onion productivity gap.

IHS/T-3/OP-306

Generation mean analysis for processing suitable seed traits of tomato (*Solanum lycopersicum*)

Ramavath Ramesh Babu, Prasanna, H.C., Ranjitha K and Bhanushree N

Division of Vegetable Crops, ICAR-Indian Institute of Horticultural Research, Central Horticultural Experiment Station, Chettalli, Karnataka
Corresponding author: rathod.ramesh89@gmail.com

Abstract

Using generation mean analysis, gene actions for seed parameters of six generations (P_1, P_2, F_1, F_2, B_1 and B_2) of tomato cross IIHR 2847 X CLN3916C were estimated. The per cent seed was lowest in line IIHR 2847 and highest in the line CLN3916C. The hybrid, IIHR 2847 X CLN3916C, showed intermediate seed content. The experimental material was evaluated at the Division of Vegetable Crops, Indian Institute of Horticultural Research, Bengaluru. Gene effects were estimated for characters and crosses with significant mean sum squares. The scaling test was conducted using the mean values, standard errors and variances of several generations. A duplicate type of epistasis was observed for the number of seeds, seed weight (g) and per cent of seed content traits, indicating that selection would not be effective for these traits due to their non-fixable nature in earlier generations.

IHS/T-3/OP-307

Natural and artificial screening of chilli genotypes to assess resistance to chilli leaf curl virus under south Gujarat conditions

T. A. Patel, and A. I. Patel

N. M. College of Agriculture, Navsari Agricultural University, Navsari, India
Corresponding author: akshay742000@yahoo.co.in

Abstract

The research was carried out during the winter season of 2024-2025 at Jarvi Seeds Pvt. Ltd. at Bharadia, Bharuch, and Gujarat, to evaluate and identify chilli (*Capsicum annuum* L.) genotypes resistant to Chilli Leaf Curl Virus under natural and artificial screening circumstances, with an emphasis on their suitability for cultivation in south Gujarat. Randomised Complete Block Design with 25 chilli genotypes and 3 replications were used. These 25 genotypes were examined in natural field circumstances and artificially inoculated with virulent whiteflies. Standard rating scales were used to assess disease incidence, severity and reaction. The results showed that genotype responses varied significantly. Under natural screening, 2 genotypes, KSP 1234 Mithila and US 730, were highly resistant, while 20 genotypes were resistant and 3 moderately resistant. Under artificial screening, only 3 genotypes, KSP 1234 Mithila, US 730 and US 1081 remained resistant, 16 showed moderate resistance and 6 became vulnerable. Disease pressure and reaction severity were often higher under artificial settings. Genotype KSP 1234 Mithila and US 730 have been discovered as stable and long-lasting resistant sources. Artificial screening was more reliable in finding real resistance, providing useful insights for chilli leaf curl virus resistant genotype in Gujarat.

IHS/T-3/OP-308

Assessing the suitability of exotic african marigold hybrids (*Tagetes erecta*) under South Gujarat conditions

T. A. Patel, and A. I. Patel

N. M. College of Agriculture, Navsari Agricultural University, Navsari, India
Corresponding author: akshay742000@yahoo.co.in

Abstract

The research was executed at Jarvi Seeds Private Limited, Bharadia, Bharuch, Gujarat, during winter season of 2024-2025 to evaluate the performance of 34 exotic marigold hybrids during winter, a study assessed their flowering, plant development, and total production. The experiment was arranged in Randomized Complete Block Design with 34 marigold hybrids and 3 replications. Seeds of marigold hybrids were raised using a standard package of practices and observations on flowering, plant growth, and yield were recorded using scientific protocols. Among 34 hybrids of marigold, Yellow#0068, Marigold#074, Marigold#078, Yellow#0065 and Marvel yellow were found promising for cultivation in south Gujarat region for yield attributes. Yellow#0068 is the top recommended marigold hybrid for commercial use in south Gujarat. It excelled in flower yield (638.30g/plant), flower diameter (5.75 cm), and number of flowers (96.07/plant), while matching other high-performing varieties for key flowering and growth traits.

IHS/T-3/OP-309

Genetic diversity among marigold hybrids (*Tagetes erecta*)

A. I. Patel and T. A. Patel

ASPEE College of Horticulture, Navsari Agricultural University, Navsari, India
Corresponding author: akshay742000@yahoo.co.in

Abstract

The investigation was carried out at Jarvi Seeds Private Limited, Bharadia, Bharuch, Gujarat, during the winter season of 2024-2025 using 34 exotic African marigold hybrids, procured from Thailand and China. The analysis of variance revealed highly significant differences among the hybrids for all yield and yield-contributing traits. For all the traits, PCV values exceeded their corresponding GCV values, but differences were less in majority of cases indicated that environmental factors had played less influence on expression of these characters. The plant height, average flower weight, branches per plant, flowers per plant flower yield per plant, days to first bud initiation, and flower diameter exhibited high heritability coupled with high/moderate genetic advance as a per cent of mean. Flower yield per plant was significantly and positively correlated with flower diameter, average flower weight, number of branches per plant and number of flowers per plant. This indicated that flower yield in marigold can be improved by direct selection of these characters. Maximum positive direct effect towards flower yield per plant was contributed by days to first bud initiation followed by number of flowers per plant, average flower weight of flower. Principal Component Analysis (PCA) indicated that among the nine characteristics examined, only two demonstrated principal components eigenvalues (PCs) exceeding 1 collectively accounting for approximately 68.62 % of the cumulative variability among the studied traits.

IHS/T-3/OP-310

Sex form variations: a strategy for earliness and yield enhancement in bitter gourd

Vishal Sunartiya, Gograj Singh Jat, Harshawardhan Choudhary, Awani Kumar Singh, Ramesh Kumar Yadav, Deepak Singh, Sachin Kumar, Avinash Tomer, Rakesh Bhardwaj, Naveen Singh, Bhoopal Singh Tomar and Tusar Kanti Behera

ICAR–Indian Agricultural Research Institute, Pusa Campus, New Delhi, India
Corresponding author: Vm822394@gmail.com

Abstract

This study aimed to assess heterosis and combining ability for earliness and yield-related traits in bitter gourd (*Momordica charantia* L.) using sex form variations as a strategy for efficient hybrid breeding. The experimental material comprised diverse parental lines and their hybrids developed through a line × tester mating design. The genotypes were evaluated for nine quantitative traits such as node number of first female flower, days to first female flower opening, days to first fruit harvest, average fruit weight (gm), fruit length (cm), fruit diameter (cm), number of fruits per plant, vine length (cm), and yield /plant (gm). Analysis of variance revealed significant differences among parents and hybrids for all traits, indicating the presence of substantial genetic variability. General combining ability analysis identified PVGy-201, IC398610 and DBGS-21-06 as superior general combiners for earliness, fruit traits and yield. Several hybrids exhibited significant and desirable specific combining ability effects, notably PVGy-201 × DBGS-2, DBGS-21-06 × G-16-2, DBGS-34 × G-23 and DBGS-21-06 × S-43, indicating the predominance of non-additive gene action. Based on standard check heterosis, several hybrids exhibited marked earliness. The hybrid PVGy-201 × G-16-2 showed maximum negative desirable heterosis for node number to first female flower (-55.53%), while PVGy-201 × S-43 recorded significant negative heterosis for days to first female flower opening (−16.87%). Earliness in fruit harvest was most pronounced in PVGy-201 × G-16-2 with −22.91% heterosis over the standard check. For yield-contributing traits, DBGS-21-06 × S-43 expressed the highest standard heterosis for yield per plant (52.50%). Superior performance for fruit traits was also observed, with DBGS-21-06 × DBGS-2 showing maximum heterosis for fruit length (44.25%) and DBGS-21-06 × G-16-2 for fruit diameter (31.25%). The hybrid DBGS-100-0 × G-23 recorded the highest heterosis for number of fruits per plant (42.90%), while IC397250 × DBGS-2 showed enhanced vine length (38.76%). The

identified superior parents and heterotic hybrids can be effectively utilized in future hybrid breeding programmes aimed at developing early and high-yielding bitter gourd hybrids.

IHS/T-3/OP-311

Genetic improvement of an underutilized fruit crop: a long term breeding strategy for *Hylocereus* (Dragon Fruit)

Nidhish Kumar, Rumana Khan, Silpa Sahoo and Sushruta Kumar Samanta

Department of Genetics and Plant Breeding, Rani Lakshmi Bai Central Agricultural University
Corresponding author: nidhish.bkj@gmail.com

Abstract

A wide range of hybridization strategies were employed, including interspecific homoploid and interploid crosses supported by embryo rescue techniques. These approaches resulted in the development of improved hybrid lines, several of which have been released for cultivation. Comparative analyses using molecular markers alongside morphological and phenological traits of parental species and hybrids provided valuable insights into genetic relationships and inheritance patterns of important dominant and recessive traits, thereby facilitating more targeted breeding efforts. In addition to intrageneric hybridization, crosses between Hylocereus and the closely related genus *Selenicereus* led to the production of promising intergeneric hybrids, expanding the genetic base available for crop improvement. Manipulation of chromosome number further contributed to genetic enhancement; in situ chromosome doubling produced autopolyploid lines that enabled evaluation of the effects of increased ploidy on fruit quality traits and metabolomic profiles. Gamete derived lines were also developed, enriching the germplasm repository with homozygous genotypes that proved valuable for subsequent hybridization programs. Interestingly, spontaneous chromosome doubling was observed in haploid gamete derived Hylocereus monacanthus lines and in interspecific interploid hybrids of *H. megalanthus* × *H. undatus* generated through embryo rescue, resulting in plants with higher than expected ploidy levels.

IHS/T-3/OP-312

Analysis of pulp pigment and seed characteristic segregation in biparental guava progenies

Ankita Kashyap, Prabhanshu Mishra, A. K. Goswami, Jai Prakash and Chavlesh Kumar

Division of Fruit Science Horticultural Technology, ICAR-IARI, New Delhi
Corresponding author: ckfruits2016@gmail.com

Abstract

Guava (*Psidium guajava* L.) is a nutritionally rich tropical fruit crop of major economic importance, valued for its high antioxidant content and pharmacological effects. Fruit pulp colour and seed parameters are essential quality traits influencing consumer preference, processing suitability, and breeding value. The present investigation was undertaken to assess the segregation pattern of pulp pigments and seed related parameters in biparental guava progenies derived from a cross between 'Allahabad Safeda' and 'Arka Kiran'. Four years old fifty full-sib progenies confirmed through SSR markers along with their parental genotypes were evaluated for pigments and seed related parameters. Seed morphological traits including seed length, width, seed number per fruit, seed weight per fruit, and seed hardness were recorded following guava descriptors. Lycopene and β-carotene contents were quantified using HPLC. Significant variability and pronounced segregation were observed among hybrids for all seed parameters and pigment contents, indicating broad range variability. Seed length and width ranged from 2.63–4.58 mm and 2.23–3.59 mm, respectively, while seed number per fruit varied widely (134.67–519.67), with several progenies exhibiting commercially desirable low seed counts. Seed weight per fruit (1.40–4.50 g) and seed hardness (60.04–182.33 N) also showed high coefficients of variation, reflecting strong genetic control and selection potential. Pulp colour segregation was skewed towards the red/pink group, with 45 progenies expressing coloured pulp, confirming polygenic inheritance. Lycopene (0.21–23.21 mg/100 g) and β-carotene

(0.05–1.95 mg/100 g) contents exhibited extremely high variability, and several hybrids surpassed both parents, demonstrating transgressive segregation for carotenoids. Correlation analysis revealed significant associations among seed parameters but no significant relationship between seed parameters and pigment content, indicating their independent inheritance. PCA explained 81.88% of total variability, clearly separating seed morphology from pigment traits, while cluster analysis grouped genotypes into five distinct clusters. Also, the study identified superior hybrid progenies combining desirable seed parameters and enhanced carotenoid content, providing valuable genetic resources for guava improvement programs targeting fruit quality and nutritional enrichment.

IHS/T-3/PP-301

Relationship between the biochemical and mineral composition of brinjal with *Leucinodes orbonalis.*

Parul Mehra, M.N. Bhalekar, K.N. Dahatonde and Shubham Singh Patel

Department of Horticulture, PGI, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra
Corresponding author: parulmehra1995@gmail.com

Abstract

The study was carried out to estimate correlation between biochemical and mineral composition of brinjal (*Solanum melongena* L.) with the *Leucinodes orbonalis*. Eight morphologically diverse brinjal genotypes were used for hybridization following half diallel mating design to obtain 28 hybrids. Evaluation of hybrids along with eight parents and two standard hybrid checks i.e. Krishna and Phule Arjun was conducted seasons (*kharif* and summer) and biochemical and minerals were estimated. Ruchira (P_1) showed least shoot borer infestation and P_3 noted least fruit borer infestation. Considering hybrid combinations, P_5 x P_6 (RHRBR-54 x RHRBR-74) recorded least shoot-and fruit-borer infestation. Correlation results indicated that P, Ca, Mg, Fe, phenols and crude fiber exhibited a clear negative significant correlation between with shoot and fruit infestation on number basis in both *kharif* and summer season. Although, N, K, Zn, total sugars, reducing sugars, non-reducing sugars and chlorophyll showed significantly positive correlation with shoot and fruits infestation in *kharif* and summer season. This study gives an idea about the biochemical and minerals which contribute to the resistance of shoot and fruit borer in brinjal which can be considered while developing a hybrid resistant to shoot-and fruit-borer.

IHS/T-3/PP-302

Conventional breeding approaches for improvement of vegetable crops

Niharika Singh, CN. Ram and Ashish Kumar Singh and D.K.Upadhyay

Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh. 224229
Corresponding author: ns644792@gmail.com

Abstract

Exploitation of heterosis through hybrid breeding resulted in significant yield gains and uniformity in tomato, cabbage, cauliflower, brinjal, chilli, and cucurbits. Conventional breeding has also contributed to development of varieties resistant to major diseases and pests, reducing dependence on chemical inputs. Improvement of quality traits such as flavor, texture, processing suitability, and nutritional attributes like vitamins, minerals, and phytonutrients has been achieved through systematic selection. Despite being time-consuming and influenced by environmental factors, conventional breeding remains highly relevant due to its simplicity, cost-effectiveness, and wide acceptability among farmers and consumers. The use of diverse germplasm resources, including landraces and wild relatives, has further strengthened breeding programs in vegetables. Even in the era of molecular breeding and biotechnology, conventional breeding continues to serve as the foundation for vegetable crop improvement, particularly in developing countries, contributing significantly to food and nutritional security and sustainable horticultural production.

IHS/T-3/PP-303

Exploiting genetic heterosis in tomato hybrids to strengthen nutritional security

K.K. Sharma and Pramila

MPUAT, Udaipur, Rajasthan
Corresponding author: krishnasharma73817@gmail.com

Abstract

The experiment was conducted at the Vegetable Research Farm, Dr. Rajendra Prasad Central Agricultural University, Samastipur, during the *rabi* seasons of 2020-21 and 2021-22. Ten genetically diverse tomato lines were crossed with three testers using a line × tester mating design to generate thirty F_1 hybrids. The hybrids, along with their parents and standard checks, were evaluated for yield and quality traits. Heterobeltiosis and standard heterosis were estimated to identify superior and stable hybrid combinations. Analysis of variance revealed significant differences among genotypes for all the characters indicating the presence of substantial genetic variability essential for climate-resilient breeding. Among parental lines, EC 177516, S-12 and Pant T-5 were identified as promising for heterosis exploitation. Among the thirty hybrids, EC 177516 × PKM-1, S-12 × PDT-3-1 and Pant T-5 × Bhilai exhibited superior performance for multiple yield and quality attributes and expressed significant positive heterosis over better parent and standard checks. Such hybrids can contribute to sustainable vegetable production systems and strengthen food and nutritional security.

IHS/T-3/PP-304

Genetic variability on Indian onion genotypes for reproductive traits

Divya Arti and Sabina Islam, Avinash Tomar and Vikrant

Division of Vegetable Science, ICAR-IARI, New Delhi
Corresponding author: divyaarti091993@gmail.com

Abstract

The study assessed genetic variability in reproductive traits among 26 onion (*Allium cepa* L.) varieties including number of umbels per plant, umbel and scape diameter, spathe, filament, style, anther, and stamen lengths, umbel length, and flower size. Mean performance of each trait was estimated to assess the overall expression and comparative performance of genotypes, serving as a baseline for identifying superior varieties. The range in mean values, is an indicator of variability studied genotypes which reflecting substantial diversity in reproductive traits. The number of umbels per plant varied from 9.35 (Sukh Sagar) to 21.80 (CO 5), suggesting marked differences in reproductive potential among genotypes. Umbel length 37.86 mm (CO 6) to 67.55 mm (Bhima Shweta) and umbel diameter 48.42 mm (CO 6) to 85.15 mm (Bhima Shweta) also showed broad ranges, reflecting considerable variation in inflorescence architecture. Similarly, scape length ranged from 47.73 cm (CO 6) to 81.61 cm (L 28), while scape diameter varied from 11.75 mm (CO 6) to 24.98 mm (Hisar-3), highlighting diversity in floral stalk morphology. Significant variability was recorded, with high GCV and PCV values for number of umbels per plant (23.39, 23.47 %), scape diameter (12.79, 12.86 %), and spathe length (18.60,18.94 %), indicating considerable genetic variation. The close correspondence between GCV and PCV values for most traits further suggested that phenotypic expression reliably reflected genetic potential. High heritability estimates (>80%) were observed for number of umbels per plant (99.30%), umbel diameter (98.84%), filament length (98.66%), scape length (98.59%), umbel length (98.39%), scape diameter (97.74%), spathe length (96.46%), style length (95.56%), anther length (88.81%), flower size (87.26%), and stamen length (80.77%). This indicates strong genetic control and effectiveness of selection based on phenotypic performance. Overall, combined evaluation of mean values, PCV, GCV, and heritability emphasizes the significance of reproductive morphological traits for DUS characterization, genetic conservation, and targeted breeding strategies in onion improvement programmes.

IHS/T-3/PP-305

Conventional breeding for crop improvement

Yashmi yadav, Satyaprakash, Shristi Rai, and Akanksha Rai

Department of Fruit Science, Sardar Vallabhbhai Patel University of Agriculture & Technology, Modipuram, Meerut
Corresponding author: yashmi7055@svpuat.edu.in

Abstract

The Conventional breeding and hybrid breeding are both, about making crops better like. The main thing in breeding is to find and pick the types. This is done by looking at how they appear and what genes they have. We also want to know if the good traits we see will always be there no matter where the plants are grown. When we cross plants we can see how well they work together. This tells us a lot about how their genes interact and which ones is most important for the traits we care about. This information helps us choose the parents to make new and better plants. Using these methods together like making hybrids and picking the types really helps us make better plants faster. The identification and selection of genotypes and evaluation of general and specific combining ability are key, to this process. By doing this we can improve breeding. Get better results more quickly which is the main goal of breeding to get superior genotypes. Overall, conventional breeding methods continue to be essential in crop improvement programs, making a substantial contribution to sustainable agriculture and global food security. Their ongoing use and improvement ensure the development of resilient and high performing crop varieties capable of addressing future agricultural challenges.

IHS/T-3/PP-306

Thar Kiran: Anthocyanins rich and high yielding variety of dolichos bean for rainfed semi-arid conditions of Western India

Gangadhara K, L.P.Yadav, V.V. Appa Rao, A.K. Singh, Anil, A.K.Verma and J.Rane

ICAR-Agricultural Technology Application Research Institute, Bengaluru
Corresponding author: gkhort476@gmail.com

Abstract

The experiment was conducted at the Central Horticultural Experiment Station-CHES (ICAR–CIAH), Vejalpur, Panchmahal, Gujarat, during 2018-2025 to evaluate and develop Indian bean varieties through conventional breeding methods for higher yield and quality parameters under rainfed semi-arid conditions. Thar Kiran is a unique variety of dolichos bean developed through pure line selection breeding method at CHES,Vejalpur,Godhra. It is characterized by attractive, shiny purple pods, high yield potential, and rich anthocyanin content. It exhibits vigorous growth with dark green leaves having prominent purple veins. The entire plant shows purple pigmentation in the stem, petiole, flowers, leaf veins, and pods.The plants have a climbing (pole-type) growth habit, attaining a height of 3.5–4.0 m, and therefore require staking or support for higher yield and improved pod quality. The pods are medium-sized, with an average pod length of 10.8 cm, pod girth of 5.33 cm, and pod weight of 8.4 g. Fresh purple pods are harvested between 100 and 110 days after sowing. Under dryland semi-arid conditions, each plant produces approximately 1,100–1,600 pods, yielding an average of 7–9 kg of fresh pods per plant, with a yield potential of 60–63 t ha^{-1}. The variety Thar Kiran possesses high nutritional value, being rich in antioxidants, proteins, vitamins, micronutrients, and minerals. It is rich source of anthocyanins (190 mg/100g), proteins (5.4g/100g) and other antioxidants like total phenols (376.5 mg GAE/100g), flavonoids (42.6 mg cat. equi/100g), total antioxidants (662.5 mg AAE/100g), β-carotene (5.4 mg/100g), vitamin C (89.34mg/100g) and lycopene (1.5mg/100g). The variety Thar Kiran performs well under rainfed semi-arid conditions and has shown resistance to dolichos bean yellow mosaic virus under field conditions. Concerted efforts are required to popularize this anthocyanin-rich and high-yielding variety of dolichos bean for consumption, commercialization, and industrial applications, particularly as a natural colorant, to help meet the nutritional demands of the growing population and contribute to alleviating hunger, malnutrition, and poverty.

IHS/T-3/PP-307

Characterization and evaluation of brinjal (*Solanum melongena* L) hybrids for morphological and yield traits

Neha Kumari, KG Gainiamliu, Jogendra Singh, J.K. Ranjan, B.S. Tomar and A.K. Singh

ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding mail: Jogendra169@gmail.com

Abstract

The experiment was carried out in 27 hybrids using DUS traits in RCBD with 3 replication for 2 years during 2024-2025 in the Vegetable Research Farm, ICAR-IARI, New Delhi. Significant variation was observed among the hybrids for key morphological and yield traits. The plant height varied from 60.23-82.50 cm, fruit yield/ plant varied from 2.25-3.09kg, fruit weight (61-230g) and fruit width (2.81-11.54cm), fruit length (13-27cm), no. of fruits/plant (17.39-57) in hybrids. Among the hybrids evaluated, DBGH-132 showed highest fruit yield (59q/ha) with pear shaped dark purple fruit, followed by DBGH-120 (58q/h) having globular purple fruit. The fruit shape across the evaluated genotypes varied widely and included ellipsoid, club-shaped, globular, ovoid, obovate, cylindrical, and flattened globular forms. Likewise, fruit color exhibited notable diversity, encompassing white, greenish-white, green, light pink, purple with stripes, dark purple, and black depending on the hybrid. The observed phenotypic diversity in these hybrids suggests a broad genetic base, which can be exploited for future breeding programs aimed at developing high-yielding, market-preferred, and stress-resilient brinjal varieties.

IHS/T-3/PP-308

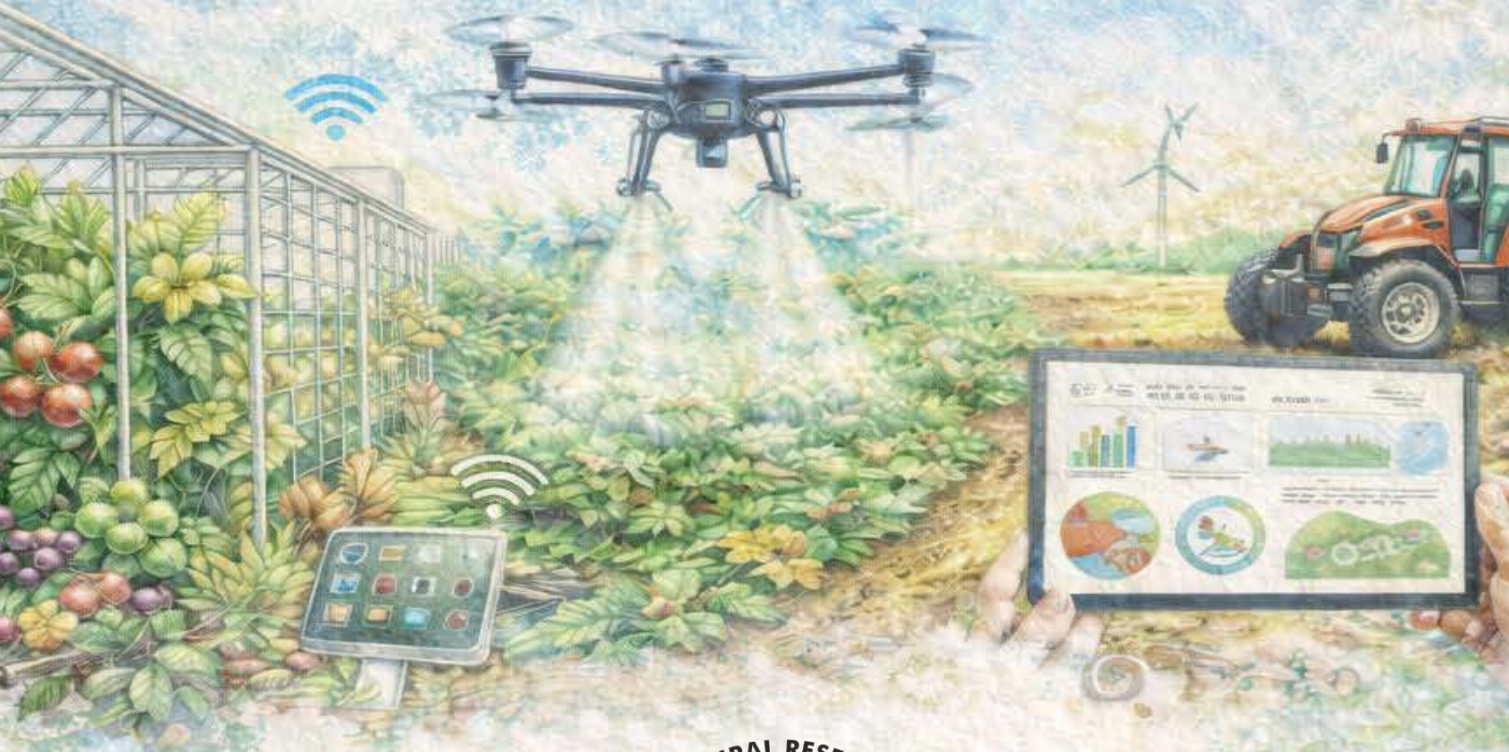
Growth regulation through combining ability and heterosis in gynoecy × monoecy combinations of sponge gourd (*Luffa cylindrica* L.)

Mohinder Kaur Sidhu, Jaswant Prajapati, Harnoor Kaur Dhillon, Shakshi Verma and Navraj Kaur Sarao

Department of Vegetable Science, Punjab Agricultural University, Ludhiana, Punjab
Corresponding author: mksidhu@pau.edu

Abstract

Gynoecy provides an effective biological approach for regulating flowering behaviour and enhancing hybrid breeding efficiency in cucurbitaceous crops. This study evaluated growth regulation, combining ability, heterosis, and molecular validation of gynoecious × monoecious hybrids in sponge gourd (*Luffa cylindrica* L.). Eight gynoecious lines were crossed with three monoecious testers using a Line × Tester design to produce 36 F_1 hybrids, which were assessed under field conditions for growth, flowering, sex expression, and yield traits. Significant genetic variability was observed for all traits, with several hybrids exhibiting substantial heterosis for earliness, fruit number, and yield per vine. Combining ability analysis revealed the predominance of non-additive gene action for most traits, indicated by higher dominance variance and degrees of dominance exceeding unity. Gynoecious lines PGY-108, PGY-123, and PGY-191 showed strong general combining ability, while hybrids such as PGY-191 × PSG-129 and PGY-191 × PSG-223 displayed superior specific combining ability and heterotic performance. Molecular validation using a gynoecy-linked KASP marker confirmed parental identity and hybrid heterozygosity. Overall, gynoecy-based hybridization effectively regulates vegetative vigour, synchronizes flowering, and enhances reproductive efficiency, supporting its use in growth regulation–oriented hybrid breeding of sponge gourd.



SOCIETY FOR HORTICULTURAL RESEARCH AND DEVELOPMENT
SHRD

Theme 4

Recent advances in production technology of indigenous and underutilized horticultural crops

4th Indian Horticulture Summit-Cum-International Conference-2026

Book of abstracts

IHS/T-4/OP-401

Innovation in walnut production: the high-yielding 'suneel s1' dwarf variety for high-density planting and economic resilience

Suneel Singh

Correspondence autor: kishtwargoldwalnut@gmail.com

Abstract

Walnut cultivation in the Himalayan region has traditionally been constrained by long juvenile periods, low productivity, and massive tree size. This paper presents the development and potential of 'Suneel S1', an innovative indigenous walnut variety developed in Kishtwar, Jammu & Kashmir. Unlike traditional varieties that take 10-15 years to fruit and grow over 60 feet tall, 'Suneel S1' is a precocious, semi-dwarf genotype suited for modern orchards. Through the standardization of specialized propagation techniques—specifically improved annular budding and cleft grafting—we achieved a field success rate of over 95%. The 'Suneel S1' variety is characterized by its compact canopy (15–20 feet), which allows for High Density Planting (HDP) and ensures safe manual harvesting. Most significantly, it exhibits a cluster-bearing habit with high productivity, recording yields of 100–150 kg per mature tree, nearly three times that of conventional seedling trees. It initiates fruiting in the first year and reaches commercial bearing age by the third year. The nuts are soft-shelled with excellent market quality. This grassroots innovation not only mitigates risks for farmers but also enhances land-use efficiency and income by drastically reducing the gestation period. The successful dissemination of this variety serves as a scalable model for revitalizing the walnut economy in the North-Western Himalayas.

IHS/T-4/OP-402

Unlocking the physio-biochemical basis of combinational seed dormancy and its management through seed treatments in leafy chenopod (*Chenopodium album*)

Nakul Gupta, M. Linga Swami Sai Reddy, Prashant Kumar Rai, Shivam Kumar Rai, and Rajesh Kumar

ICAR-Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh, India
Correspondence autor: nakulgupta1988@gmail.com

Abstract

The study addresses the issue of seed dormancy by application of different seed treatments and development of germination testing protocol by standardizing the substratum, temperature, photoperiod and duration of test. Among 24 seed dormancy breaking treatments, scarification + heat treatment (70°C for 5 min) and scarification + cold stratification (4°C for 7 days) was most effective in breaking seed dormancy in freshly harvest seed of chenopod (*Chenopodium album* L.) by improving seed germination 6.72-fold and 5.83-fold, respectively over non-treated control. Improved water uptake and hydrolytic enzyme activity (β-amylase and protease activity) in these treatments not only improve germination but also decreased mean germination time and increased speed of germination. Reduced H_2O_2 and malondialdehyde (MDA) content, and enhanced superoxide dismutase (SOD) and peroxidase (POD) activity supported the release of dormancy in treated seed. Further, these treated seeds were used for standardization of seed germination testing protocol. The results indicated that seeds germinated most effectively at alternate temperature (20°↔ 25°C) and light on top of paper (TP). It was determined that the fifth day and the fourteen days were appropriate for the first and final counts, respectively. Dormancy management through scarification supported the presence of physical dormancy, whereas cold and heat treatment supported the presence of physiological dormancy. In conclusion, study claimed the proto-blastic nature and presence of combinational seed dormancy (physical + physiological) in chenopodium.

IHS/T-4/OP-403

Assessment of weed management strategies in onion under different cropping seasons

Sanket J. More, Bhagyashri Kawale, Sagar Wayal and Vijay Mahajan

ICAR-Directorate of Onion and Garlic Research, Pune, Maharashtra
Corresponding author: sanketmore1818@gmail.com

Abstract

A multi-season field experiment was conducted during late *kharif* (2024-25), *rabi* (2024-25), and *kharif* (2025) to evaluate integrated weed management (IWM) strategies for onion using two varieties per season. Nine treatments comprising pre-emergence herbicides (pendimethalin and oxyfluorfen), sequential post-emergence herbicides, and polythene mulching were assessed. The weed-free treatment (T_8) recorded the highest bulb yields during late *kharif* (34.8 and 33.0 t ha^{-1}) and *rabi* (51.5 and 46.7 t ha^{-1}). However, pendimethalin 30% EC @ 1.0 kg a.i. ha^{-1} followed by polythene mulching (T_5) performed statistically on par with T_8 in both seasons, yielding 30.4-31.1 t/ha in late *kharif* and 41.4-50.2 t ha^{-1} in *rabi*. Remarkably, T_5 outperformed all other treatments, including weed-free during kharif 2025, producing 32.1 t ha^{-1} (Bhima Dark Red) and 35.2 t ha^{-1} (Bhima Super). Its consistently superior performance across seasons highlights mulching as a robust, season-independent IWM component. Pendimethalin (pre) followed by propaquizafop + oxyfluorfen (T_1) ranked among the top treatments only during late *kharif* and *rabi*, yielding 29.6-31.1 t ha^{-1} and 39.9-40.3 t ha^{-1}, respectively, and remaining statistically comparable to T_5 and T_8. However, its effectiveness declined in *kharif* 2025, suggesting reduced responsiveness to the prevailing monsoon-season weed spectrum. In contrast, T_3 (pendimethalin PRE followed by clodinafop-propargyl + oxyfluorfen) emerged as the most suitable herbicide-based treatment only during *kharif* 2025, achieving the highest WCE among herbicidal treatments and ranking within the top three yield performers. Weed control efficiency exceeded 85% in T_1 and approached near 100% in T_5 during late *kharif* and *rabi*. During *kharif* 2025, the highest WCE was recorded in T_3. These shifts underscore the strong influence of seasonal weed diversity, dominated by Cyperus rotundus, Amaranthus viridis, Cynodon dactylon, and Euphorbia prostrate, on the performance of post-emergence herbicides. Overall, pendimethalin 30% EC @ 1.0 kg a.i. ha^{-1} followed by polythene mulching (T_5) consistently delivered superior weed suppression and yield stability, establishing it as a reliable and sustainable IWM strategy for onion production across diverse seasons and weed ecologies.

IHS/T-4/OP-404

Assessment of natural farming inputs for yield and quality of pea (*Pisum sativum* L.)

Raj Kumar, N.K. Singh, Amit Kumar, H. C. Joshi and Kamal Kumar Pande

KVK (ICAR-VPKAS)-Bageshwar, Kafligair, Uttarakhand
Corresponding author: rajhortches@gmail.com

Abstract

An on-farm trail (OFT) on Assessment of Natural Farming inputs for yield and quality of pea (*Pisum sativum* L.) was conducted during 2024-25 at KVK (ICAR-VPKAS)- Bageshwar, Uttarakhand at 15 selected framer fields. All the soil samples were collected and analyzed. The level of soil organic carbon (higher), Electric Conductivity (normal) and available macro nutrients (NPK) status medium to high were recorded. This trial comprises four treatments T_1 - chemical input (farmers practices), T_2 - Ghanjeevamrit (1t/ha) + Jeevamrit (10% Spray), T_3- Ghanjeevamrit (1t/ha) + Jeevamrit (10% Spray) + 20% drenching) + Saptdhanyakur (3% spray) + mulching and T_4- Ghanjeevamrit (2 t/ha) + Jeevamrit (10% spray + 20% drenching) + Saptdhanyakur (3% spray) + mulching. All the treatments have significant effect on plant height, number of pods per plant, pod length, number of grains/pods, yield /ha, shelling percent, TSS and economics. The highest cost of cultivation (₹ 79,150.0) was recorded in T_4 followed by T_3 (₹ 78500.0), T_2 (₹ 76570.0) and minimum in T_1 (₹ 72975.0). Maximum plant height (61.19cm), number of pods/plant (21.90), pod length (9.68cm), shelling percent (42.46%) and TSS (16.37°Brix) were recorded in T4 followed by T_3, T_2 and minimum in T_1. Among the treatments evaluated maximum yield (76.85q/ha), net return (₹ 162947.02) and benefit cost ratio (3.06) was recorded in T_4 followed by T_3 (70.30q/ha,

₹ 142973.36 and 2.82), T_2 (65.85q/ha, ₹ 130884.73 and 2.71) and minimum in T_1 (59.50q/ha, ₹ 114465.11 and 2.57), respectively. These findings indicate that natural farming is not only supports competitive pea yields but also promotes long-term soil fertility and ecological sustainability.

IHS/T-4/OP-405

Impact of RDF and NAA on yield and quality attributes of mango (*Mangifera indica* L.) under semi-arid ecosystem of Western India

Raj Kumar, Kanak Lata, Nawal Kishor Singh and, Amit Kumar

Corresponding author: rajhortches@gmail.com

Abstract

An on farm trail was carried out by KVK (ICAR-CIAH), Panchmahal, Godhra Gujarat, during 2019-20 and 2020-21 at five farmer's orchards to find out the Impact of RDF and NAA on yield and quality attributes of mango (*Mengifera indica* L.) cv. Kesar under semi-arid ecosystem of Western India. The four treatment combinations T_1= farmers practices (application of imbalance manure, fertilizers and irrigation), T_2= recommended technology (manure (70 kg) and fertilizers N-1000g, P-750g and K-750 g/plant)+ mulching with grasses /straw (15 kg dry grass / m^2), T_3 = T_2 (RT) +two spray of NAA@ 20 ppm at IIIrd week of March and IVth of April and T4= 75% (RT)+two spray of NAA@200ppm at IIIrd week of March and IVth week of April were followed. Among the four treatments combinations, the maximum plant height 9.68m, stem girth increase (14.20%) and plant spread E-W (11.14%) and N-S (11.16%), yield (52.50 kg/plant and 109.20q./ha.), maximum average fruit weight (224.08g), fruit length (9.32cm), fruit width (6.12cm) and pulp (69.91%) were recorded in T_3. Maximum peel (16.40%) and stone (17.21%) were recorded in T_1. The maximum TSS (16.29°Brix), reducing (5.56 %), non-reducing (10.34 %) and total sugar (15.89%) was recorded when the plant treated with T_3 followed by T_4, T_2 and T_1. The maximum acidity (1.18 %) was recorded in T_1 followed by T_2 (1.09%) and T_4 (0.75 %) and it was minimum in T_3 (0.65%). The maximum cost of cultivation (Rs. 62750) was recorded in T_3 followed by T_4 (Rs. 55800), T_3 (Rs. 55500) and the same was minimum in T_1 (Rs. 46510). The highest gross return (Rs. 273000) and net returns (Rs. 210250) were computed in T_3. The maximum cost benefit ratio (4.43) was computed in T_4 followed by T_3 (4.35), T_2 (4.01) and minimum in T_1 (3.19). The application of T_3 combination was found to be more effective and can be applied to improve the vegetative growth, yield and quality of Kesar mango fruits. However, application of 75% RDF with spray of NAA was also found to be better than bare RDF.

IHS/T-4/OP-406

Effect of plant and environmental variables on growth, production and quality of Nagpur Mandarin (*Citrus reticulata*)

Jitendra Singh, Himanshu Chawla and Dhaneshra Kumari Gurjar

College of Horticulture and Forestry, Jhalawar (AU, Kota)
Corresponding Author Email: jsingh_rau2s@rediffmail.com

Abstract

The effect of plant and environmental variables on production and quality of Nagpur Mandarin (*Citrus reticulata* Blanco) was during 2023-24 and 2024-25. The experiment was carried out in three *tehsils* (Jhalrapatan, Asnawar and Raipur)of the Jhalawar district. In each *tehsil,* four villages scattered in all four directions were included. Purposely, 12 villages, which constituted 12 treatments, falling administratively in Jhalrapatan, Asnawar and Raipur *tehsils* of Jhalawar district were selected. In each village, three orchards of isodiametric mandarin plants having 20 cm diameter were selected. The experiment was laid out in a Randomised Block Design with three replications. Among different treatments, T_4 treatment (Binda orchard) was found significantly superior over other treatments with respect to production and quality of mandarin. The leaf nitrogen level (2.83%), phosphorus level (0.22%) and potassium level (1.60%); and environmental variables such as relative humidity (30 to 88%), maximum temperature (21.06°C to 40.23°C), minimum temperature (9.97°C to 29.74°C), rainfall (maximum 381 mm) and periodicity of rain (maximum 0.84) were observed better which led to better and quality of mandarin.

IHS/T-4/OP-407

Role of heading back in early production of almond nursery plants

O.C Sharma, Sachin Kumar, M.K Verma, Javid Iqbal Mir, Mohammad Ansar, SU Nabi and WH Raja

ICAR-CITH, Rangreth, Srinagar, Jammu and Kashmir, India
Corresponding author: sachin.kumar2@icar.org.in

Abstract

The investigation was conducted to study the effect of heading back after budding at different times on growth of almond nursery plants. The experiment was carried out under nursery conditions to compare heading back during September (after budding) and heading back during February–March. Nine almond varieties, Waris, Makhdoom, IXL, CPS, Merced, Shalimar, Pranyaj, Primorski and Non Pareil, were evaluated. Growth parameters such as plant height (cm), rootstock girth (mm), scion girth (mm) and number of branches were recorded. Results indicated that heading back during September performed better than February–March in all varieties. Under September heading back, maximum plant height was recorded in Makhdoom (207.91 cm), followed by Non Pareil (201.63 cm), whereas minimum plant height was observed in Primorski (165.43 cm). Rootstock girth ranged from 16.41 to 18.92 mm, with Pranyaj recording the highest value (18.92 mm). Maximum scion girth was observed in Non Pareil (16.13 mm). The highest number of branches was recorded in Shalimar (25.25), followed by Non Pareil (23.83). In contrast, heading back during February–March resulted in comparatively lower growth, with plant height ranging from 127.15 to 166.60 cm and reduced girth and branching. The study concludes that heading back during September after budding is most effective for producing early, vigorous and high-quality almond nursery plants and can be recommended for commercial nursery production.

IHS/T-4/OP-408

Cow urine-mediated green synthesis of zinc oxide nanoparticles and their role in enhancing yield and post-harvest shelf-life of guava (*Psidium guajava*)

Shivali Sharma, Gaurav Sharma, Manish Srivastav, Anil Kumar, Ranjit Pal and Ghan Shyam Abrol

Corresponding author: gauravhort@gmail.com

Abstract

The field evaluation was conducted on guava cultivars, L-49 and Lalit, 2023-24 and 2024-25 using a factorial randomized block design. Foliar application of cow urine-mediated ZnO-NPs at flowering and one month after flowering significantly enhanced yield attributes compared to bulk zinc sulphate. The highest fruit set (75.35%), fruit retention (75.83%), yield per tree (9.35 kg), and productivity (15.58 t/ha) were recorded with ZnO-NPs at 200 ppm. The cultivar L-49 treated with 200 ppm ZnO-NPs (V1N5) showed superior performance with reduced fruit drop and maximum yield. Postharvest application of ZnO-NPs markedly improved shelf-life, with 200 ppm maintaining highest marketable fruit retention (40.55%) up to 12 days of storage, compared to 14-15% under conventional ZnSO4. The study demonstrates that rapid cow urine–mediated ZnO nanoparticles, owing to their stable physicochemical properties, offer a sustainable and efficient nanotechnological strategy for enhancing yield and postharvest longevity of guava.

IHS/T-4/OP-409

Effect of foliar-applied potassium sulphate on phenological development and quality attributes of mango cv. Amrapali

Nirmala Singh and B. K. Singh

Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh
Corresponding author: nirmalasingh.hort.2025@bhu.ac.in

Abstract

Mango (*Mangifera indica* L.) is one of the choicest fruit crops of high commercial value in India. However, low productivity, poor fruit quality due to nutrient imbalance and heavy fruit drop remain major constraints, particularly in cv. Amrapali. Potassium plays a vital role in photosynthesis, carbohydrate translocation, fruit retention, and quality improvement in fruits. Keeping this in view, the present study was carried out to investigate the effect of different concentrations of potassium sulphate (0.5%, 1.0%, 1.5%, 2.0%, 2.5%, 3.0% and 3.5%) as foliar spray on flowering, fruit set, yield, and physico-chemical quality attributes of mango cv. Amrapali. The experiment was laid out in randomized block design with three replications. Potassium sulphate solutions were applied to mango as foliar spray at three different stages (before panicle emergence, after fruit set and before harvest) whereas, control trees were sprayed with distilled water. Observations were recorded on panicle emergence, panicle length, number of male and hermaphrodite flowers, fruit set, fruit drop, fruit retention, yield per tree, and quality parameters such as fruit size, weight, firmness, total soluble solids (TSS), acidity, ascorbic acid, and total carotenoids content. Results revealed that among the different treatments, foliar application of 2.5% potassium sulphate significantly influenced flowering behavior as evidenced by early panicle emergence, increased panicle length and high hermaphrodite: male flower ratio. This treatment was effective in reducing fruit drop, enhancing fruit retention thereby increased yield per tree. Potassium sulphate (2.5%) foliar spray also resulted in increased fruit size, fruit weight, TSS, ascorbic acid, carotenoids content, and reduced acidity. The study concludes that foliar application of 2.5% potassium sulphate is an effective nutrient management strategy for improving productivity and fruit quality of mango cv. Amrapali and can be recommended for sustainable mango cultivation under eastern Uttar Pradesh conditions.

IHS/T-4/OP-410

Study of comparative effect of organic and chemical fertilizers on growth and yield parameters of carrot (*Daucus carota*)

Avinash Tomer, Gograj Singh Jat, Vikrant, Bhag Chand Shivran, Divya Arti and Sidharth

CCR (P.G.) College, Muzaffarnagar
Corresponding author: tomeravi115@gmail.com

Abstract

A field experiment was conducted during rabi season of 2022–23 and 2023–24 at Ch. Chhotu Ram (P.G.) College, Muzaffarnagar, C.C.S university Meerut (U.P.), to studied the comparative effect of organic and chemical fertilizers on growth and yield parameters of carrot (*Daucus carota* L.) cv. Nantes. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 12 treatments and 3 replications, including combinations of recommended dose of fertilizers (RDF), farmyard manure (FYM), and vermicompost. Results revealed that the application of 80% RDF + Vermicompost @ 3 t/ha Treatment (T6) significantly outperformed other treatments in terms of plant height, number of leaves, leaf length, fresh plant weight, root length, and yield. T6 recorded the maximum plant height (44.19 cm and 45.64 cm), number of leaves (15.30 and 15.76), root length (20.87 cm and 22.21 cm), and highest yield (146.46 and 150.23 q/ha) in 2022–23 and 2023–24, respectively. The enhanced performance under T6 is attributed to the synergistic effects of chemical and organic nutrient sources, improved nutrient availability, and enhanced soil health and microbial activity. These findings underscore the potential of INM, particularly the combination of reduced chemical inputs with vermicompost, in improving carrot productivity sustainably.

IHS/T-4/OP-411

Effect of foliar application of NAA on fruit yield and quality of dragon fruit under semi-arid climatic conditions

Arathi Balan, Satyam Singh, Nitu Kumari, Neetu Saroj, Ranjit Pal, Alan Evon Singh, Sukanya Misra, Manoj Kundu, and Ghan Shyam Abrol

College of Horticulture & Forestry, Rani Lakshmi Bai Central Agricultural University, Jhansi, Utter Pradesh, India
Corresponding author: ranjit_pal2@yahoo.com

Abstract

The Effect of foliar application of NAA on fruit yield and quality attributes of dragon fruit under semi-arid climatic condition was carried out in Jhansi district of Uttar Pradesh during 2025. The field experiment was carried out on randomized complete block design (RCBD) with four replications and six treatments. The treatments included NAA at 50, 100, 150, 200, 250 ppm concentrations along with a control (water spray). The treatments were applied at 7, and 14 days after fruit set. The NAA application significantly enhanced fruit yield and quality parameters. The foliar application of NAA at 250 ppm was found most superior for increasing flesh firmness, fruit length, fruit weight, fruit yield, and also improved fruit quality parameters. The study concludes that foliar application of NAA at 250 ppm concentrations during the early fruit development stages is very effective to maximize marketable fruit yield and quality in pink flesh dragon fruit under semi-arid climatic condition.

IHS/T-4/OP-412

Standardization of high-frequency micropropagation system for local genotypes of pointed gourd (*Trichosanthes dioica*)

Shyalli Kumari and Udit Kumar

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh
*Corresponding author- udit@rpcau.ac.in, sayali1772019@gmail.com**

Abstract

The investigation was undertaken to develop a high-frequency micropropagation protocol for elite local genotypes of pointed gourd (*Trichosanthes dioica* Roxb.) to ensure rapid, disease-free multiplication and sustainable planting material supply. Sequential in vitro experiments were conducted using nodal segments as explants. Among the sterilization treatments evaluated, Tween-20 + NaClO + ethanol resulted in the highest proportion of contamination-free explants (90.26%). For shoot induction and proliferation, Murashige and Skoog (MS) medium supplemented with 1.0 mg L^{-1} BAP proved optimal, recording maximum shoot induction (89.40%), superior shoot length (9.1 cm), and highest number of shoots per explant (3.2). Efficient *in-vitro* rhizogenesis was achieved on MS medium fortified with 1.0 mg L^{-1} NAA + 1.0 mg L^{-1} IBA, which resulted in early root initiation (7.2 days), maximum root number (8.9), and longest root length (4.4 cm). Significant genotype-dependent responses were observed, with genotype PGS-3 exhibiting superior regenerative potential, particularly under the optimized shoot induction medium. During ex vitro acclimatization, a substrate mixture of cocopeat:vermiculite:perlite (3:1:1) ensured the highest survival (88.10%) and rapid establishment. The standardized protocol offers a robust biotechnological intervention for conservation, rapid multiplication, and climate-resilient production of pointed gourd, supporting sustainable intensification of underutilized horticultural crops.

IHS/T-4/OP-413

Biofortification-based enhancement of strawberry yield and quality using AMF, Selenobacteria and Nano Zinc Oxide

Divya Pandeya, Shipra Singh Parmarb and Jitender Chauhana

Department of Fruit Science, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India
Department of Vegetable Science, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India
Corresponding mail: shipraparmar690@gmail.com

Abstract

The horticultural sector is increasingly focused on adopting innovative and sustainable agronomic practices to enhance crop productivity and improve produce quality. Among emerging strategies, plant biofortification has gained wide acceptance as an effective approach to increase the concentration of essential nutrient elements in plant tissues, thereby addressing micronutrient deficiencies and improving nutritional quality. Selenium (Se) and zinc (Zn) deficiencies are prevalent worldwide, affecting both crop performance and human health. Therefore, developing agronomic interventions that enhance the uptake and accumulation of these micronutrients in horticultural crops is of considerable importance. In this context, the present study was undertaken to evaluate the combined effects of arbuscular mycorrhizal fungi (AMF), selenobacteria, and nano zinc oxide on strawberry fruit yield, yield efficiency, and fruit quality, with special emphasis on selenium and zinc biofortification. The experiment followed a three-factor × three-level design, consisting of two levels of AMF inoculation, three levels of selenobacteria and three concentrations of nano zinc oxide applied as a foliar spray. This integrated approach aimed to assess potential synergistic interactions among beneficial soil microorganisms and nano-nutrient supplementation. The results revealed that the combined application of microbial inoculants and nano zinc oxide significantly improved strawberry growth and yield attributes compared to untreated control plants. Notably, strawberry plants receiving co-rhizoinoculation with AMF and Stenotrophomonas maltophilia, along with foliar application of nano zinc oxide at 100 mg L^{-1}, exhibited the most pronounced improvements. These plants showed substantial increases in cumulative fruit number (182.07 ± 6.25%), fruit yield per plant (374 ± 2.95%), and yield efficiency (244.60%) over the control, indicating a strong synergistic effect of the treatment combination. In addition to yield enhancement, fruit nutritional quality was significantly improved under integrated treatments. The combined application of AMF and Stenotrophomonas maltophilia resulted in marked increases in fruit phosphorus (111.11%) and selenium (30.51%) content compared to the control, demonstrating enhanced nutrient uptake and translocation. These improvements suggest that AMF-mediated root colonization, coupled with selenobacterial activity and nano zinc supplementation, plays a crucial role in improving micronutrient bioavailability and assimilation. Overall, the findings indicate that the combined use of AMF, selenobacteria and nano zinc oxide offers a promising and agronomically sustainable strategy for improving strawberry yield and nutritional quality. This integrated biofortification approach enhances micronutrient uptake efficiency through AMF–bacteria–nanoparticle interactions and holds significant potential for sustainable horticultural production systems.

Poster Presentation

IHS/T-4/PP-401

Effect of growth regulators and apical pinching on growth and yield of okra.

Bhakti Panchal

Krishi Vigyan Kendra, NAU, Surat, Gujarat
Corresponding author: bbpanchal@nau.in

Abstract

The effect of growth regulators and apical pinching on growth, yield and quality of okra was carried out at Krishi Vigyan Kendra, Navsari Agricultural University, Surat (Gujarat) during *Kharif*- 2022 and 2023. Significantly maximum inter-nodal length/plant (6.77 cm), number of branches/plant (4.06), plant height (28.54, 34.78, 50.83, 59.16 and 66.75 cm at 30, 45, 60, 75 and 90 DAS, respectively), leaf area per plant (965.03 cm2), number of nodes per plant (15.04), number of leaves per plant (9.92, 30.23, 33.47, 39.88 and 46.27 at 30, 45, 60, 75 and 90 DAS, respectively), minimum days to first picking (46.48) and maximum days to last picking (96.71) were obtained with spraying of GA3 @ 200 ppm 25 and 45 days after sowing in growth characters. Whereas, days to first flowering and days to 50 % flowering were non-significant. The apical pinching at 50 days after sowing had maximum inter-nodal length per plant (5.56 cm), number of branches per plant (2.99), plant height (26.65, 33.15, 47.33, 54.06 and 61.53 cm at 30, 45, 60, 75 and 90 DAS, respectively), leaf area per plant (909.55 cm2) and number of nodes per plant (14.71) were recorded in growth characters. While, days to first flowering, days to 50 % flowering, number of leaves per plant (0-90 DAS), days to first picking and days to last picking were famed non-significant with all four levels of apical pinchingThus, it can be concluded that application of GA3 @ 200 ppm at 25 and 45 days after sowing resulted in better growth and yield of plants. Among the apical pinching methods, pinching at 50 days after sowing found superior in terms of vegetative growth and yield. Notably, the combination of growth regulator GA3 @ 200 ppm (spraying at 25 and 45 DAS) and apical pinching at 50 days after sowing received better net return.

IHS/T-4/PP-402

Fortified bio vegetables are enable strategy to alleviate malnutrition

Ashok Choudhary, Ranjna Sirohi, Rajesh Choudhary, Yogesh Kumar Sharma and L. N. Bairwa

Sri Karan Narendra Agriculture University, Jobner, Durgapura, Jaipur
Corresponding author: ashokchoudhary116@gmail.com

Abstract

Malnutrition and hunger are serious global issues, particularly in rural areas where access to a balanced food is limited. Through boosting crops with essential nutrients like iron, zinc, and vitamin A through breeding, genetic engineering, or agronomic techniques, fortified bio vegetables provide an affordable and sustainable option. Iron-enriched spinach and vitamin A-rich sweet potatoes, which address nutrient deficiencies and improve health outcomes, especially in resource-poor settings. Governments, non-governmental organisations and agricultural services must work together to promote fortified bio vegetables in order to increase awareness, help farmers, and ensure supply. These crops provide long-term health advantages and environmental sustainability in addition to fighting malnutrition. Overcoming hurdles such as consumer acceptability and distribution barriers is important to their success. Adoption of bio fortified vegetables must be increased if global food security and malnutrition reduction are to be achieved.

IHS/T-4/PP-403

Effect of foliar micronutrient application on growth, yield, quality and economic returns of garlic in Western Rajasthan

Hari Dayal Choudhary and B.R. Choudhary

Agriculture University, Mandor, Jodhpur, Rajasthan
Corresponding author: haridayal.choudhary@gmail.com

Abstract

A field experiment was conducted during *Rabi* seasons (2022-23 and 2023-24) at Dr. B.R. Choudhary Agricultural Research Station, Mandor, Jodhpur (Rajasthan), to assess the effect of foliar application of micronutrients on growth, yield, and economics of garlic (*Allium sativum* L.) cv. 'Yamuna Safed-3'. The experiment was laid out in a Randomized Block Design (RBD) with eight treatments replicated four times, comprising different combinations of $ZnSO_4$, $FeSO_4$ and boron applied 30, 60, and 90 days after planting. The foliar application of micronutrients significantly influenced growth, yield and quality parameters. Among all treatments, combined foliar application of $ZnSO_4$ 0.5% + $FeSO_4$ 0.5% + boron 0.25% recorded maximum plant height (50.97 cm), number of leaves per plant (10.13), neck thickness (10.07 mm), polar diameter (36.68 mm), equatorial diameter (41.75 mm), fresh bulb weight (34.39 g), number of cloves per bulb (23.51) and TSS (39.70 °Brix). The highest bulb yield (57.60 q/ha) and economic returns (gross return ₹4, 65,833/ha, net return ₹3, 84,222/ha, and B:C ratio 5.71) were also obtained under this treatment. The superior performance under combined micronutrient foliar application could be attributed to improve physiological and biochemical processes enhancing photosynthesis, nutrient uptake and assimilate translocation. Thus, it is concluded that foliar application of $ZnSO_4$ 0.5% + $FeSO_4$ 0.5% + Boron 0.25% is most effective for maximizing growth, yield and profitability of garlic under the semi-arid conditions of western Rajasthan.

IHS/T-4/PP-404

Taro: A climate-resilient underutilized tuber with nutritional and economic potential

Manish Kumar Singh, Ajeet Singh, Jayshree Singh, Udham Singh, Bhanu Prakash Singh and S.V. Dwivedi

College of Horticulture, Banda University of Agriculture and Technology, Banda, Uttar Pradesh
Corresponding author: manish961638@gmail.com

Abstract

Taro (*Colocasia esculenta* L. Schott) represents a significant yet underutilized tropical tuber crop with immense potential for addressing global food security and nutritional insecurity. Despite its high adaptability to diverse agro climatic conditions including shaded environments, its remarkable productivity per unit area, taro remains marginalized in modern commercial agriculture. Nutritionally, taro corms are energy-dense, supplying approximately 112 kcal per 100 g. They are predominantly carbohydrate-based (26.5 g). Featuring highly digestible starch due to its minute granule size (14/m), making it ideal for hypoallergenic formulations. The corms provide a substantial amount of dietary fiber (4.1 g) and low protein (1.5 g) and fat (0.2 g). Mineral highlights include an exceptionally high concentration of potassium (up to 591), essential for cardiovascular health. Furthermore, edible leaves offer a significantly enhanced micro-nutrient profile, providing 5.0 g of protein, 52 mg of Vitamin C, and an impressive 4825 IU of Vitamin A (beta-carotene), alongside 107 mg of calcium. Taro exhibits significant therapeutic potential as the presence of bioactive compounds, including mucilage, anthocyanins, and polyphenols, contributes to high antioxidant activity, offering protective benefits against oxidative stress, cancer, and chronic diseases. Its low glycemic index renders it a beneficial carbohydrate source for diabetic management. Beyond subsistence consumption, the crop offers versatile industrial applications, ranging from gluten-free flour and biodegradable plastics to bio-ethanol production. However, presence of anti-nutritional factors like calcium oxalate requires appropriate processing. Taro is a crop that has high economic potential and has as a climate-resilient solution for sustainable food systems.

IHS/T-4/PP-405

Enhancing utilization and commercial potential of Ivy gourd

Soumadeep Putatunda, Nityamanjari Mishra, Ananya Mishra, Disha Baishnabi, Ankita Mohapatra, Natasa Dewan and Pradyumna Tripathy,

College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India
Corresponding author: soumadeep.rs25@ouat.ac.in

Abstract

Ivy gourd [*Coccinia grandis* (L.) Voigt] is an underutilized tropical vegetable with a rich spectrum of bioactive ingredients, including proteins, vitamin C, β-carotene, and phyto-chemicals that have anti- inflammatory, anti-diabetic, and antioxidant properties. Remarkable nutritional, medicinal, and agronomic potential yet remains insufficiently exploited in mainstream food and horticulture systems. This abstract synthesizes current research on its improvement in cultivation practices, genetic resources and adoption constraints to identify practical avenues for enhancing its utilization and commercial values. Agronomic research emphasizes the effectiveness of integrated nutrient management, optimized trellising systems, and the identification of high-yielding genotypes, while underscoring gaps in germplasm improvement and the need for cultivars with favorable traits. Despite these advantages, limited consumer awareness, inadequate standardized cultivation protocols, unavailability of planting material and weak seed supply systems hinder wider adoption. This review proposes targeted research priorities, genetic strategies, and integrated approach interventions to unlock the crop's full potential, positioning ivy gourd as a sustainable, economically viable vegetable capable of contributing to nutritional security and smallholder livelihoods.

IHS/T-4/PP-406

Effect of zinc and humic acid on growth, yield and quality of Broccoli (*Brassica oleracea* Var. *italica plenck*).

Mayank Sharma and Dr. M.K. Poonia

Agriculture University, Jodhpur, Rajasthan
Corresponding author: mayanksharma2979@gmail.com

Abstract

Broccoli (*Brassica oleracea* var. *italica* Plenck) has emerged as an important nutraceutical vegetable due to its rich antioxidant and micronutrient profile. However, its productivity and quality are often constrained under semi-arid conditions, necessitating precision nutrient management strategies. The present investigation was undertaken to evaluate the influence of foliar-applied zinc and humic acid, individually and in combination, on the growth, yield and quality of broccoli. The study demonstrated that zinc nutrition played a pivotal role in enhancing vegetative vigour and head development, while humic acid contributed to improved physiological efficiency and nutrient assimilation. Notably, their combined application produced synergistic effects, resulting in superior biomass accumulation, higher marketable yield and better-quality heads with improved nutritional composition. These findings underline the significance of integrating micronutrients with organic bio-stimulants as a sustainable precision horticultural practice. Such approaches not only optimize crop performance but also contribute to nutritional security and profitability in commercial vegetable production.

IHS/T-4/PP-407

Role of indigenous underutilized horticultural crops in enhancing nutritional security

Mahesh and Lal Chand Sarswat

Agriculture University, Jodhpur Rajasthan
Corresponding author: maheshjat3486@gmail.com

Abstract

In recent years, the concept of food security has gradually expanded towards nutritional security, encouraging greater attention to neglected and underutilized horticultural crops across the globe. India, with its wide range of climatic conditions from tropical to temperate zones, possesses a rich diversity of indigenous underutilized horticultural crops that grow naturally in the wild or are cultivated on a limited scale. These crops are native to specific regions and are generally not produced commercially or traded widely, even though their indigenous value and ethnobotanical significance are well documented. Indigenous underutilized horticultural crops are resilient, require minimal inputs, and are highly nutritious, being rich sources of vitamins, minerals, antioxidants, and bioactive compounds with medicinal properties. However, their cultivation and consumption remain limited due to inadequate awareness among farmers and consumers, scarcity of quality planting material, and insufficient research and adoption of improved production technologies. Hence, increasing awareness about their nutritional and health benefits, promoting their use in traditional medicine, adopting improved agro-techniques, and strengthening extension activities can significantly enhance the production, utilization, and conservation of these valuable crops.

IHS/T-4/PP-408

Effect of spacing and NPK combination on growth and fruit yield of strawberry

Sujeet Singh, Vijay Bahadur and Saket Mishra

Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh
Corresponding author: sujeetsingh6391@gmail.com

Abstract

The effect of different spacing and NPK (nitrogen, phosphorus, potassium) combination on plant growth, fruit yield and fruit quality of Strawberry (*Fragaria ananassa* Duch.) Winter Dawn" was carried out at Department of Horticulture, Prayagraj, Naini Agriculture Institute, Sam Higginbottom Institute of Agriculture, Technology and sciences, Prayagraj during 2023-2024. The treatments consist of varying spacing combined with various NPK concentrations. Result showed that the treatment T8(25×45cm+125:160:110NPKkg/ha) was determined to have the finest growth features, including petiole length (12.04 cm), plant spread (32.55 cm), plant height (14.91 cm), and number of leaves (16.33). The fruit quality and yield, T5 (25 x 30 cm + 100 x 120 g NPK kg/ha) was found to be the best. These factors include the number of flowers per plant (12.13), the number of days it took for a fruit bud to develop (60.87 days), the number of fruits per plant (9.53), weight of the fruit (32.81 g), fruit yield per hectare (189.85 kg/ha).

IHS/T-4/PP-409

Effect of NPK, sulphur, zinc and boron in onion (*Allium cepa*)

Himanshu Yadav

Visva Bharati University, Shantiniketan, West Bengal
Corresponding author: himanshusonu2014@gmail.com

Abstract

A field experiment was conducted to study the effect of NPK, sulphur, zinc and boron on onion at Horticulture farm, Sriniketan, during *rabi* season of 2022-2023. The experiment was laid out in factorial randomized block design consisting of two factors with three replications. Factor A consists of three levels of different NPK sources and sulphur [F1: NPK @ 125:100:100 (through 10-26-26 & urea), F2: NPK @ 125:100:100 (through 10-26-26 and urea) & sulphur @ 40 kg/ha, F3: NPK @ 125:100:100 (through Urea, SSP and MOP)]; whereas Factor B consists of four levels of zinc and boron alone or in combination [M0: No ZnSO4 and No boron, M1: ZnSO4 @ 10 Kg/ha (Basal dose), M2: boron @ 2g/Litre (20% solution through foliar application), M3: ZnSO4 + boron]. It was observed that the use of different nutrients sole or in combinations showed positive response towards growth, yield and quality of onion. The application of Urea, 10-26 26, zinc (T_2) resulted maximum plant height and (T_9) Urea, SSP, MOP resulted maximum number of leaves. The combined application of urea, 10-26-26, sulphur, zinc and boron (T_8) resulted maximum neck diameter (9.99 mm), polar diameter (58.70 mm), equatorial diameter (49.7 mm), bulb weight (46.1 gm) and yield (230.3 q/ha) whereas, application of urea+10-26 26+sulphur (T_5), Urea+10:26:26+boron (T_3) and urea+10-26-26+sulphur+boron (T_7) have a good response towards the quality of onion. So, the combined application of nutrients such as Urea and 10-26-26 (NPK @ 125-100-100 kg/ha), Sulphur (40 kg/ha), Zinc Sulphate (10 kg/ha as basal application) and Boron (@ 2g/litre as foliar application) can be suggested to farmers of Red and Laterite Zone of West Bengal for onion cultivation during *rabi* season.

IHS/T-4/PP-410

Optimizing moisture and fertilizer levels for seed production and cost-effectiveness

Lalita Bochalya, R.K Narolia, M. R Choudhary and O. P. Garhwal,

Corresponding author: lalitabochal89@gamil.com

Abstract

The investigation was carried out during the *rabi* season of 2023–24 at the Horticulture Farm, S.K.N. College of Agriculture, Jobner, Rajasthan, to optimize moisture and fertilizer levels for seed production and assess the cost-effectiveness in spinach beet (*Beta vulgaris* var. *bengalensis*). The experiment was laid out in a factorial randomized block design comprising two irrigation schedules (IW/CPE ratios of 0.75 and 1.0) and five fertilizer treatments, which included different combinations of inorganic fertilizers, farmyard manure (FYM) and vermicompost (VC), both with and without *Trichoderma* enrichment. The variety 'All Green' was used. The irrigation at 1.0 IW/CPE significantly enhanced seed quality parameters such as germination percentage, field emergence, seed vigour index and nutrient content. The application of 75% recommended dose of nitrogen (RDN) through inorganic fertilizers combined with *Trichoderma*-enriched vermicompost at 8 t/ha (O_4) recorded the highest values for germination, field emergence, seed vigour index and nutrient uptake (nitrogen, phosphorus and potassium), which were statistically at par with the treatment receiving 100% RDN along with vermicompost at 8 t/ha (O_2). Economic analysis revealed the highest net returns and benefit: cost ratio under the treatment combinations I_1O_4 and I_1O_2, respectively. The study concludes that the integration of irrigation at 1.0 IW/CPE with either O_4 or O_2 is most effective for enhancing seed yield, quality and economic returns in spinach beet under semi-arid conditions.

IHS/T-4/PP-411

Potential of underutilized vegetable crops in Indian Agriculture

Banti Bairwa

Agriculture University, Jodhpur, Rajasthan
Corresponding author: buntybairwa042020@gmail.com

Abstract

Vegetable crops which are neither grown commercially on a large scale nor traded widely may be termed underutilized vegetable crops. The possible reasons for the low utilization of underutilized vegetables, in spite of their recognized importance, are lack of availability of planting material, lack of awareness of nutritional and medicinal importance and lack of information on production techniques of these crops. In this context, there is an urgent need to take up programmes on genetic resources exploration, management, utilization and improvement of underutilized vegetable crops to ensure food and nutritional security for the future. The climate and soil of India are favourable for the production of different underutilized vegetables. Thus, the Government of India has been taking some steps towards highlighting underutilized vegetables. Finally, it can be concluded that underutilized vegetable production will meet the shortage of per capita consumption availability, thereby solving nutritional problems and at the same time generating employment, increasing the income of rural people and contributing to the national economy.

IHS/T-4/PP-412

Effect of gibberellic acid and micronutrient on garden pea growth, yield, and quality

Rahul Kumar Bochalya, K.K. Meena, Om Prakash, Lalita Bochalya, Rahul Mahala, Saroj Choudhary

Agricultural Research Institute, Durgapura (SKNAU), Jaipur Rajasthan
Corresponding author: bochalyarahulkumar82@gmail.com

Abstract

A field experiment was conducted during November-March 2024-25, at Department of Horticulture, Rajasthan Agricultural Research institute Durgapura, Jaipur to study the effect of foliar application of gibberellic acid and micro nutrients on growth, yield and quality attributes of garden pea (*Pisum sativum* var. hortens L.). With sixteen treatments and three replications. The results revealed that all treatments exhibited significant variation for most of the parameters across different treatment combinations. The interaction effect between gibberellic acid and micro nutrients was also found to be significant for most traits. Among the treatments, the combination of G3M2 (gibberellic acid 125 ppm and $ZnSO_4$ at 0.5%) showed the best performance with 50% flowering (45.00), pod length (10.81 cm), number of pods/plant (12), number of pickings (5.00), yield (126.60 q/ha), shelling percentage (53.87%) and in TSS (16.84°Brix) G3M2 (Gibberellic acid 125 ppm and borex 0.2%). Thus, it is concluded at G3M2 (gibberellic acid 125 ppm and $ZnSO_4$ at 0.5%) turns out to be the optimum treatment, improving the growth, yield and quality.

IHS/T-4/PP-413

Response of potato to nitrogen doses in relation to growth, yield, and tuber quality under South-Eastern Rajasthan

B. L. Nagar, D.L.Yadav, Sanjay Rawal, Jagdev Sharma and M.C, Jain

AICRP on Potato, Agricultural Research Station, Directorate of Research, Agriculture University, Kota
Corresponding author: banwarilalnagar510@gmail.com

Abstract

A field experiment was conducted at the Agricultural Research Station, Ummedganj, Kota during 2022–23, 2023–24, and 2024–25 to assess the influence of nitrogen levels on the growth and yield of potato variety Kufri Ganga. The highest tuber yield (34.88 t/ha) was recorded under the NPK dose of 300:125:125 kg/ha, which was statistically at par with NPK doses of 350:125:125 kg/ha and 250:125:125 kg/ha, yielding 34.17 and 33.80 t/ha, respectively. The maximum benefit: cost ratio (3.11) was recorded with the NPK dose of 300:125:125 kg/ha, followed by 350:125:125 kg/ha and 200:125:125 kg/ha (3.02 and 2.94, respectively). The recommended NPK dosage of 187.5:125:125 kg/ha is suitable.

IHS/T-4/PP-414

Enhancing yield and quality attributes of Strawberry

Anshita salaria and Nav prem singh

Corresponding author: anshita-2497009@pau.edu

Abstract

Integration of morden practices with protected cultivation has proven effective for maintaining the favourable microclimatic conditions and extending the fruiting season in strawberry. Based on sensory qualities, 'Camarosa', 'Sans Andreas' and 'Nabila' cultivars performed better under subtropical conditions; wherein, fruits harvested during February and March were superior in sensory qualities attributes and nutrients content. Efficient post-harvest management including rapid cooling at 5-6°C, 90–95% RH and modified atmosphere packaging (MAP) reduces respiration, PLW, fruit spoilage and enhances fruit shelf-life.

IHS/T-4/PP-415

Rapid *in-vitro* regeneration and mass multiplication of long-day garlic

Rajni Kumari

Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan
Corresponding author: rajnikarn2@gmail.com

Abstract

The study was undertaken to develop highly efficient, robust and commercially feasible protocols for micropropagation of garlic (*Allium sativum* L.) cultivar Mukteshwar Local. The sterilized garlic cloves were soaked in distilled water or various concentrations of GA3 for different time periods and then inoculated on MS basal medium containing 3% sucrose, supplemented with or without different concentrations of GA3, for *in-vitro* sprouting of cloves. The sprouted cloves were inoculated in MS medium supplemented with different concentrations of BAP and NAA. The sprouting percentage was higher (85.00%) on MS medium containing 2 mg L^{-1} GA3 when cloves were soaked in 100 mg L^{-1} GA3 solution for 24 hr. Maximum number of shoot buds (7.0) was recorded in treatment containing MS + 4.0 ppm BAP + 1.0 ppm NAA. Among different treatments for shoot multiplication, MS+5.0 ppm BAP+ 1.0 ppm KIN + 0.5 ppm GA3 was the best. The number of shoots also varied with the level of sucrose, light intensity, and light-dark cycle during shoot multiplication. The shoot multiplied best in 30 g L^{-1} sucrose, 5000 lux light intensity, and a 16:8 h of light-dark cycle. The protocol may be used for the mass multiplication of garlic cultivars as well as for the regeneration of genetically transformed cells or tissue.

IHS/T-4/PP-416

Enhancing productivity of old mango orchards through centre opening canopy and nutrients management in tarai region of Uttar Pradesh

Saurabh Tomar, Avinash Tomar

S.V.P. University of Agriculture and Technology Meerut, Uttar Pradesh
Corresponding author: saurabhtomar@svpuat.edu.in

Abstract

An on farm trial was conducted during 2024-25 at Krishi Vigyan Kendra, Pilibhit, Uttar Pradesh, to evaluate the impact of centre opening based canopy management on yield and economics of mid-age mango orchards (>25 years) with five farmers covering twenty-five mango trees of Dashehari and Langra varieties under tarai conditions. Two different treatments farmers' practice (T_1), involving no pruning with application of DAP @ 2 kg/tree, and improved practice (T_2), comprising centre opening pruning along with recommended doses of FYM, N, P, K and micronutrients (boron, zinc and copper sulphate) and plant-protection measures were evaluated. The results revealed that centre opening significantly improved orchard performance. The improved practice recorded a higher fruit yield of 65.2 q/ha compared to 51.5 q/ha under farmers' practice, registering a yield increase of 21.01 per cent. Fruit pulp percentage (37.5%) remained unchanged under both treatments, indicating no adverse effect on fruit quality. The improved practice generated a higher gross return (₹2,60,800/ha) compared to farmers' practice (₹2,06,000/ha). The study concludes that centre opening based canopy management is a viable and profitable technology for rejuvenation of old mango orchards.

IHS/T-4/PP-417

Yield and quality attributes of rejuvenated guava (*Psidium guajava*) cv. Bhavnagar Red

J. S. Parasana, D. K. Varu and Shivani Patel

College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat
Corresponding author: jsparasana@jau.in

Abstract

A field experiment was conducted to determine the different combinations of integrated nutrient management on growth, yield and quality in rejuvenated guava (*Psidium guajava*) cv. Bhavnagar Red at Fruit Research Station, Madhadi Baug, JAU, Junagadh, Gujarat, during 2020-21 and 2021-22. The results revealed that treatments exerted significant effects results. The treatment T_4 showed a significant effect on fruit characters like fruit weight (155.22 and 158.11 g), length (8.03 and 8.15 cm), girth (7.78 and 7.86 cm), number of fruits per tree (513 and 523.67), yield (79.72 and 82.88 kg/plant as well as 22.08 and 22.96 t/ha) respectively. At the same time, quality parameters were also affected significantly. The maximum non-reducing sugar (4.75 and 4.79 %) was observed in fruits of treatment T_8. However, minimum acidity (0.48 and 0.74 %) was reported in treatment T_4 and T_8 fruits. Total sugar (7.13 and 7.18 %), reducing sugar (2.39 and 2.44 %) and TSS (11.23 and 11.74 °B) were significantly affected by treatment T_4. Ascorbic acid (234.34 and 238.23) was found maximum in the fruits of treatment T_4 for 2020-21 and in T_3 for 2021-22, respectively. Farmers of South Saurashtra Agro climatic Zone growing guava are recommended to apply 187.5 g of each N : P2O5 : K2O/plant along with FYM 5 kg/plant + Vermicompost 2.5 kg/pl. + Azospirillum 125 ml/pl. + PSB 15 g/pl. as basal dose during Kharif season and remaining 187.50 g N/pl. as a split after completion of Kharif season for getting higher yield and net return.

IHS/T-4/PP-418

Effect of transplanting dates and micronutrients on growth and yield of different tomato cultivars

Sidharth, Avinash Tomar

Division of Vegetable Science
ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding author: sidharthgrak786@gmail.com

Abstract

The experiment entitled "Effect of transplanting dates and micronutrients on growth and yield of different tomato cultivars" was conducted at Vegetable Research Farm of the Department of Vegetable Science, CCS Haryana Agricultural University, Hisar, during the Rabi season 2021-22. Field experiment comprising of three dates of transplanting (30th November, 30th December, 30th January), two cultivars i.e. Hisar Arun and Pb Ratta and four micronutrients (Boron @ 0.5 %, Zinc @ 0.5 %, Mixture of Boric acid @ 2.5 g/litre + Zinc sulphate @ 2.5 g/litre each and Control (water spray) were laid out in split plot design with three replications thus making a total of twenty four treatment combinations. The results of the study indicated that the plant height was recorded significantly higher when cultivar Pb Ratta was transplanted on 30th December under application of mixture of Boric acid @ 2.5 g/litre + Zinc sulphate @ 2.5 g/litre each and the maximum number of branches (8.90) was recorded on 30th November of transplanting in cultivar Hisar Arun with application of mixture of Boric acid @ 2.5 g/litre + Zinc sulphate @ 2.5 g/litre each. Whereas, the fruit yield per plant (2.08 kg) and total marketable fruit yield (318.07 q/ha) was recorded maximum on 30th December transplanting date in cultivar Hisar Arun with application of Mixture of Boric acid @ 2.5 g/litre + Zinc sulphate. Based on the study it was found that tomato cultivar Hisar Arun transplanted on 30th December supplied with three foliar applications of micronutrients (Boric acid @ 2.5 g/litre + Zinc sulphate @ 2.5 g/litre each) at 35, 50 and 65 days after transplanting produced maximum fruit yield.

IHS/T-4/PP-419

Influence of KNO3 and GA3 on vegetative growth of dragon fruit [*Hylocereus costaricensis* (Web.) Britton and Rose]

Tendul chouhan, Sutanu Maji, Himanshu Chawla and Dhaneshra Kumari Gurjar

Department of Horticulture, School of Agriculture Science and Technology, Babasaheb Bhimrao Ambedkar University, Lucknow
Corresponding author: tendulchouhan@gmail.com

Abstract

Dragon fruit has become a promising high-value crop in India but has not so much awareness about its production technology. The investigation was planned to evaluate the effect of some chemical and growth regulator applications on the growth of dragon fruit. The investigation had 9 treatments (T1 control, T2 - KNO3 @ 3 %, T3 - KNO3 @ 4 %, T4 - GA3 @ 50 ppm, T5 -GA3 @ 100 ppm, T6 - KNO3 @ 3% + GA3 @ 50 ppm, T7 - KNO3 @ 3 % + GA3 @ 100 ppm, T8 - KNO3 @ 4 % + GA3 @ 50 ppm, T9 - KNO3 @ 4 % + GA3 @ 100 ppm) with three replications laid out in Randomized Block Design. Different concentrations of GA3 and KNO3 were found to have a significant impact on the vegetative growth variables of dragon fruit plants. As a result, the investigation found that combining the effect of GA3 and KNO3 in the form of treatment T7, i.e. KNO3 @ 3 % + GA3 @ 100 ppm would be most effective for better vegetative growth such as average increase plant height (10.33cm), distance between areoles (0.21), the arch height (0.6 mm), increased number of spines per areole (6.0) and growth of newly emerged shoots (26.6) of dragon fruit plant in Northern India climatic conditions. Hence, the application of KNO3 @ 3% + GA3 @ 100 ppm could be used for better plant growth and development of the dragon fruit.

IHS/T-4/PP-420

Effect of various inorganic and organic sources on the ultimate analysis of Water chestnut

Sarjesh Kumar Meena, Deepa H. Dwivedi, Surendra R. Patil, Kaustubh Y. Deshmukh

Corresponding author: sarjeshmeena5757@gmail.com

Abstract

The present investigation was carried out to evaluate the effect of different organic and inorganic fertilizers on the ultimate composition of water chestnut (Trapa natans var. bispinosa Roxb.) with respect to kernels, fruit peel and whole plants. The ultimate analysis included the determination of nitrogen, carbon, hydrogen, sulfur, protein content and the ratios of carbon–hydrogen and carbon–nitrogen. Among the treatments, Nano-Urea @ 4.0% recorded the highest values of nitrogen (1.99%), carbon (41.95%), hydrogen (6.767%), sulfur (0.244%), carbon–hydrogen ratio (6.20) and protein (12.44%) in kernels, whereas the maximum carbon–nitrogen ratio (23.26) was observed under 50% RDF Nutrient + DAP . In fruit peel, Jivamrut @ 10% resulted in the highest nitrogen (2.51%), sulfur (0.342%), and protein (15.69%). ½ RDF (Urea + DAP) produced the highest hydrogen (5.53%) and RDF showed the maximum carbon content (39.33%). In the whole plant, RDF recorded the highest carbon (36.75%), hydrogen (5.29%) and carbon–hydrogen ratio (19.02) whereas, Jivamrut was superior in nitrogen (2.68%), sulfur (0.588%), carbon–hydrogen ratio (6.93) and protein (16.75%). Overall, Nano-Urea improved kernel quality, Jivamrut increased peel and plant protein enrichment and RDF contributed to higher carbon accumulation.

IHS/T-4/PP-421

Role of biostimulant in enhancing yield and physico-chemical attributes of garlic (*Allium sativum*)

Saroj Choudhary, Ashok Choudhary, Krishna Jat, Vinod Prajapat and Rahul Kumar Bochalya

Rajasthan Agricultural Research Institute, Durgapura
Corresponding author: sarojchoudhary051999@gmail.com

Abstract

The field experiment was conducted during the Rabi season of 2024–25 at the Vegetable Research Farm, Rajasthan Agricultural Research Institute, Durgapura, Jaipur, to investigate Role of Biostimulant in Enhancing Yield and Physico-Chemical Attributes of Garlic (*Allium sativum* L.). Ten treatment combinations consisting of the recommended dose of fertilizers (RDF) and biostimulant with three replications. Among all treatments, T_6 (75% RDF + 30 kg ha^{-1} seaweed extract granules + 0.3% foliar spray at 45 DAP) consistently demonstrated superior performance in enhancing the yield and physico-chemical attributes of garlic bulbs. Treatment T_6 resulted in a significant increase in yield traits which produced the highest clove weight (2.65 g), neck thickness (0.92 cm), and the highest number of cloves per bulb (24.52) and highest yield 199.83q ha-1. And with respect to physico-chemical parameters, T_6 recorded a desirable reduction in bulb moisture content (60.73%), which is conducive to improved storage quality and reduced post-harvest losses. Correspondingly, the dry matter content increased to 39.27%, indicating enhanced bulb density and greater suitability for processing. In addition, sulphur content was highest under T_6 (1.35%), reflecting improved flavour intensity, pungency and nutritional quality, thereby contributing to superior market acceptability and consumer preference. Overall, the results clearly demonstrate that the integrated application of 75% RDF along with 30 kg ha^{-1} seaweed extract granules and a 0.3% foliar spray significantly enhances the yield and physico-chemical characteristics of garlic. This nutrient management strategy emerges as a promising and efficient approach for producing high-quality garlic bulbs under open-field conditions.

IHS/T-4/PP-422

Effect of position and portion of canopy on yield, quality and other attributes on jamun

Dhaneshra Kumari Gurjar, Jitendra Singh, Himanshu Chawla and Tendul Chouhan

Department of Fruit Science, College of Horticulture and Forestry, Jhalawar, Agriculture University, Kota
Corresponding author: dhansugurjar99@gmail.com

Abstract

The effect of canopy position (lower, middle, upper) and canopy portion (inner, outer) on physical fruit quality of *Syzygium cuminii* Skeels cv. Goma Priyanka was studied. The tree canopy was divided into vertical tiers and horizontal portions to evaluate variations in fruit parameters such as fruit length, fruit weight, seed length, seed weight, pulp weight and shelf life of fruit. Results showed significant differences based on canopy micro-environment. Fruits from the middle outer canopy exhibited superior physical traits, including maximum fruit length, fruit weight, seed length, seed weight, pulp weight and shelf life of fruit. These advantages are attributed to better light penetration, air circulation and photosynthetic efficiency in that zone. Conversely, fruits from inner portions especially in the lower and upper tiers showed inferior quality due to reduced light and poor ventilation.

IHS/T-4/PP-423

Suitability of Kalmegh cultivation under organic conditions

Vinod Kumar, Amey Kale, Umesh Pankaj and Susheel Singh

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India
Corresponding author: dilman.vinod@gmail.com

Abstract

A field experiment was conducted at Rani Lakshmi Bai Central Agricultural University (RLBCAU), Jhansi, to evaluate the suitability of Kalmegh cultivation under organic nutrient management. The study was carried out for two consecutive years to assess the influence of different organic nutrient sources on growth, biological yield, and andrographolide content. Among treatments, T_6 (50% Recommended Dose of Fertilizer + 50% vermicompost) recorded superior performance in terms of growth attributes, herbage yield, and maximum andrographolide content. Treatment T_7 (100% vermicompost) was found statistically at par with T_6, indicating that Kalmegh can be successfully cultivated under fully organic conditions without compromising yield or quality. The results clearly demonstrate that vermicompost is the most suitable organic nitrogen source for *Andrographis paniculata*, enhancing both productivity and bioactive compound accumulation while maintaining soil health. This technology offers a sustainable and eco-friendly approach for large-scale organic cultivation of Kalmegh in Bundelkhand region. Further validation under farmers' field conditions and agroforestry systems is proposed to establish its wider applicability and adoptability.

IHS/T-4/PP-424

Synergistic influence of gibberellic acid and potassium on seed yield and quality of red radish

Ganesh Ram, B. R. Choudhary, I. S. Naruka and Naresh Kumar

Department of Horticulture, COA, Gwalior, RVSKVV, Gwalior, M.P.
Corresponding author: grchoudhary9116@gmail.com

Abstract

The experiment was conducted at Division of Vegetable Science, SKUAST,Jammu during rabi season of 2022–2023 to study the effect of potassium and gibberellic acid (GA_3) on seed yield and quality. The experiment was laid out in a factorial Randomized Block Design (FRBD) with three replications, comprising sixteen treatment combinations. The treatments consisted of four levels of potassium (40, 50, 60 and 70 kg K_2O ha^{-1}) and four concentrations of GA_3 (0, 100, 200 and 300 ppm). The results revealed that application of GA_3 at 200 ppm significantly improved seed yield and quality parameters, recording minimum days to seed harvest (111.79 days), higher number of seeds per siliqua (6.25), siliqua length (5.90 cm), 1000-seed weight (9.55 g), seed yield per plant (18.09 g), seed yield per hectare (2.19 q), germination percentage (93.13%) and seed vigour index (249.06). Among potassium levels, application of 50 kg K_2O ha^{-1} resulted in superior performance with minimum days to seed harvest (118.66 days), higher seeds per siliqua (5.55), siliqua length (5.13 cm), 1000- seed weight (9.12 g), seed yield per plant (15.16 g), seed yield per hectare (1.88 q), germination percentage (86%) and seed vigour index (200.12). The interaction effect showed that the combined application of 200 ppm GA_3 with 50 kg K_2O ha^{-1} proved to be the most effective treatment, recording the minimum days to seed harvest (109.35 days), maximum number of seeds per siliqua (6.33), siliqua length (6.03 cm), 1000-seed weight (9.80 g), seed yield per plant (18.50 g), seed yield per hectare (2.26 q), germination percentage (95%) and highest seed vigour index (255.33). Thus, combined application of GA_3 and potassium was found to be beneficial for enhancing seed yield and quality.

IHS/T-4/PP-425

The effect of foliar application of zinc and boron on yield and physico-chemical attributes of guava (*Psidium guajava* L.) cv. Lalit and Shweta under Bundelkhand region of U.P.

Puneet Thakur, Arun Kumar Shukla, Sunil Kumar, Manoj Kundu, Avijit Ghosh, Ghan Shayam Abrol

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India
Corresponding mail: thakurpuneet18@gmail.com

Abstract

Guava (*Psidium guajava* L.) extensively cultivated in tropical and subtropical regions, belonging to the most important fruit crop having high nutritive value. Uttar Pradesh is the largest producing state in India. For optimum production and productivity of guava, the soil of semi-arid region of Bundelkhand is deficient in micronutrient like zinc and boron. A field experiment was conducted in central research farm IGFRI Jhansi (U.P.), having an objective of foliar-applied zinc and boron combinations on physico-chemical and yield related attributes of guava cv. Lalit (V1) and Shweta (V2) using a factorial randomized block design. Different foliar spray treatments of zinc and boron in combination having five different micronutrient levels; Borax 0.25% + ZnSO4 0.5% (T1), Borax 0.25% + ZnSO4 0.75% (T2), Borax 0.5% + ZnSO4 0.5% (T3), Borax 0.5% + ZnSO4 0.75% (T4) and Water spray (T5) was applied on mature guava trees (15 years). Significant differences were observed among treatments for all measured attributes for factor A and factor B. The maximum fruit set (62.8%), Fruit Retention (63.4 %), Fruit Yield (59 Kg/tree) was observed in V1T4 i.e. cultivar 'Lalit' receiving foliar application of Borax 0.5% + ZnSO4 0.75%. The fruit physico-chemical attributes such as Fruit Weight (259.2 g), Fruit Length (9.2cm), TSS (13.8 oBrix), Total Sugar (9.8%), Ascorbic acid (247.1 mg/100g) was observed maximum in V2T4 i.e. cultivar 'Shweta' receiving foliar application of Borax 0.5% + ZnSO4 0.75% while the fruit width (9.2 cm) was observed maximum in V2T3 i.e. cultivar 'Shweta' receiving foliar application of Borax 0.5% + ZnSO4 0.5%. These results indicated that foliar applications of zinc and boron altered the yield related attributes and physico-chemical composition of guava fruits under Bundelkhand conditions of U.P.



Theme

5

Post-harvest management, processing, value addition, and Agri-export zones for indigenous and underutilized horticultural crops

IHS/T-5/OP-501

Prospects and potential of fruit processing in Bundelkhand region of India

Anup Kumar Bhattacharjee

Horticultural Science Division
ICAR Headquaters, Krishi Anusandhan Bhawan – II, New Delhi
Corresponding author: dadabhatu@gmail.com

Abstract

The Bundelkhand region, spanning Uttar Pradesh and Madhya Pradesh, has historically been known for its drought-prone landscape and socio-economic challenges. However, it also possesses a significant yet underutilized agro climatic potential for fruit cultivation, a mix of traditional fruit crops (mango, guava, aonla, ber, pomegranate, citrus in pockets) and many underutilized indigenous fruits (karonda, bael, custard-apple, jamun, tamarind). With over 30,000 hectares under fruit cultivation, the region can be transformed into a vibrant hub for fruit processing and agro-industrial development. Mango, guava, aonla, ber and local fruits occupy significant pockets and can provide enough raw material for village-level and cluster processing units, while indigenous fruits are especially promising for niche products like functional foods, nutraceutical extracts, etc. Value-added product opportunities from fruits are plenty like powders, candies, RTS (ready-to-serve) drinks, candy/juices, extracts for nutraceuticals juice from aonla; jelly, jams, pulps, purees, RTS beverages, aseptic pulp for processors from guava; mango pulp and slices for export/domestic packaged industry; pickles, squashes, dehydrated chips/powders, and pectin/extracts from ber, jamun, bael, karonda; cold-pressed oils, marmalade, juice concentrates from citrus fruits; and dehydrated powders from fruits that are seasonal or low volume. Investment in mini-processing units, engagement with Farmer Producer Organizations (FPOs), and support for women-led Self Help Groups (SHGs) can unlock employment and income in rural communities while reducing post-harvest losses by 25–30%. Despite this potential, the sector faces critical bottlenecks including inadequate processing infrastructure, cold storage shortages, poor logistics, and limited access to finance and training. Government initiatives such as the PMFME Scheme, MIDH, and the Bundelkhand Special Package are stepping in to address these issues by supporting micro-enterprises, promoting horticultural clusters, and developing supply chain infrastructure. A cluster-based processing hubs development approach, complemented by skill development, micro-irrigation and water harvesting at orchard level, e-commerce linkages, and financial facilitation, is essential to realize Bundelkhand's fruit processing potential. With the right investments and policy support, Bundelkhand can achieve sustainable economic growth and become a key player in India's agro-processing sector.

Oral Presentation

IHS/T-5/OP-502

Mango peel and kernel utilization to prepare "*Nankhatai*".

Dev Raj, Tanveer Ahmad and A. K. Pandey

ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat
Corresponding author: drdpandir@yahoo.co.in

Abstract

The present investigation was undertaken to utilize mango peel and kernel for preparation of "Nankhatai". India is the largest producer of mango in world with the share of 45.1 per cent. Beside this, India is also largest processor of mangoes with the share of 20 per cent. Processing of mango generated approximately 40-45 per cent of waste. Mango peel and kernel possessing very good nutritive value especially in term of dietary fibre can be utilized for preparation of the mango peel and kernel based biscuits. Biscuits are one of the most popular bakery product in the world used as snack food due to its ready to eat nature, affordable cost and availability in different taste. Mango peel and kernel based biscuits were prepared with different combination of mango peel powder 0%, 5%, 10% and 15% and mango kernel powder 0%, 5%, 7.5% & 10% along with other ingredients. Prepared biscuits were examine on sensory basis and results revealed that mango peel and kernel based biscuit 'Nankhatai" prepared by using 5% mango peel powder, 7.5% mango kernel powder and *maida* 87.5% (treatment T_7) and 5% mango peel powder, 10% mango kernel powder and *maida* 85% along with other ingredient (treatment T_8) possess higher sensory score on 9 point Hedonic scale as compare to other treatment combinations.

IHS/T-5/OP-503

Mutagenesis riven morpho-physiological responses to drought in fennel

Arvind K. Verma, R.S. Meena, Sharda Choudhary and C.B. Harisha

ICAR- National Research Centre on Seed Spices, Ajmer, Rajasthan
Corresponding author: arvindiari@gmail.com

Abstract

Gamma-ray irradiation at 150–250 Gy was used to induce genetic variability in fennel. The treated seeds were used to raise M_1 generation, and in M_2 generation, plants showing dwarf stature, early maturity, and multiple branching were identified as putative mutants. These selected lines were evaluated across M_3 to M_7 generations to confirm the stability of dwarf and early-maturing traits and to assess improvements in yield and quality. After the mutant lines exhibited consistent performance, they were screened for tolerance to moisture-deficit conditions. Controlled stress was imposed by shielding the crop from rainfall using rain shelters, regulating irrigation based on the ETo method, and applying water-deficit treatments from flowering to seed-setting stages. Photosynthetic efficiency was examined using photosystem II analysis, infrared thermal imaging, and canopy temperature depression to identify drought-tolerant genotypes. Under moisture stress, the highest seed yield was recorded in line M-1 (24.5 q/ha), followed by M-25 (23.3 q/ha) and M-14 (22.3 q/ha). Yield reductions ranged from 21.5% in M-35 and M-26 to 23.4% in M-11. Overall, these results demonstrate that the selected genotypes possess strong adaptive potential and are well suited for cultivation in arid and semi-arid regions facing unpredictable climate patterns and limited water availability.

IHS/T-5/OP-504

Pretreating Avocado Seeds for cocoa powder replacement in chocolate preparation

Fathima Shibu, P. Preethi, S.V.R. Reddy, G. Karunakaran, H. Chandrakala and C. Sameela

ICAR-Indian Institute of Horticultural Research, Hessarghata, Bengaluru
Corresponding author: pppreethifruits@gmail.com

Abstract

The escalating price of cocoa globally has encouraged the search for economical alternatives in chocolate-based product development. Avocado seeds, often discarded despite being rich in phenol, protein, fat and bioactive compounds, offer promising potential as a substitute for coco bean. This study investigated the use of avocado seed powder as a replacement for cocoa powder in chocolate preparation. To improve its functional and sensory qualities, the seeds were pretreated through drying, roasting and fermentation using acetic acid and yeast. The resulting powders were assessed for physicochemical, biochemical, and functional attributes. Fermentation produced the most favorable improvements in color, aroma, and flavor, making the powder more similar to cocoa. When incorporated for chocolate preparation, fermented seed powder enhanced texture, taste, and overall acceptability. Sensory analysis showed greater consumer preference for chocolates made with fermented powder compared to other treatments. Overall, the study demonstrates that fermented avocado seed powder is a sustainable, economical cocoa alternative that adds value to avocado processing as well as confectioneries for development of affordable chocolate-based products.

IHS/T-5/OP-505

Standardization of pre-storage treatments for extended marketability and quality of rose apple (*Syzygium jambos*) fruits

Thippeswamy B., Vijay Rakesh Reddy S, Preethi, P., Sudhakar Rao, D.V., Anuradha Sane and Shamina Azeez

ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka
Corresponding author: drrakesh.reddyiihr@gmail.com

Abstract

Rose apple (*S. jambos* L.) fruits known for their crisp texture and subtle sweet flavor, are in good market demand for fresh table consumption. However, these fruits are highly perishable due to their thin peel and soft flesh, rendering them highly susceptible to bruising. All these factors cause the rose apple fruits to deteriorate quickly within 24 hours of harvest, posing significant challenges for long-distance transportation and maintaining their freshness and marketable appeal. As a result, the growers are forced to market them immediately after harvest. To address these major issues, the current work was carried out to standardize the pre storage treatments with non-ventilated punnet boxes for effective handling and long-term storage of these perishable commodities. Four different pre-storage treatments 1-MCP (500 ppb), Chitosan (1 %), Salicylic acid (200 ppm) and Melatonin (500 µM) were evaluated along with a control for storage at the recommended low temperature of. 5±1°C. At this optimum low temperature (5±1°C), fruits treated with salicylic acid (200 ppm) packed in non-ventilated punnet boxes were found to retain freshness, marketable appearance, and reduced spoilage for 24 days efficiently, compared to a storage life of 5 days for control fruits stored at the same temperature. Flavour profiling of the stored fruits indicated that, the salicylic acid treated fruits retained the major volatiles responsible for the typical rose apple flavour to a greater extent.

IHS/T-5/OP-506

Flash vacuum expansion for extraction of betalains from beetroot and its stabilization through co-pigmentation

Brijesh Kumar Yadav, Alka Joshi, Shruti Sethi, and B.S Tomar

Division of Food Science and Postharvest Technology, ICAR-IARI, New Delhi, India
Corresponding author: alka.foodtech@gmail.com

Abstract

A novel technique 'vacuum flash evaporation' has been standardized to intensify the pigment yield without any thermal abuse from beetroot (*Beta vulgaris* L.). It is a hypobaric process, consisting of instantaneous vaporization of water under vacuum from a superheated steamed tissue sample. The sudden drop in pressure causes cell disruption and enhanced diffusion which facilitates the migration of betalains into the extraction medium. The technique was optimized using a 3-factor, 3-level Box–Behnken design. A 3-minute superheated steam treatment followed by a 3-minute vacuum exposure at 250 mm Hg was found to be the most effective, yielding maximum betalains (825.26 mg/kg) and antioxidant recovery, along with minimal colour change (ΔE = 6.28). Betalain yield was enhanced by 60%, with minimal colour change, thermal damage, and solvent residue. However, like other biopigments, extracted native pigment was found to be both photo- and thermosensitive. To enhance pigment stability, native betalains were copigmented with acylated anthocyanins extracted from black carrot. The improved stability of the copigmented betalains was confirmed by a higher rate constant (k) and longer half-life (min), which was further validated by better color retention in thermally processed products such as microwaved, baked, and extruded foods.

IHS/T-5/OP-507

Edible flowers

P. Pranuthi, T. Suseela, A.V. D Doorajee Rao3 and Ch.Sai Ratna Sharvani

Dr YSRHU-COH, V.R.Gudem, Andhra Pradesh
Corresponding author: pasupuletipranuthi94@gmail.com

Abstract

Edible flowers have emerged as a significant component of contemporary culinary tradition and functional food research, offering a unique combination of sensory appeal, nutritional value and bioactive potential. Traditionally incorporated into culinary practices across diverse cultures, edible flowers such as Rosa, Tagetes, Chrysanthemum, Hibiscus and Clitoria ternatea are now gaining renewed scientific attention due to their rich phytochemical profiles. These blooms contain abundant antioxidants, phenolic compounds, flavonoids and essential micronutrients that contribute to their potential health-promoting properties, including anti-inflammatory, antimicrobial and anti-aging effects. Despite their growing popularity, the systematic study of edible flowers remains limited by factors such as seasonal variability, post-harvest deterioration and insufficient standardization of safety and quality parameters. This abstract highlights recent advances in the characterization, preservation and application of edible flowers in both culinary and nutraceutical domains. It also emphasizes the need for interdisciplinary approaches combining horticulture, food science, and biotechnology to ensure sustainable cultivation, enhanced shelf life and improved consumer safety. As global interest in natural, plant-based ingredients continues to rise, edible flowers represent a promising frontier for innovation in functional foods, offering opportunities to integrate aesthetic, nutritional and therapeutic benefits into modern diets.

IHS/T-5/OP-508

Nutritional value and nutraceutical properties of mushrooms

Diwakar Bahukhandi, Deeba Kamil and Vipin Verma

Division of Plant Pathology, ICAR-IARI, Pusa, New Delhi
Corresponding author: diwakar14jan@gmail.com

Abstract

Mushrooms generally contain high moisture levels (80–90%) and serve as excellent sources of high-quality proteins, dietary fiber, essential vitamins and minerals. They are particularly rich in B-complex vitamins such as thiamine, riboflavin, niacin and folic acid, along with vitamin C. Minerals including potassium, phosphorus, magnesium, zinc and copper occur in appreciable amounts, while iron and calcium are present in lower concentrations. Mushrooms are characterized by low lipid content, negligible cholesterol and a predominance of polyunsaturated fatty acids, contributing to their low caloric value. Notably, the presence of ergosterol, a precursor of vitamin D, makes mushrooms one of the few non-animal dietary sources of this vitamin. On a dry weight basis, mushrooms contain substantial proportions of carbohydrates (50–65%) and proteins (19–35%), with minimal lipids (2–6%). The carbohydrate fraction is dominated by biologically active polysaccharides such as β-glucans and chitin, which enhance dietary fiber content and support gut health. In addition, mushrooms are rich in bioactive compounds, including polysaccharides, triterpenoids, lectins, antioxidants and glycoproteins, exhibiting immunomodulatory, antioxidant, anticancer, hypoglycemic, hypocholesterolemic, anti-inflammatory and antimicrobial activities.

IHS/T-5/OP-509

Effect of brining concentration and packaging material on the shelf life and quality of minimally processed tender Jackfruit slices (*Artocarpus heterophyllus* L.).

A V S Hyndavi, D V Swami and P Ashok

Dr Y.S.R. Horticultural University, Venkataramannagudem, Andhra Pradesh
Corresponding author: hyndavi05@gmail.com

Abstract

An experiment was conducted at Post Harvest Technology Research Station, Dr. Y.S.R. Horticultural University, Venkataramannagudem, Andhra Pradesh, to determine the optimal combination of brining concentration and packaging material for extending the shelf-life of minimally processed fresh-cut tender jackfruit slices. The study employed a Completely Randomized Factorial Design with three replications, investigating two factors: Brine Solution concentration (B1: 5%, B2: 8%, B3: 10%) and Packaging Material (P1: LDPE, P2: HDPE, P3: Glass jar, P4: PET bottle). Significant degradative changes occurred during storage across all treatments. Key physico-chemical parameters decreased: moisture (87.87% to 82.27%), water activity (aw: 0.68 to 0.55), protein (4.30% to 2.58%), and ascorbic acid (13.52 to 9.00 mg/100g). Concurrently, microbial spoilage increased substantially (1.98×104 CFU/g to 5.12×104 CFU/g). The investigation revealed that the treatment combination of 10% brine solution (B3) packed in a Glass jar (P3) was superior. This specific treatment recorded the best performance in terms of maximizing the retention of physico-chemical quality parameters, thereby offering the longest practical shelf life for minimally processed tender jackfruit slices.

IHS/T-5/OP-510

Optimizing phenolic extraction from potato peel using ultrasound-assisted technique: a response surface and genetic algorithm approach

Raghavendra H.R., Shruti Sethi, Arpan Bhowmik, Eldho Varghese and Alka Joshi

ICAR-Indian Agricultural Research Institute, Assam
Corresponding author: raghuhorti53@gmail.com

Abstract

Potato peels, often considered a waste product during potato processing, are rich in phytochemicals, particularly phenolics. These compounds, known for their antioxidant and antimicrobial properties, offer valuable potential for the food industry. In this study, phenolics were extracted from potato peel using ultrasound-assisted extraction, where key variables such as sonication time (5-25 min), ethanol concentration (0-100%), and extraction temperature (25-65°C) were optimized using a central composite design (CCD). The extraction process was fine-tuned with response surface methodology (RSM) followed by a genetic algorithm (GA) approach to maximize total phenol content (TPC). The optimized conditions for the highest recovery of phenols (621.27 mg/100g dry weight) involved 22.032 minutes of sonication, 61.818°C temperature, and 99.99% ethanol concentration. Ultrasound-assisted extraction proved to be significantly more efficient than conventional solvent extraction, yielding 2.84 times more phenolic compounds. The optimized extraction conditions, along with the predictive model, open up promising opportunities for the food industry, providing products with notable health benefits.

IHS/T-5/OP-511

Optimization of functional drink from dragon fruit peel using BBD RSM

Ghan Shyam Abrol, Azaj Ansari, Ravindra Tiwari, Alan Evon Singh, Ranjit Pal and Gaurav Sharma

College of Horticulture and Forestry, RLBCAU, Jhansi, Uttar Pradesh
Corresponding author: ghanshyamabrol@gmail.com

Abstract

The study was focused to valorise of dragon fruit (*Hylocereus* spp.) peel for the development of a bioactive functional drink. The study employed Box–Behnken Design (BBD) under Response Surface Methodology (RSM) to optimize formulation parameters using dragon fruit peel pulp (10–15 g), herbal extract (2–5 mL; tulsi, giloy and ajwain) and spice extract (2–5 mL; cardamom, cumin, black pepper, and ginger). Fifteen experimental combinations were evaluated for sensory attributes including taste, aroma, flavour, appearance and overall acceptability (OAA). Statistical analysis revealed that dragon fruit peel and spice extract significantly influenced all sensory responses, with the optimized formulation (15 g peel, 2 mL herbal extract, 3.5 mL spice extract) attaining highest OAA score (8.00). The optimized beverage exhibited a high antioxidant activity (75.24% DPPH radical scavenging), along with substantial phenolic (86.23 mg GAE/100 g), anthocyanin (22.32 mg/100 g) and ascorbic acid (23.65 mg/100 g) contents. GC–MS analysis identified key bioactive and volatile compounds such as furfural, β-pinene, alloaromadendrene, globulol and linoleic acid ethyl ester, which contribute to both sensory and functional properties. In-vitro anti-inflammatory evaluation demonstrated a concentration-dependent inhibition of protein denaturation, with an IC_{50} value of 1309 µg/mL, indicating moderate anti-inflammatory potential compared to Diclofenac Sodium (IC_{50} = 1043 µg/mL).Thus, the study substantiates dragon fruit peel as a sustainable and valuable resource for formulation of antioxidant- and bioactive-rich functional beverages.

IHS/T-5/OP-512

Comparative evaluation of drying techniques on bioactive compounds, nutritional quality, and anti-nutrients of Kachnar (*Bauhinia variegata*) flowers

Shubham Samkaria, Sonia Sharma, Payal Chauhan and Poonam Kumari,

Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, Uttar Pradesh, India
Corresponding author: poonam.kumari@csir.res.in

Abstract

This study evaluated nutritional, phytochemical composition and anti-nutritional factors of kachnar (*Bauhinia variegata* L.) flowers collected from two locations (Mandi and Palampur) and dried using three different methods, viz. dehumidifier drying, oven drying and shade drying. The nutritional analysis revealed that there was a non-significant effect of drying method on ash content ranging from 6.02 % to 6.47 %. The flowers from location Mandi recorded slightly higher fat and protein concentration than the Palampur samples. Shade drying treatment was most effective in preservation of phytochemicals irrespective of the location. The shade-dried flowers from Mandi had the highest carotenoid content (202.15 mg/100 g), while the oven-dried flowers from Palampur had lowest (140.68 mg/100 g). Similar trend was observed for total phenolics and flavonoid content. α-amylase inhibition was also highest for shade dried samples from Mandi (36.34 %). Anti-nutritional factors like alkaloids, saponins, phytates and tannins were also analysed in the study with oven dried samples showing comparatively lower concentrations. Shade dried and dehumidifier dried samples also exhibited good antimicrobial activity against some common pathogenic bacteria. The results highlight the potential of kachnar flowers as a source of biocative compounds and their potential application in functional foods and value added products.

IHS/T-5/OP-513

Development of a cost-effective package formula for enhancing vase-life of cut roses

Ganesh B Kadam, Md Basit Raza, Tarak Nath Saha, Prabha K, Shivakumar KV and KV Prasad

ICAR-Directorate of Floricultural Research, Pune, Maharashtra
Corresponding author: ganeshiari@gmail.com

Abstract

The study was carried out to develop a low-cost package formula for extending the vase life of cut roses. Different preservative solutions were tested and compared with a widely used commercial imported solution and a control (tap water). Among the treatments, the best performing formula was later standardized and packaged as DFR-Phool Shakti. Results showed that DFR-Phool Shakti extended the vase life of cut roses to 5.89 days, which was significantly higher than the control (4.78 days) and comparable to the commercial solution (6.78 days). The cumulative flower bud opening under DFR-Phool Shakti treatment was also greater and closely matched the commercial solution. In addition, microbial growth in water treated with our packaged formula was comparable to that treated with commercial solution, while both being significantly lower than control (tap water). Although the commercial treatment gave the slightly better vase life, its cost was five times higher than DFR-Phool Shakti. Thus, DFR-Phool Shakti represents a cost-effective and efficient alternative for rose growers and exporters, offering extended vase life and improved flower quality at a fraction of the cost. The product is currently under the process of commercialization for wider use.

IHS/T-5/OP-514

Valorization of jamun seed waste: influence of drying methods on nutraceutical quality

Akansha Upadhyay, Akath Singh, Anshuman Singh, Sahil and Kiran

Division of Postharvest Management, ICAR-Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh
Corresponding author: akanshaupa2018@gmail.com

Abstract

The study evaluated the effect of post-harvest drying methods on the retention of phytochemicals and minerals in jamun seed powder from four cultivars—J- 37, J-42, J-15, and Konkan Bahadoli .Seeds were subjected to cabinet drying (60 °C), infrared drying (60 °C), and freeze drying (−40 °C) and analyzed for total phenolics, flavonoids, ascorbic acid, antioxidant activity, and mineral content (phosphorus, potassium, sodium, zinc, and iron) immediately after processing and after three months of storage. Freeze drying resulted in superior retention of total phenolics, flavonoids, ascorbic acid, and antioxidant activity compared to infrared and cabinet drying. Among the cultivars, J-15 exhibited the highest flavonoid and ascorbic acid content, while Konkan Bahadoli retained maximum total phenolics. Mineral analysis showed that freeze-drying best-preserved phosphorus (98.74 mg/100 g) and potassium (925.13 mg/100 g), whereas infrared drying resulted in higher zinc (0.90 mg/100 g) and iron (4.60 mg/100 g) retention. Konkan Bahadoli consistently recorded the highest mineral content across most parameters. Storage significantly reduced nutritional quality, with declines of 36% in flavonoids, 16.6% in antioxidant activity, 72.3% in zinc, and 74.4% in iron after three months, underscoring the need for improved storage strategies. Overall, jamun seeds were nutritionally superior to pulp powder, demonstrating strong potential as high-value nutraceutical ingredients and supporting circular economy approaches in fruit processing.

IHS/T-5/OP-515

Broccoli leaf waste: an innovative approach for carotenoid extraction via green solvent and advanced mechanical technique

Rajan Mahendra, Neelam Upadhyay, Susheel Kumar Sarkar, Pranita Jaiswal, Bhoopal Singh Tomar

ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding author: neelamftiari@gmail.com

Abstract

The study was aimed to develop and demonstrate extraction of natural colourants from broccoli leaf waste (BLW) utilizing flaxseed oil as green solvent. BLW was treated with enzymes followed by extraction of carotenoids using flaxseed oil employing high shear dispersion technique. The variables for extraction included concentration of enzyme, solid-solvent ratio along with time and speed of treatment. The selection of treatment was done for based on physico-chemical parameters. The total carotenoid content, total chlorophyll content, DPPH, FRAP, CUPRAC and total flavonoid content of carotenoid rich extract from broccoli leaf wastes were 86.32 ± 0.70 (µg/g), 315 ± 0.01 (µg/g) ,82.96 ± 0.50 (% inhibition), 254.76 ± 13.46 (*µ*mol TE/ml), 334.83 ± 14.29 (*µ*mol TE/ml), 24.12 ± 0.21 (mg. QE/g) respectively were found significantly ($p<0.05$) higher the green solvent employed for extraction of carotenoids from broccoli waste. Unsaponifiable matter showed significant enhancement in the optimized carotenoid-rich flaxseed oil (CREO), with higher recovery (4.66%) than control (2.66%), attributed to improved cellular disintegration and co-extraction of carotenoids and other non-glyceridic compounds. Whereas, fatty acid profiling revealed no significant changes in major fatty acids between control and CREO, indicating that carotenoid enrichment improved oxidative protection without altering the intrinsic fatty acid composition of flaxseed oil. The results were confirmed through FTIR wherein the carotenoids extracted in flaxseed oil showed higher absorption as compared to the control. Thermogravimetric analysis also shows that carotenoid-enriched flaxseed oil (CREO) exhibited markedly enhanced thermal stability with a delayed degradation onset (402°C) compared to control oil (299°C), attributed to the antioxidant action of carotenoids that protect polyunsaturated fatty acids during thermal stress. Therefore, results demonstrated successful extraction of carotenoids using flaxseed oil as green solvent. The extract could be used as a natural colourant for a wide range of food products included sauces, dips, etc.

IHS/T-5/OP-516

Genotypic determinants of fruit quality and phytochemical diversity in rose hips

Saraswati, Namita, M K Singh, Sapna Panwar, Shalini Gaur Rudra Harikrishna and Aditi Kundu

Division of Floriculture and Landscaping,
ICAR-Indian Agricultural Research Institute, New Delhi, India
Corresponding author: namita.icar@gmail.com

Abstract

The present investigation was conducted at ICAR–Indian Agricultural Research Institute (IARI), New Delhi for two years (2024 and 2025) to explore the nutraceutical potential of rosehips (Rosa spp.) in functional food development. Thirty genotypes were evaluated for biochemical and pomological traits to identify elite candidates for breeding, nutritional enhancement, and horticultural valorization. Antioxidant activities (FRAP, DPPH, CUPRAC), polyphenols, flavonoids, carotenoids, titratable acidity, ascorbic acid, and total sugars were quantified in pulp and seed fractions under both fresh and dried states. Dry pulp consistently exhibited superior biochemical richness. Among genotypes, dry seeds of var. Pusa Mahak recorded the highest polyphenol content (1926 mg GAE/100 g), while dry pulp of R. chinensis (FLS-RC-1) showed maximum flavonoids (12,616 mg QE/100 g) and ascorbic acid (806.9 mg/100 g). Var. Pusa Mahak also led in carotenoids (4202 mg/100 g). Peak antioxidant activities were observed in the dry pulp of Rose Sherbet (FRAP: 35.8 µmol TE/g; CUPRAC: 48.1 µmol TE/g) and Var. Pusa Glory (DPPH: 33.2 µmol TE/g). Pomological assessment revealed wide variability in fruit size, pulp-to-seed ratio, and dry matter content. Nutritional yield per fruit was highest in Var. Pusa Mahak (4049.84

mg), followed by Var. Pusa Aradhana, TMMT, R. chinensis (FLS-RC-1), and Var. Summer Time. Overall, seeds were richer in total phenolics, whereas pulp fractions contained higher carotenoids, flavonoids, and ascorbic acid. These findings establish a robust framework for trait-based selection in rose improvement programs and highlight the nutritional promise of Rosa genotypes as functional food and nutraceutical candidates.

IHS/T-5/OP-517

Deep learning–driven dragon fruit maturity grading using a smartphone-based system

Tanuj Misra, Ranjit Pal, Chanchal Rajpoot, Sukanya Misra, Manoj Kundu, and Ghan Shyam Abrol

Rani Lakshmi Bai Central Agricultural University, Jhansi, Utter Pradesh, India
Corresponding author: tanujmisra102@gmail.com

Abstract

Fruit maturity assessment is critical for optimizing harvest timing, postharvest handling, and market quality in high-value non-climacteric horticultural crops such as dragon fruit (*Hylocereus* spp.). We have developed a deep learning based smartphone system for automated dragon fruit maturity grading using image analysis. A lightweight convolutional neural network (CNN) architecture was designed using multiple convolution and max-pooling blocks followed by fully connected layers, comprising approximately 0.14 million trainable parameters, making it suitable for deployment on resource-constrained mobile devices. The model was trained to classify dragon fruit images into five distinct maturity stages: green, pre-colour breaking, post-colour breaking, harvesting stage, and over-ripening stages. The proposed model achieved excellent learning convergence, with a training loss of 0.0092 and training accuracy of 100%, indicating effective feature extraction and class separability. On the independent test dataset, the system attained a test accuracy of 99.61% with a low test loss of 0.0269, demonstrating strong generalization capability. The confusion matrix analysis revealed near-perfect classification across all maturity stages, with negligible misclassification observed only between closely related ripening stages. These results confirm the robustness and reliability of the proposed approach. The developed CNN model was integrated into a smartphone-based framework, enabling real-time, non-destructive, and user-friendly maturity grading under field conditions. The proposed system offers a practical decision-support tool for farmers, traders, and supply chain stakeholders, contributing to improved harvest management, reduced postharvest losses, and enhanced market value of dragon fruit. This study highlights the potential of mobile deep learning solutions for precision horticulture and smart agri-food systems.

IHS/T-5/OP-518

Optimization of process parameters for the extraction of pigments for herbal gulal preparation

Priyanka Sharma, Gaurav Sharma, Ghanshyam Abrol and Neeraj Negi

Corresponding author: priyankafls@gmail.com

Abstract

This experiment was conducted in the year 2024-25 in laboratory of Department of Floriculture and Landscaping, Rani Lakshmi Bai Central Agricultural University, Jhansi. For the extraction of pigments flowers, leaves, seeds and underground storage organs of different plant species were utilized. Flowers of different species that were utilized are Marigold (*Tagetes erecta*), Bougainvillea sp., Larkspur (*Consolida ajacis*), Petunia x hybrida, Gaillardia pulchella, Butea monosperma, Annual Chrysanthemum (*Glebionis coronaria*), leaves of marigold, rhizomes of turmeric, roots of beetroot and black carrot, and seeds of Sinduri (*Bixa orellana*). The base used was corn starch for making these gulals from flowers and other plant part pigments. Two extraction methods were used viz. cold extraction and hot extraction. For the pigment extraction 13 type of raw material was used viz. T1 (Beetroot), T2 (Turmeric), T3 (Marigold), T4 (Bixa orellana), T5 (Butea monosperma) T6 {Gaillardia (yellow) flowers}, T7 (Bougainvillea flowers), T8 (Annual chrysanthemum flowers), T9 (Black Carrot), T10 (Larkspur),

T11 (Petunia), T12 (Marigold leaves) and T13 {Gaillardia (red) flowers}. Among all pigments used for the making making gulal, as regards colour preference, the acceptability was maximum for herbal gulal prepared from Black Carrot irrespective of extraction method, followed by turmeric, gaillardia (red), bougainvillea, Bixa orellana and petunia. Among different methods of extraction, pertaining to texture of herbal gulal the texture was found better in cold extraction method. For the pigment extraction, it was observed that optimum species for extraction of pigment for herbal gulal preparation are Black Carrot, Turmeric, Gaillardia (red), Bougainvillea, Bixa orellana and Petunia.

IHS/T-5/OP-519

Essential oil–mediated biochemical defense mechanisms governing storage pest resistance in coriander seeds

Sanjay Kumar, Vasundhara Sharma, K P Tripathi, M K Mahatma, Krishna Kant and Y K Sharma

ICAR- National Research Centre on Seed Spices, Ajmer,
Corresponding author: sanjaykumar10187@gmail.com

Abstract

This study evaluated the seed longevity, insect susceptibility, biochemical changes occurred in three coriander varieties (ACr-1, ACr-2, and AgCR-1) due to different packaging materials (cloth, jute, HDPE, plastic, and aluminum foil) and storage conditions (ambient, 4°C, and -20°C) over two years. It was revealed that under ambient conditions, ACr-1 showed a rapid decline in germination from 88% to 0% across all packaging types, while storage at 4°C and −20°C maintained viability between 42–80%. ACr-2 exhibited a similar pattern, with germination dropping to 4–64% under ambient storage, whereas low-temperature conditions preserved 26–80% viability. In AgCR-1, complete germination loss occurred in aluminum foil under ambient conditions, while other packaging materials retained 30–70% viability; controlled temperatures stabilized germination at 60–70%. Insect infestation was highest in seeds stored at room temperature in cloth, jute, and HDPE bags, but significantly reduced in plastic and aluminum foil under cold storage. Among varieties, ACr-1 was most susceptible to insect damage (27–86%), followed by ACr-2 (12–65%) and AgCR-1 (6.2–32%). The observed varietal resistance appeared to be governed by differences in biochemical composition, particularly essential oil content and seed phenolics. Overall, the findings demonstrate that both storage temperature and packaging material strongly influence seed viability and pest resistance. Controlled environments and moisture-resistant packaging are essential for maintaining the storability and quality of coriander seeds.

IHS/T-5/OP-520

Influence of blending and storage on physico-chemical and sensory quality of ber-based squash

Naresh Kumar, B R Choudhary, Ganesh Ram and Susheel Kumar

ICAR- Central Institute for Arid Horticulture, Bikaner
Corresponding author: nareshrasaniya1996@gmail.com

Abstract

Ber (*Ziziphus mauritiana* Lamk.) is an underutilized tropical fruit with high nutritional value but limited commercial exploitation. This study aimed to develop and evaluate ber-based blended squash by combining ber pulp with lime juice, sweet orange juice, and ginger pulp in varying proportions, with juice and total soluble solids standardized at 25% and 45°B, respectively. Nine formulations were assessed for physicochemical properties, sensory attributes, and overall acceptability over 90 days of ambient storage. The formulation containing 75% ber pulp, 15% lime juice, and 10% ginger pulp consistently exhibited the highest organoleptic score (7.91) and overall acceptability (7.84). Over the storage period, these values declined minimally by 13.37% and 16.24%, respectively, indicating superior sensory stability relative to other treatments. The incorporation of lime and ginger enhanced flavour balance, improved consumer acceptability, and contributed to overall storage stability.

These results demonstrate that the optimized ber-lime-ginger squash is a highly acceptable, shelf-stable, value-added product with strong potential for commercialization as a functional beverage, offering a practical approach to the utilization of underexploited tropical fruits.

IHS/T-5/OP-521

Comparative evaluation of drying techniques on bioactive compounds, nutritional quality and anti-nutrients of Kachnar (*Bauhinia variegata* L.) flowers

Shubham Samkaria, Payal Chauhan, Sonia Sharmaa, and Poonam Kumaria,

Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, Uttar Pradesh, India
Corresponding author: poonam.kumari@csir.res.in

Abstract

Edible flowers, with their nutritional, phytochemical, and therapeutic properties, have gained attention from researchers and industries. Beyond their traditional uses as food garnishes and flavoring agents, they are rich in bioactive compounds like polyphenols and flavonoids which contribute to their antioxidant, antimicrobial, and anti-inflammatory activities. *Bauhinia variegata* L., commonly known as Kachnar, is a deciduous flower tree widely distributed in South and Southeast Asia. Its flowers and buds are traditionally consumed in Indian cuisine and used in Ayurveda for medicinal benefits. This study evaluated the phytochemical, nutritional and anti-nutritional constituents of *B. variegata* flowers from two locations, assessing the effect of drying techniques on quality attributes. Shade drying was more efficient in preserving phytochemicals, followed by dehumidifier drying. The shade-dried flowers from Mandi had the highest carotenoid content (202.15 mg/100 g), while the oven-dried flowers from Palampur had the lowest (140.68 mg/100 g). Similar trends were observed for total phenolic and flavonoid content. Shade-dried samples showed the strongest antioxidant activity, with the lowest IC50 values in Mandi (42.74 µg/ml) and Palampur (50.63 µg/ml). Dried samples from shade drying inhibited α-amylase the most (36.34%), followed by dehumidifier drying (36.49%). Mandi samples had slightly higher fat and protein contents than Palampur samples, regardless of drying method. Shade drying preserved protein content and had higher residual moisture. Oven drying reduced moisture but negatively affected heat-sensitive nutrients like fats and proteins. Dehumidifier drying balanced moisture reduction with better nutritional quality. Anti-nutritional compounds like alkaloids and tannins, although lower in concentration, were comparatively high in case of shade dried samples. The samples were also assessed for their antimicrobial activity, with shade dried and dehumidifier dried samples showing good activity.

IHS/T-5/OP-522

Vinegar production through semicontinuous acetification of sand pear base wine via regulating the air flow rate

Shubham Samkaria and Rakesh Sharma

Department of Food Technology, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Himachal Pradesh, India
Corresponding author: shubhamsamkaria29@gmail.com

Abstract

The present study evaluated the effect of air flow rate on the acetification kinetics and quality attributes of vinegar produced from base wine using a bioreactor system. Physicochemical characterization of the base wine prior to acetification revealed suitable titratable acidity, ethanol content, total phenolic content, and antioxidant activity for vinegar production. Acetification was carried out using a mother vinegar culture, and growth stimulators were incorporated into the base wine to optimize microbial activity. Air flow rate was identified as a critical operational parameter influencing oxygen availability for acetic acid bacteria and, consequently, the rate and efficiency of acetification. An initial increase in acetification rate and fermentation yield was observed with increasing air flow rate, reaching an optimum at 0.8 g L^{-1} min^{-1}, corresponding to a dissolved oxygen level of 13.5%. At this condition,

the highest acetification rate (1.54 g L^{-1} d^{-1}) and fermentation yield (84.42%) were achieved. Further increases in air flow rate adversely affected acetification performance, likely due to excessive shear stress and oxidative losses. Comparative analysis of vinegar produced using an acetator and without an acetator demonstrated a significantly higher acetification rate, volatile acidity, and titratable acidity in acetator-produced vinegar. However, total phenolic content and antioxidant activity were marginally reduced, attributed to enhanced oxidative degradation under higher aeration conditions. Despite these reductions, vinegar produced using the acetator exhibited slightly higher overall sensory acceptability. The findings highlight the importance of optimizing aeration conditions to balance acetification efficiency and preservation of bioactive compounds during vinegar production.

IHS/T-5/PP-501

Post-harvest treatment effects on shelf -life and quality of of Indian gooseberry

Vartika Singh, Sanjay Pathak, Bhagwan Deen, Jagveer Singh and Kuldeep Pandey

Acharya Narendra Deva University of Agriculture & Technology, Ayodhya, Uttar Pradesh
Corresponding author: vartika.soag@itmuniversity.ac.in; vartika815@gmail.com

Abstract

The present study aimed to assess the impact of post-harvest treatments on aonla (*Emblica officinalis* Gaertn.) cultivars stored under ambient conditions (9.75°C–25.5°C) in North India. Commercial cultivars, viz. Francis, Narendra Aonla-6, NA-7, NA-10, NA-25, NA-26 and genotype NA-27 were used. Physiological Loss in Weight (PLW), Decay loss (DL), Soluble Solids Content (SSC), Titratable Acidity (TA), Ascorbic acid (AsA) and Sugars were determined. The results revealed that PLW, DL, SSC and Sugars exhibited increasing trend whereas TA and AsA content revealed a downswing trend with progression of storage span among all cultivars. Among treatments, 100% aloe vera gel and a combination of calcium chloride (5%) with acetic acid (1%) were most effective in reducing weight loss and decay percentage while maintaining higher ascorbic acid levels compared to potassium permanganate and untreated fruits.Thus, post-harvest application of aloe vera gel (100%) and calcium chloride (5%) with acetic acid (1%) effectively extended the storage life of aonla under ambient conditions while preserving fruit quality.

IHS/T-5/PP-502

Role of underutilised vegetables towards nutritional security of tribal communities in north central plateau zone of Odisha

Nityamanjari Mishra, Ananya Mishra, Disha Baishnabi, Soumadeep Putatunda, Ankita Mohapatra, Natasa Dewan and Pradyumna Tripathy

College of Agriculture, Odisha University of Agriculture and Technology,
Bhubaneswar, Odisha, India
Corresponding author: nityamanjarim@ouat.ac.in

Abstract

Wild tribal foods form a nutritionally significant yet under-recognised component of indigenous food systems across Odisha. Among these, underutilised vegetables including wild leafy greens, tubers and other vegetables constitute an important source of vitamins, minerals, phyto-nutrients including antioxidants and flavonoids for major tribal groups such as Santal, Juang, Bhuyan, Kondh, Saora, Bonda, Paroja and Munda communities. In Mayurbhanj, tribal groups such as the Santals and Ho regularly collect wild leafy vegetables, tubers like yams and others as well as seasonal berries, which act as vital sources of iron, calcium and vitamins during lean months, improving dietary diversity and reducing micronutrient deficiencies In Keonjhar's Juang and Paudi Bhuyan villages**,** regular collection of wild greens such as Pittasunga, Koshala saag, Kurta saag and Bhuin neem contributes significantly to dietary iron, calcium and pro-vitamin A intake during the pre-monsoon lean period. Therefore efforts should be made for better utilization of these underutilized vegetable crops towards the nutritional security of the tribal people of the zone.

IHS/T-5/PP-503

Moringa is powerhouse with improved shelf-stability

Kirtika Mishra, Dipika Sahoo, Nityamanjari Mishra, Aurobinda Behera, Aurolipsa Panda, Pradyumna Tripathy and Gobinda Chandra Acharya

College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha
Corresponding author: kirtikamishra.rs24@ouat.ac.in

Abstract

Moringa (*Moringa Oleifera* Lam.) leaves are rich source of vitamins, minerals, essential fatty acids and particularly, amino acids and phytochemicals which helps to reduce the malnutrition and also cures around 300 diseases in humans while some of diseases in animals too. In traditional medicine system, its leaves are known for its anti-cancer, hypotensive and restorative effects. Additionally, they have demonstrated efficacy in managing a wide range of disorders, including cardiovascular, gastrointestinal, hepatic, renal conditions etc. Owing to these valuable attributes, the demand of moringa leaves has expanded swiftly across national and international markets.

IHS/T-5/PP-504

Effect of edible coatings on the shelf life of guava (*Psidium guajava*)

Km Rooma, Rupali sharma, Arvind Kumar and Vikas Yadav

Department of Horticulture, CCSHAU, Hisar, Haryana
Corresponding author: roomachaudhary31@gmail.com

Abstract

The present study was carried out at CCS Haryana Agricultural University, Hisar, during 2024–2025 to evaluate the effect of edible coatings on the shelf-life of guava (*Psidium guajava* L.) cv. Hisar Safeda. The experiment included different edible coating treatments Guar gum (1%, 1.5%, 2%), Chitosan (0.5%, 1%, 1.5%), sodium alginate (0.5%, 1%, 1.5%), Aloe vera (25%, 50%, 75%) along with a control which were replicated thrice using completely randomized design (CRD). The results indicated a significant improvement in shelf-life of guava under ambient storage conditions due to treatments T_6 (chitosan 1%) and T_3 (guar gum 2%). These treatments performed best in enhancing total soluble solids (TSS) (10.62 °Brix), TSS/acid ratio (45.82), total sugars (6.96%), reducing sugar (4.99%), non-reducing sugars (1.88%), ascorbic acid (200.87 mg/100g), overall, T_6 (chitosan 1%) and T_3 (guar gum 2%) proved to be most effective treatments for enhancing both physical and chemical qualities of guava fruits.

IHS/T-5/PP-505

Nutritional diversification through indigenous underutilized horticultural crops

Sanjay Seemawat, B.G. Chhipa and Prahlad Sahay Sharma

Maharana Pratap University of Agriculture and Technology, Udaipur Rajasthan
Corresponding author: sanjayraj4116@gmail.com

Abstract

Underutilized indigenous horticultural crops are plant species that are traditionally consumed by limited local populations and possess scientific evidence of their nutritional and ethnobotanical significance. In India, these crops represent an invaluable yet largely unexplored resource for ensuring nutritional security, sustainable agriculture and biodiversity conservation. Owing to their rich nutritional composition, including high levels of antioxidants, vitamins, minerals and bioactive compounds, these crops have immense potential to combat hidden hunger, micronutrient deficiencies and malnutrition. In addition to their dietary importance, many underutilized

horticultural species exhibit therapeutic properties that support traditional healthcare systems and offer promising prospects for pharmacological innovations. Their cultivation can reduce overdependence on a few dominant fruit and vegetable crops, thereby enhancing agro-biodiversity and ecosystem resilience. Furthermore, these crops provide opportunities for value addition through processing, product diversification and marketing, contributing to income generation and livelihood improvement in rural and tribal communities. Despite their advantages, widespread adoption remains limited due to inadequate research, poor documentation, and lack of quality planting material, insufficient agronomic knowledge and underdeveloped storage and processing technologies. Preservation of traditional knowledge and cultural heritage associated with these crops is also at risk. Therefore, focused research investment, farmer capacity building, improved infrastructure, and supportive policy frameworks are essential to unlock the full potential of underutilized indigenous horticultural crops and integrate them into mainstream agricultural and nutritional strategies in India.

IHS/T-5/PP-506

Hyperspectral imaging–based intelligent sorting: an advanced non-destructive approach for enhancing post-harvest quality and value in horticultural crops

Ms. Krishna Jat

Corresponding author: Jatkrishna950@Gmail.com

Abstract

Hyperspectral Imaging–Based Intelligent Sorting (HIS) has emerged as a promising non-destructive technology that integrates imaging and spectroscopy to acquire both spatial and spectral information across a wide range of wavelengths. HIS enables rapid and precise detection of internal and external quality parameters such as maturity stage, firmness, moisture content, soluble solids, biochemical composition, and latent defects that are invisible to the human eye. Advanced chemometric and machine learning models translate hyperspectral signatures into accurate classification and sorting decisions in real time. This technology enhances grading accuracy, reduces post-harvest losses, and ensures uniformity and traceability in horticultural produce. The integration of HIS at pack houses, processing units, and Farmer Producer Organization (FPO)–managed aggregation centers offers significant opportunities for value addition and market differentiation, particularly for high-value domestic and export markets. Although challenges related to high initial investment, data processing complexity, and skilled manpower exist, advancements in sensor miniaturization, artificial intelligence, and digital agriculture platforms are improving feasibility and scalability. Adoption of hyperspectral imaging–based sorting can substantially strengthen post-harvest management systems, improve price realization, and contribute to sustainable and market-oriented horticultural development in India.

IHS/T-5/PP-507

Utilization of gladiolus corms as an antimicrobial agent in food processing and traditional medicine

Nehali Patel, Sudha Patil and Dixita Prajapati

ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat
Corresponding author: drsudhapatil@nau.in

Abstract

A new compound called, trihydroxy-3-methoxyanthraquinone, along with Methyl hydroxycinnamate, Eugenin and 1,3,6-Trihydroxy-8- methyl anthraquinone have been identified in the corms of *Gladiolus gandavensis*. Similarly, scientists in Cameroon and Botswana have identified 1,6,7-Trihydroxy-3-methoxy-8- methyl-anthraquinone and 1-Hydroxy-3,6,7-trimethoxy-8- methyl-anthraquinone in Gladiolus psittacinus. These apparently related findings and the pointer to antimicrobial activities in gladiolus corms have prompted this present study. The cold water extract and the Soxhlet extracts are taken from corms and subjected to various spot tests using appropriate reagents to investigate the presence of chemical constituents. Separation of constituents is subjected using thin

layer chromatography (TLC) using the solvent systems. The stationary phase was of silica gel. Spots were observed under daylight, UV at 254 nm or by spraying with Dragendorff reagent. Moreover, antimicrobial effects of gladiolus corm extract were evaluated by measuring the diameters of inhibition zones on agar plates, using clinical isolates of bacteria like Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus and Listeria monocytogenes; and the fungi, viz. Candida albicans, Aspergillus niger and Trichophyton mentagrophyte. The results showed that the extracts, at concentrations of 75 – 400 mg of the plant material per mL of water were active against Pseudomonas aeruginosa and Aspergillus niger, but relatively inactive against the others.

IHS/T-5/PP-508

Metabolic resilience induced by preharvest micronutrient nutrition enhances tomato quality as revealed by FT-IR fingerprinting and sensory evaluation

Babanjeet, Dilpreet Talwara, Kulbir Singha, Salesh Kumar Jindala, Shruti Kapoor and Vikas Kumar

Regional Research Station, Punjab Agricultural University, Abohar, Punjab
Corresponding author: babanjeet-vs@pau.edu

Abstract

The conducted experiment was aimed to evaluate the impact of mineral sprays and storage conditions on physicochemical quality, antioxidant profile and storability of tomato fruits. Three pre-harvest treatments-zinc sulfate heptahydrate (ZnSO4.7H2O, 0.5%), potassium iodide (KI, 1%) and ferrous sulfate heptahydrate (FeSO4.7H2O, 0.5%) were applied and fruits harvested at turning and red-ripe stages were stored under ambient (25 ± 2 °C) and refrigerated (8 ± 2 °C) conditions for 0, 4, 8 and 12 days. The treatments, ZnSO4.7H2O consistently exhibited superior than others, showing the highest ascorbic acid content (24.12 mg 100 g-1 FW at 12 days), total phenolic content (TPC, 74.81 mg GAE 100 g-1 FW), total flavonoid content (TFC, 38.27 mg 100 QE g-1 FW) and lycopene (5.32 mg g-1 FW). FeSO4.7H2O notably enhanced antioxidant potential, recording maximum FRAP (Ferric reducing antioxidant power) activity (15.42 mg TE 100 mL-1). Refrigerated storage substantially mitigated physiological degradation with fruits under Zn treatment maintaining superior firmness (0.53 kg cm^2) and lower physiological weight loss (8.25%) relative to other treatments. Sensory evaluation further confirmed the superiority of Zn-treated fruits, which maintained enhanced color, flavor, texture and overall acceptability after 12 days of refrigerated storage. Additionally, harvest stage also exerted fruit quality, with turning-stage fruits generally demonstrating greater biochemical stability and extended shelf life as compared to red-ripe fruits. Thus, integration of pre-harvest ZnSO4.7H2O treatment, combined with refrigerated storage, most effectively maintained post-harvest nutritional quality, antioxidant capacity and shelf-life of tomato fruits. These findings provided a scientifically substantiated, resource-efficient approach to mitigating post-harvest losses and improving marketability of tomatoes under varying storage environments.

IHS/T-5/PP-509

Post-harvest management, processing, value-addition, and Agri - export zones for indigenous and underutilized horticultural crops

Shristi Rai, Arvind Kumar, Yashmi Yadav, Akansha Rai, Prasoon Kum. Rai and Vikash Tyagi

Department of Fruit Science, Sardar Vallabhbhai Patel University of Agriculture & Technology, Modipuram, Meerut, Uttar Pradesh
Corresponding author: nidrai01234@gmail.com

Abstract

Recent developments in post-harvest management emphasize advanced technologies such as nano-encapsulation, edible coatings, and smart packaging, which play a key role in extending shelf life, preserving quality, and improving the safety of perishable produce. Value addition using minimal, thermal, and non-thermal processing methods—such as washing, cutting, blanching, drying, fermentation, high-pressure processing, and pulsed electric

field treatment—allows product diversification while retaining nutritional quality and functional properties. These processing strategies facilitate the development of functional foods with improved health-promoting properties. Moreover, effective utilization of processing byproducts and wastes for recovering bioactive compounds, dietary fiber, animal feed, and bioenergy support a circular economy and minimizes environmental impacts.

Agri-Export Zones (AEZs) play a vital role in reinforcing the complete value chain by coordinating production, post-harvest handling, processing, quality control, and marketing within a specific geographical region. The creation of AEZs encourages the adoption of international quality standards, minimizes post-harvest losses, strengthens export competitiveness, and increases profitability for farmers and agribusiness enterprises. Overall, combined application of advanced post-harvest technologies, value-addition, functional food innovation, waste utilization, and AEZ-driven export strategies offers a sustainable approach to economic growth and international market expansion for indigenous and underutilized horticultural crops.

IHS/T-5/PP-510

Empowering Rural Economies through Value Addition and Export Promotion of Underutilized Fruits

Battula Soujanya and Kiran Kumar Adapa

Corresponding author: bsoujanya129@gmail.com

Abstract

Underutilized indigenous fruits such as aonla (*Emblica officinalis*), bael (*Aegle marmelos*), jamun (*Syzygium cumini*), Ber (*Ziziphus mauritiana*), Phalsa (*Grewia asiatica*) and karonda (*Carissa carandas*) possess immense nutritional, medicinal, and economic potential but remain largely confined to local markets due to limited processing, poor shelf life, and inadequate market linkages. These fruits are rich in bioactive compounds and have strong relevance in traditional medicine, functional foods, and nutraceutical industries, making them highly suitable for value-added product development. Value addition through processing into products such as aonla candies, bael nectar, jamun vinegar, and karonda pickles significantly enhances shelf life, reduces post-harvest losses, and improves marketability. Importantly, small-scale processing and cottage-based enterprises provide viable income-generation opportunities for rural women, self-help groups, and smallholder farmers, thereby contributing to livelihood diversification and inclusive rural development. In recent years, the Government of India has reoriented its agri-export strategy by promoting Agriculture Export Clusters (AECs) and implementing supportive schemes such as the Mission on Integrated Development of Horticulture (MIDH). These initiatives aim to strengthen the entire value chain from production and processing to branding and international marketing—of high-potential horticultural commodities. Strategically located clusters in Maharashtra (pomegranate and grapes), Uttar Pradesh (aonla), and the North Eastern region (exotic and indigenous fruits) have emerged as processing and export hubs, facilitating quality compliance, cold chain infrastructure, and market access. The integration of value addition with cluster-based export models offers a sustainable pathway to mainstream underutilized fruits into global markets while enhancing farmer incomes and promoting women-led agri-enterprises. However, strengthening of processing infrastructure, capacity building, quality certification, and export-oriented policies will be crucial for realizing the full agri-export potential of these neglected fruit crops.

IHS/T-5/PP-511

Effects of drying methods for retention of bioactive compounds and minerals in jamun pulp powder: implications for value addition and storage stability

Akansha Upadhyay, Akath Singh, Anshuman Singh, Sahil and Kiran

Division of Postharvest Management, ICAR-Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh
Corresponding author: akanshaupa2018@gmail.com

Abstract

This investigation was carried out to assess the effect of cabinet, infrared, and freeze drying on retention of bioactive compounds and minerals in jamun pulp powder prepared from four cultivars (J-37, J-42, J-15, and Konkan Bahadoli), along with their stability during three months of storage. The powders were analyzed initially and after 3 month of storage for total phenolics, flavonoids, anthocyanins, ascorbic acid, antioxidant activity, individual phenolic compounds using HPLC, and mineral content (P, K, Na, Zn, and Fe). Freeze drying consistently resulted in higher retention of anthocyanins, ascorbic acid, antioxidant activity, and phosphorus, indicating superior preservation of heat-sensitive constituents, while Konkan Bahadoli exhibited the highest levels of most bioactive compounds across drying methods. HPLC analysis identified gallic acid, caffeic acid, and ellagic acid as major phenolics, with caffeic acid dominant in fresh samples but undetectable after storage. Storage significantly influenced quality, as antioxidant activity declined by 21.5% and zinc and iron contents decreased by 63.4% and 58.1%, respectively, after three months .Overall, freeze drying emerged as the most effective technique for preserving nutritional and functional quality, highlighting the importance of drying method, cultivar selection, and storage optimization for commercial value addition of Jamun.

IHS/T-5/PP-512

Comparative sensory evaluation of single-fruit and blended amla–guava value-added jam

Renu Godara, Shakti Khajuria, Kanak Lata, J.K. Jadav

Corresponding author: messigodara@gmail.com

Abstract

Amla (Emblica officinalis) and guava (Psidium guajava) are widely recognized for their high vitamin C content, antioxidant potential, and health-promoting properties. However, despite its superior nutritional value, amla remains under-utilized in processed foods due to its strong acidic and astringent taste, which often limits consumer acceptance. Blending amla with guava, a fruit characterized by natural sweetness and pleasant flavour, offers a practical approach to improve palatability while retaining nutritional benefits. The present study was conducted to comparatively evaluate the sensory quality, consumer preference, shelf life, and cost effectiveness of single-fruit and blended value-added jam products. Three jam formulations were standardized using traditional processing methods. Amla jam was prepared using 1.00 kg amla pulp with 1.50 kg sugar, guava jam using 1.00 kg guava pulp with 1.50 kg sugar, and a blended amla–guava jam using 0.70 kg amla pulp and 0.30 kg guava pulp with 1.00 kg sugar. Sensory evaluation was carried out by a panel of 40 untrained consumers using a 9-point hedonic scale to assess colour and appearance, flavour, texture, taste, and overall acceptability. Distinct differences in sensory performance were observed among the products. The amla–guava mixed jam recorded the highest mean scores for all sensory attributes, with colour and appearance (8.30), flavour (8.15), texture (8.10), taste (8.30), and overall acceptability (8.25), indicating very high consumer preference. The blended jam exhibited excellent taste balance and markedly reduced astringency of amla, leading to superior sensory appeal. Guava jam ranked second with an overall acceptability score of 7.60, supported by good flavour (7.65) and taste (7.75). In contrast, amla jam received comparatively lower scores, particularly for flavour (6.85) and taste (6.90), although its colour and texture were rated acceptable. Weighted mean score analysis confirmed these trends, with the amla–guava mixed jam achieving WMS > 8.00 (Rank I), guava jam WMS > 7.50 (Rank II), and amla jam WMS < 7.50 (Rank III). Shelf-life evaluation revealed no significant differences among the products. All jams remained organoleptically

acceptable for up to 30 days at room temperature and 90 days under refrigerated conditions, with no noticeable deterioration in colour, flavour, texture, or taste. Cost analysis showed that the preparation cost was ?120/kg for amla jam, ?140/kg for guava jam, and ?126/kg for the amla–guava mixed jam. The blended jam emerged as the most cost-effective option by combining superior sensory quality with reduced sugar requirement. The study concludes that blending amla with guava significantly enhances sensory acceptability, consumer preference, and economic feasibility, making amla–guava mixed jam a promising value-added product for household-level and small-scale food processing enterprises.

IHS/T-5/PP-513

Identification and characterization of bioactive peptides from *Aconitum heterophyllum*

Pallavi Anand

Manipal University, Jaipur, Rajasthan, India
Corresponding author: anandpallavi44@gmail.com

Abstract

This study aimed to isolate, purify, and characterize bioactive peptides from A. heterophyllum roots and use in-silico tools to predict their potential biological activities. Proteins were extracted from the plant using acid-base extraction and defatted with n-hexane. Total protein concentration was quantified via the Bradford Assay, and the protein profile was analyzed using SDS-PAGE. The extracted proteins were subjected to enzymatic hydrolysis using pepsin and trypsin, with the degree of hydrolysis monitored by the Ortho-Phthalaldehyde (OPA) method. Purified peptide fractions obtained via the AKTA Pure 150 system were analyzed using MALDI-TOF/TOF mass spectrometry. Peptide sequences were identified using the Mascot Server and Swiss-Prot database, while potential bioactivities were predicted using the BIOPEP-UWM and PeptideRanker web servers. Thus, result showed that SDS-PAGE analysis revealed a diverse protein profile with molecular weights ranging from 10 kDa to 100 kDa. MALDI-TOF/TOF analysis identified prominent low-molecular-weight peptides in the 500–1300 m/z range. Three specific peptide sequences were positively identified: LLQLLRR, TPEHQR, and KIQCPQH. In-silico analysis predicted: LLQLLRR- Strong potential for antibacterial, ACE-inhibiting, and antioxidant activities. TPEHQR- Immunomodulating and ACE-inhibiting properties. KIQCPQH- Potential antioxidant and enzyme-inhibiting properties. In conclusion this research successfully demonstrates that Aconitum heterophyllum is a promising source of therapeutic bioactive peptides. The study highlights an effective workflow combining wet-lab biochemistry with advanced mass spectrometry and bioinformatics to discover novel plant-derived peptides with significant antioxidant and ACE-inhibiting potential.

IHS/T-5/PP-514

Effect of drying methods and packaging materials on storability of jamun (*Syzygium cumini*) pulp powder

Kaustubh Deshmukh, Anjali Giri, Shashwat Mahalle, Sarjesh Kumar Meena, Namrata Khairkar and Harsha Kumbhalkar

Corresponding author: kaustubhdeshmukh11099@gmail.com

Abstract

The present investigation was undertaken to standardize suitable drying methods and packaging materials for preparation of Jamun pulp powder with maximum retention of nutritional and bioactive constituents during 2022-23 Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Jamun pulp without seed was dehydrated using cabinet dryer and microwave oven dryer, powdered and packed in five packaging materials, viz. LDPE pouches, aluminium foil pouches, metallised polyester polyethylene laminated pouches, PET jars and glass jar. The Factorial Completely Randomized Design with ten treatment combinations and three replications was used. Physico-chemical and sensory parameters were evaluated at 30 days intervals over a storage period of 180 days.

The results indicated a gradual increase in moisture content, total soluble solids, total and reducing sugars, polyphenols, tannins and antioxidant activity during storage, while pH, titratable acidity, ascorbic acid and non-reducing sugars decreased. Among the treatments, microwave oven drying combined with aluminium foil pouch packaging proved superior in maintaining quality attributes, sensory acceptability and economic feasibility, recording the highest benefit: cost ratio.

IHS/T-5/PP-515

Standardization of post-harvest drying and resin embedding methods for value-added floriculture products

Jayveer Sahu, Anuj Kumar, K.C. Meena, B.K. Kachuli

Shivani Dashore, Heera Lal Gaurav Sharma, Priyanka Sharma and Neeraj Negi
Corresponding author: sahujayveer2001@gmail.com

Abstract

The study, conducted at K.N.K. College of Horticulture, Mandsaur, from January to May 2025, evaluated the performance of four chrysanthemum varieties—Dolly Orange (V1), Lal Pari (V2), Pusa Aditya (V3), and Red Spoon (V4)—under different drying methods and resin embedding treatments. Four drying techniques were tested: press drying in magazine paper (D1), press drying in newspaper (D2), drying in silica gel (D3), and press drying in blotting paper (D4). For preparation of value-added products, four resin embedding treatments were applied: E1 (epoxy resin:hardener 2:1, cured 24 hr), E2 (2:1, 48 hr), E3 (3:1, 24 hr), and E4 (3:1, 48 hr). Observations were recorded on fresh and dry weight, moisture loss (%), drying time, colour retention, shape retention, texture after drying, texture of resin-embedded products, curing time, and overall acceptability of keyrings, pendants, and earrings. Among the varieties, Pusa Aditya exhibited the highest fresh weight and moisture loss, while Dolly Orange produced the maximum dry weight. Red Spoon showed superior colour retention, shape retention, texture, and shortest drying time, whereas Lal Pari performed lowest across all parameters. Silica gel drying resulted in the highest moisture loss, press drying in magazine paper gave maximum dry weight, colour retention, and texture, and blotting paper maintained optimal shape retention. Interaction effects indicated the best dry weight with V1D1, V1D2, and V3D1; highest colour retention and texture with V4D1; and maximum shape retention with V4D4. Resin embedding significantly influenced the quality of value-added products, with E4 (3:1, 48 hrs) producing the most transparent, clear, and aesthetically superior keyrings, pendants, and earrings. Overall, the combination of Red Spoon, magazine paper drying, and E4 resin embedding provided optimal results for flower quality and marketable value-added floral products.

IHS/T-5/PP-516

Assessment of nutritional quality in pigmented okra (*Abelmoschus esculentus*) genotypes

Dinesh Kumar Malav, Ramesh Kumar Yadav, Suman Lata, Harshawardhan Choudhary, Rakesh Bhardwaj, Shailendra Kumar Jha and Aditi Kundu

ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi, India
Corresponding Author: dineshmalav1111@gmail.com

Abstract

Twenty-eight okra (*Abelmoschus esculentus* (L.) genotypes, including pigmented types along with green podded varieties used as checks, were evaluated to understand the extent of variability in nutritional quality, antioxidant activity, mineral composition, mucilage content, pigment profile, and yield. Considerable variation was recorded among genotypes for all biochemical traits, suggesting ample scope for selection and improvement. Total sugar content ranged from 1.31 to 5.25%, with Kumkum (F_1) recording the highest value, followed by DOVRS-15 and Kashi Lalima. Vitamin C content also varied widely, and higher levels were observed in Kumkum (F_1), DOVRS-10, and Kashi Lalima compared with green check varieties. Among the genotypes, Pusa Lal Bhindi-1

consistently exhibited superior functional quality, with highest phenolic content and antioxidant activity, along with higher dietary fiber and mineral content, particularly calcium and iron. Mucilage content showed wide variation across genotypes, indicating the potential of certain coloured types for specific dietary and industrial applications. Potassium content was highest in DOVRS-17, followed by DOVRS-7 and Kumkum (F_1). Pigment analysis clearly differentiated coloured and green podded genotypes; coloured okra accumulated higher levels of anthocyanins, whereas green pods were richer in chlorophyll and carotenoids. High heritability coupled with high genetic advance for most nutritional traits indicated the predominance of additive gene action. Overall, the results demonstrate the clear nutritional advantage of coloured okra over green check varieties, with Pusa Lal Bhindi-1 and Kumkum (F_1) emerging as promising donor genotypes for the development of nutritionally enhanced okra cultivars.

IHS/T-5/PP-517

Development and evaluation of dragon fruit leather fortified with oats for enhanced functional and nutritional properties

Alan Evon Singh, Ghan Shyam Abrol, Ravindra Tiwari, Shankar Rajpoot, Vardiboina Ruchitha and Priyanka Sharma

Corresponding author: alanevonsingh@gmail.com

Abstract

The study aimed to develop dragon fruit leather with and without oat enrichment and to comparatively evaluate their physico-chemical, nutritional, and bioactive properties. Different formulations were optimized using a Box–Behnken Design (BBD) under Response Surface Methodology (RSM). The leathers were prepared using standardized dehydration techniques and analyzed for functional quality attributes. Results revealed that oat-enriched dragon fruit leather exhibited superior physico-chemical and nutritional characteristics, with higher total soluble solids (28.4°Brix), titratable acidity (0.832% citric acid equivalent), total sugars (23.5%), and crude fiber content (5.16%) compared to the leather prepared without oats (26.2°Brix, 0.821%, 22.6%, and 4.20%, respectively). In contrast, the leather without oat enrichment showed significantly higher bioactive properties, including total phenolic content (26.33 mg GAE/100 g), antioxidant activity (52.94% DPPH inhibition), and anthocyanin content (9.85 mg/100 ml). Moisture and ash contents showed minimal variation between the formulations, with oat-enriched leather recording 5.16% moisture and 4.39% ash, while the control leather showed 4.20% moisture and 3.81% ash, indicating effective dehydration and good shelf stability in both products. These findings highlight the versatility of dragon fruit leather as a functional, value-added post-harvest product with formulation-specific advantages.

IHS/T-5/PP-518

Impact of storage time on physico-chemical properties and bioactive potential of carambola bagasse-fortified mix fruit juice powder

Shankar Rajpoot, Vigya Mishra, Ghan Shyam Abrol, Ravindra Tiwari and Alan Evon Singh

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh
Corresponding author: shankarrajpoot1466@gmail.com

Abstract

The study aimed to evaluate the impact of storage time on physico-chemical properties and bioactive potential of carambola bagasse-fortified mixed fruit juice powder. Carambola-guava mix fruit juice fortified with carambola bagasse powder was prepared by adding 5% carambola bagasse, 50% carambola juice, 50% guava juice, and 25% maltodextrin, followed by spray drying at an inlet air temperature of 180°C and a feed flow rate of 8 ml/min. Samples were sealed in plastic pouches and stored under ambient conditions for 90 days. During this period, a significant increase was found in moisture (6.70), total soluble solids (87.60), water activity (0.365), and Water Solubility Index (65.42) non-significant decrease and a gradual, significant decrease in vitamin C (46.52),

free radical scavenging activity (66.94), crude fiber (4.20), and total phenolics content (267.32) were recorded. Total carotenoids (5.41) and overall acceptability (8.04) of the product also showed a non-significant decrease during the storage periods. The proposed study showed that fruit juice powder enriched with carambola bagasse may be kept for up to 90 days without losing its sensory value. However, the product's bioactive potential was severely impacted during storage, showing a significant decrease in the product's quality under ambient storage conditions.

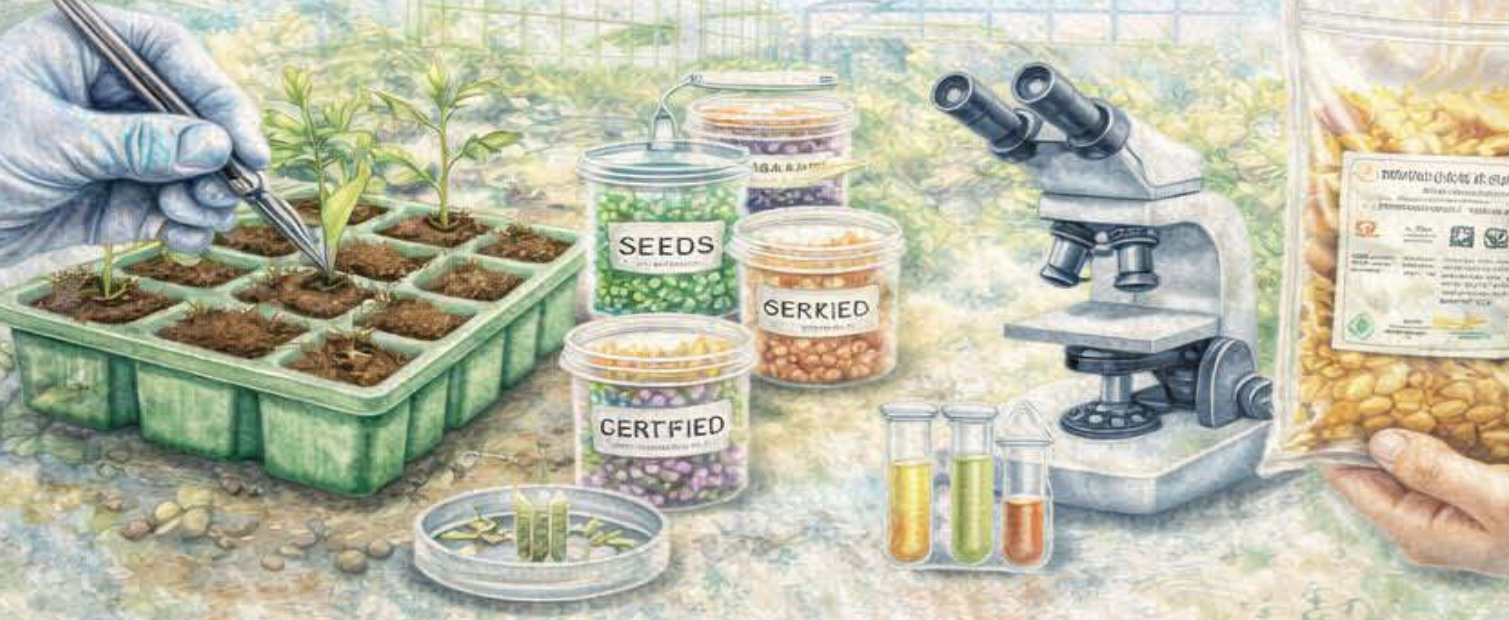
IHS/T-5/PP-519

Development and standardization of functionally enriched edible film from dragon fruit peel polysaccharides

Vardiboina Ruchitha, Ghan Shyam Abrol, Ravindra Tiwari, Dnyaneshwari, Monika Meena and Naman Rathore
Corresponding author: ruchitha213@gmail.com

Abstract

Dragon fruit (*Hylocereus* spp.) processing generates a substantial quantity of peel as a by-product, which is often discarded despite being a rich source of dietary fibre, bioactive compounds, and polysaccharides. Limited technical know-how and lack of value-addition strategies have restricted its effective utilization. In recent years, increasing consumer awareness regarding environmental sustainability and food safety has accelerated the demand for biodegradable, edible, and functionally enriched food packaging materials. Edible films and coatings derived from natural polymers not only serve as eco-friendly alternatives to synthetic packaging but also provide additional functional benefits such as antioxidant and antimicrobial activity. In this context, the present study was undertaken to develop and standardize a functionally enriched edible film using polysaccharides extracted from dragon fruit peel. The study aimed to utilize agro-processing waste efficiently while developing a value-added, biodegradable coating material with enhanced functional properties. Polysaccharides were extracted from dragon fruit peel using suitable aqueous extraction techniques, followed by purification and drying. The extracted polysaccharides served as the primary film-forming biopolymer. Potato starch was incorporated as a co-film-forming agent to improve film integrity, flexibility, and mechanical strength. Tulsi (*Ocimum sanctum*) extract, known for its antioxidant and antimicrobial properties, was added as a functional ingredient to enhance the bioactivity of the edible film. The edible films were prepared using the solution casting method. Different formulations were developed by varying the concentration of dragon fruit peel polysaccharides, potato starch, and Tulsi extract to standardize the film composition. Glycerol was used as a plasticizer to improve film flexibility and reduce brittleness. The prepared films were dried under controlled conditions and evaluated for physicochemical, mechanical, functional, and sensory attributes. The developed edible films were analyzed for thickness, moisture content, solubility, water vapor permeability, tensile strength, and elongation at break to assess their suitability as coating materials. Sensory evaluation was conducted to determine the acceptability of the films in terms of appearance, texture, and overall acceptability.



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Theme 6

Clean planting material and high yielding seeds

4th Indian Horticulture Summit-Cum-International Conference-2026
Book of abstracts

IHS/T-6/OP-601

Morphological, biochemical and yield evaluation of mandarin (*Citrus reticulata*) accessions for elite germplasm selection in the Eastern Himalayas

Natasha Gurung

ICAR-Indian Agricultural Research Station, Regional Station, Kalimpong, West Bengal
Corresponding author: natashagurung23@gmail.com

Abstract

The study aimed to identify elite germplasm of Darjeeling mandarin (*Citrus reticulata* Blanco) across thirty-three grafted mandarin trees grown at IARI Regional Station, Experimental Farm. The age of mandarin trees were 6 years and grafted on Rough Lemon. Eight important key horticultural traits, i.e. fruit weight, pulp percentage, juice percentage, total soluble solids (TSS), TSS: acid ratio, number of seeds, and yield per plant were recorded during 2023-24 and 24-25. The accessions, MD-15, MD-21, MD-22 and M-48, outperformed others in composite scores. These findings suggest that selected germplasm has significant potential for conservation in future breeding programs to improve productivity.

IHS/T-6/OP-602

Effect of organic amendments and microbial consortia on Dragon fruit sapling vigour and growth

S. Ramachandran, G. Karunakaran, Uma Maheshwari and G. Selvakumar

ICAR-Indian Institute of Horticultural Research, Hessaraghatta Lake Post, Bengaluru, Karnataka
Corresponding author: S.Ramachandran@icar.gov.in

Abstract

An attempt was made to evaluate the seedling establishment of Kamalam fruit and its root growth by application of different types of organic amendments (FYM, poultry manure and vermicompost and concentrated organic cakes like, Pongamia and neem cake) along with different types of microbial consortia. The potting medium was prepared with soil, sand and FYM (1:1:1 ratio). In place of FYM, poultry manure and vermicompost, *pongamia* and neem cake were used at recommended levels. In the potting media, microbial consortia like, Arka Microbial Consortia (AMC) liquid, Arka Actino Plus, Arbuscular Mycorhiza and Bacillus *amyloliquie faciens* P-72 were used to stimulate more healthy roots and shoot growth in the potting media. The experiment was carried out on both red and white pulped dragon fruit cuttings for 6 months during 2023 at Hirehalli, Tumkur District, Karnataka. The experiment was laid out in a factorial randomized block design with three replications and thirteen treatments. The data were collected during the plant growth period in the nursery, and also root parameters were collected. That application of vermicompost (T_3 treatment) in place of FYM significantly increased shoot and root length of red (67.5; 26.3 cm) and white (59.0; 31.9 cm) pulped dragon fruit, respectively. The number of shoot branches in both red and white pulped were significantly higher in T_{11} treatment [soil+ sand+ neem cake (1:1:1) (300% neem cake)] 4.80 and 3.80 respectively. The number of roots is higher in T_{10} treatment [soil+ sand+ neem cake (1:1:1) (200% neem cake)] 20.8 and 23.3, both in red and white pulp respectively. Both shoot and root biomass were highest in T_3 treatment [(soil+ sand+ vermicompost (1:1:1)] 0.60 kg plant-1 and 12.1g plant-1 in red pulped Kamalam fruit. The nematode population was studied using gall index as an indicator (0-5 scale), among the treatments T_2 (100% Arka fermented cocopeat) and pongamia and neem cake applied treatments (T_6, T_9, T_{10}, T_{11} and T_{12}) recorded significantly lower gall indices in both white and red varieties of Kamalam. Thus, application of vermicompost and concentrated cake can help in establishing quality seedlings of Kamalam fruit.

Oral Presentation

IHS/T-6/OP-603

Respiration-based colorimetric assay for rapid evaluation of seed viability in vegetable crops

Manja Naik. E, Vishwanath Rohidas Yalamalle, Jitendra and D. Vijay

ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding author: vishwantah_yal@yahoo.com

Abstract

The study aimed to develop a rapid, on-farm seed viability assessment method in broccoli, cucumber, and pumpkin. Respiration is one of the earliest physiological processes initiated during seed imbibition; however, its quantitative relationship with seed viability and vigour remains inadequately explored. Seed lots with higher germination percentages exhibited greater CO_2 evolution. Species-specific variation in CO_2 evolution was observed, ranging from 487 ppm seed^{-1} in broccoli to 525 ppm seed^{-1} in cucumber and 539 ppm seed^{-1} in pumpkin. The testing procedure involved the absorption of CO_2 released by imbibed seeds into a bromothymol blue indicator solution (250 µL) contained in a sealed 1.5 mL tube, producing a colour change during incubation – green/yellow for viable seeds and blue for non-viable seeds. Seed viability can be assessed within 4-5 hours, making it the fastest seed viability assessment method. Viability estimates obtained using this method closely matched total viability by the standard germination test, with deviations of 2–6% in cucumber and pumpkin and 1–5% in broccoli. Viability was further validated by measuring the optical density (OD) at 450 nm, where the lot with higher viability recorded the highest OD values. Linear regression analysis between OD values and corresponding germination percentages showed strong correlations, with R^2 values of 0.87 in broccoli, 0.92 in pumpkin, and 0.96 in cucumber seed lots.

IHS/T-6/OP-604

Coat-type surface covering protective vegetable nursery technology for hot arid climate

Hanuman Ram, D.K. Samadia and P. S. Gurjar

ICAR-Central Institute for Arid Horticulture, Bikaner-334 006, Rajasthan, India
Corresponding author: hramdhanari@gmail.com

Abstract

The north-western part of India is distinct for promotion of arid horticulture owing to vast land resource and scope for cultivation of daily-need vegetable crop-plants. Tomato, chilli and brinjal are very essential commodity and abundant in demand. Un-availability of quality and disease-free seedlings during the transplanting period is a big problem and resulted to poor harvest. Extreme high and low temperature condition is the prime constraint for the raising of seedlings in time with common practices of nursery. In this context, ICAR-CIAH, Bikaner has developed SOP's as package of practices and defined as technology "Coat-type surface covering protective vegetable nursery scheme" for seedling production year the round. It is local fabrication, simple, cost-efficient and an excellent mechanism to escape from the severity of temperature. Coat-type frames are arranged on raised beds (50-60 sq. m plot area and a pair bed of 25 m x 01 m size) and transparent polythene (120-200 gauge) and 40 mesh insect-proof nylon-net sheet is used to cover the structures in respect of winter and summer season sowing under hot arid climate.

IHS/T-6/PP-601

Front line demonstration for dissemination of technology on fenugreek in Jhajjar Haryana

Desh Raj Choudhary

Krishi Vigyan Kendra, CCS Haryana Agricultural University, Jhajjar, Haryana, India
Corresponding author: desraj1992@gmail.com

Abstract

Front line demonstrations on fenugreek (variety AFg-5) were conducted by Krishi Vigyan Kendra, Jhajjar during 2022-23 and 2023-24 with ten farmer fields each year. The FLD was conducted with farmers' active participation to disseminate improved technology of fenugreek to achieve potential production along with interventions of high-yielding variety, seed treatment, recommended dose of fertilizers and non-monetary inputs. Front line demonstration data were recorded on plant height (cm), number of branches/ plants, pest incidence (%) and seed yield (q/ha) as compared to the farmer practices. The improved variety AFg-5 recorded the higher seed yield (15.90 and 17.20 q/ha) than local variety during 2022-23 and 2023-24, respectively. The experiment exhibited mean extension gap of 2.0 q/ha, technology gap of 3.45 q/ha with 17.25% of technology index. The improved technology gave higher economic attributes and benefit:cost ratio 2.89 as compared to check variety (2.59). The FLD made a positive and significant efficacy of fenugreek seed yield than local cultivar.

IHS/T-6/PP-602

Impact of micronutrient spray on growth, bulb yield and economics of onion

Desh Raj Choudhary

Krishi Vigyan Kendra, CCS Haryana Agricultural University, Jhajjar, Haryana, India
Corresponding author: desraj1992@gmail.com

Abstract

The experiment was conducted as on-farm testing at farmer fields during *Rabi* season of 2022-23 and 2023-24 to assess the impact of micronutrient spray on growth, bulb yield and economics of onion. Two treatments, *i.e.* T_1- farmer practices (without spray) and T_2- foliar spray of micronutrient replicated at five farmers field of Jhajjar district. Micronutrients were applied through foliar spray of multiplex general liquid 2.5 ml/ litre (625 ml/ ha) which contains Zn 9%, Fe 8%, Mn 0.50%, Cu 0.50% and Bo 0.25% after one month of transplanting and at bulb formation stage of the onion. The use of micronutrient as foliar spray was found effective in T_2 treatment the significantly highest plant height (68.35 and 69.10 cm), number of leaves (6.80 and 6.95), bulb weight (55.38 and 58.80 g) and bulb yield (307.90 and 311.80 q/ha) during 2022-23 and 2023-24, respectively. Maximum net return (₹ 110367 and 211270/ ha) and benefit cost ratio (1.96 and 2.82) were recorded in the treatment T_2 whereas, in farmers' practices were found net return (₹ 88428 and 176530/ ha) and BC ratio (1.79 and 2.55), respectively during both the year of study. Therefore, the use of micronutrient application to be increases the production and recommended for onion cultivation.

IHS/T-6/PP-603

Effect of budding height on success of patch budding in Aonla (*Emblica officinalis* Gaertn)

Upendra Yadav and Bhagwan Deen

Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, India
Corresponding author: upendray123123@gmail.com

Abstract

The effect of budding height on patch budding on aonla (*Emblica officinalis* Gaertn)" was studied during 2023 at the Main Experimental Station of Horticulture, ANDUA&T Kumarganj Ayodhya. The experiment was laid out in Randomized Block Design, comparises five treatment combinations and four repetitions. Five treatments combinations consisting of 5, 10, 15, 20 and 25 cm budding height from the ground level. The 15 cm height was treated as control. The observations were recorded on days taken for sprouting of bud, survival of buds after 15 DAB and 30 DAB, total sprouting, total died sprouts, total sprouts survival, length of sprout, diameter of scion, number of determinate shoots, plant height, diameter of rootstocks just below union, diameter of scion just above union, number of leaves on determinate shoots and leaf chlorophyll content. Minimum days for bud sprouting (15.86 days), scion-shoot died percentage (0%) and maximum survival percentage (100%), total sprouting (90%) and total sprouts survival (100%) observed when patch budding was done at 25 cm budding height. Maximum length (81.56 cm) of sprouted shoot and diameter (6.03 mm) of scion, number of determinate shoots (85.05) and plant height (106.56 cm), rootstocks diameter (10.95 mm) just above union, diameter (7.53 mm) of scion just above union and number of leaves (92.52) were also recorded at 25 cm budding height. The total leaf chlorophyll content (3.31 mg/g) was found to be maximum at 25 cm budding height and minimum (2.60 mg/g) at 5 cm budding height. It is concluded that the 25 cm budding height was the best for the propagation of aonla using patch budding in the month of June under North India condition.

IHS/T-6/PP-604

Varietal differences in development of clones in nucleus seed production

Dhruv Kumar, R. K. Singh, and Murari Lal

Central Potato Research Institute, Regional Station, Modiputam, Uttar Pradesh
Corresponding author: dhruv.cpri@gmail.com

Abstract

A field study was conducted at Central Potato Research Institute, regional station, Modipuram, during *rabi* season of 2020-21 and 2021-22 to assess the varietal differences in development of clones in stage–I of nucleus seed production of potato. Well sprouted 5,232 indexed tubers were planted in second week of October with recommended protocol for stage –I crop. Germination was at par in all cultivars except cv. Kufri Surya, in which germination per cent was recorded 94.8, not only less, the germination was observed late by 2-3 days. Rogueings were done on the basis of visual observations as well as *ELISA* test in all cultivars. Haulms of all cultivars were pulled on 2nd January of each year. The highest number (%) of clones were developed from cv. Kufri Chipsona-3 (96.5%) which was at par with cvs. Kufri Chipsona-1 (96.36%) and Kufri Garima (93.4%), followed by. Kufri Bahar (90.06%) and Kufri Anand (88.04%), 81.38% clones were developed in Kufri Surya, while lowest number of clones (76.48%) were developed in. Kufri Khyati which was at par with. Kufri Mohan (76.99%) and Kufri Pukhraj (78.55%). As far as tubers yield is concern, highest tubers yield (wt. of tubers/clones) was recorded in. Kufri Mohan (1630g) which was at par with Kufri Chipsona-3 (1430g) followed by Kufri Chipsona-1 (1370g) and Kufri Bahar (1260g), while lowest yield of 1025g/ clone was recorded in. Kufri Khyati which was at par with all remaining cultivars in this study. From the above study we can conclude that there are differences in yield as well as rate of clonal development among cultivars.

IHS/T-6/PP-605

A preliminary assessment of seed yield and seed quality traits in ridge gourd (*Luffa acutangula* L.) genotypes under Chhattisgarh plains

Kalp Das, Padmakshi Thakur, Ganesh Prasad Nag and Rajshree Gayen

Krishi Vigyan Kendra, Raipur, Indira Gandhi Krishi Vishwavidyalaya, Chhattisgarh
Corresponding author: nkalpdas9@gmail.com

Abstract

The study was undertaken at Krishi Vigyan Kendra (KVK), Raipur, Indira Gandhi Krishi Vishwavidyalaya (IGKV), Chhattisgarh, to assess the effect of pollination timing and fruit retention on seed yield and seed quality traits in ridge gourd (*Luffa acutangula* L.). The experiment was conducted under open-field conditions following recommended agronomic practices using three ridge gourd genotypes, namely Arka Vikram (hybrid), Local Selection-23 and Local Selection (Narayan), as experimental material. Treatments consisted of different pollination timings and fruit retention levels imposed during hybrid seed production. Pre-harvest observations included flowering behaviour, days to fruit set, fruit set percentage, number of fruits retained per vine and days to maturity. Post-harvest assessments comprised fruit characteristics, seed number per fruit, seed yield per plant, test weight and seed quality parameters such as germination percentage, seedling length and seed vigor index. The results indicated that pollination timing and fruit retention had a pronounced influence on seed yield and seed quality. Properly timed pollination improved fruit set and seed development, while optimum fruit retention enhanced seed yield and seed vigor. Both excessive and inadequate fruit retention adversely affected seed filling and seed quality, highlighting the need for balanced crop load management.

IHS/T-6/PP-606

Propagation efficiency of wedge grafting in custard apple: cultivar- specific responses

Sunil Khandoliya, D. K. Sarolia, I. S. Naruka and Ramawatar Choudhary

Department of Horticulture, RVSKVV, Gwalior, Madhya Pradesh
Corresponding author: skhandoliya7@gmail.com

Abstract

The study was conducted to evaluate the success of wedge grafting in different custard apple cultivars under shade net nursery conditions. The experiment was carried out during 2023 at KNK College of Horticulture, Mandsaur .Eight custard apple cultivars viz., Balanagar, Arka Sahan, Annona-2, NMK-1, APK-1, NMK-3, Saraswati-7, and Chandsili were evaluated in a Completely Randomized Design with three replications. Observations were recorded on days to sprouting, days to 50% sprouting, vegetative growth parameters, and graft survival percentage. Significant variation was observed among cultivars. Balanagar recorded the earliest sprouting, with minimum days to sprouting (11.67) and days to 50% sprouting (14.00), while NMK-3 required the maximum time for sprouting. Arka Sahan exhibited superior graft performance, recording the highest number of buds and shoots per graft, maximum number of leaves (15.33), leaf area (37.09 cm^2), SPAD value (34.94), scion and rootstock girth, and the highest graft survival percentage (94.44%). The lowest growth and survival parameters were observed in Saraswati-7. The study concludes that wedge grafting success in custard apple is significantly influenced by cultivar. Arka Sahan was found to be the most suitable cultivar for wedge graft propagation under shade net conditions, while Balanagar was superior for early sprouting, making both cultivars suitable for nursery multiplication programmes.

IHS/T-6/PP-607

Effect of plant growth promoting rhizobacteria on growth of budded plants of walnut

Nayan Priya

Dr. Yashwant Singh Parmar University of Horticulture & Forestry, Nauni, Himachal Pradesh
Corresponding author:nayanpriya2002@gmail.com

Abstract

The investigation was carried out at Dr Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, during 2023-24. The experiment consists of ten treatments T1 (*Bacillus licheniformis* @0.5 litres/plant), T2 (*Bacillus licheniformis* @1.0 litres/plant), T3 (*Bacillus licheniformis* @1.5 litres/plant), T4 (*Bacillus pumilus* @ 0.5 litres/plant), T5 (*Bacillus pumilus* @1.0 litres/plant), T6 (*Bacillus pumilus* @1.5 litres/plant), T7 (*Bacillus subtilis* @0.5 litres/plant), T8 (*Bacillus subtilis* @1.0 litres/plant), T9 (*Bacillus subtilis* @1.5 litres/plant) and T10 (control) replicated size in randomized block design. PGPR significantly improved bud take success, plant height, scion diameter, scion height, number of leaves, leaf area, leaf chlorophyll content, photosynthesis, transpiration, stomatal conductance, fresh and dry weight of shoot, fresh and dry weight of root, total root length, total plant biomass, total phenolic content, and proportion of saleable plants. Soil nutrient status (available N, P, K), dehydrogenase activity, and microbial populations (bacteria, fungi, actinomycetes) were also enhanced, while soil pH, electrical conductivity, and organic carbon content remained unaffected. The best performance across all parameters was recorded with Bacillus pumilus @1.5 litres/plant (T6), which achieved maximum bud take success (89.04%), plant height (73.05 cm), scion diameter (12.30 mm), scion height (58.00 cm), number of leaves (98.45), leaf area (76.63 cm^2), chlorophyll content (52.70 mg/g), photosynthetic rate (16.19 µmol $CO2/m^2/s$), transpiration rate (3.12 mmol $H2O/m^2/s$), stomatal conductance (0.11 $mmol/m^2/s$), fresh weight of shoot (70.80 g), dry weight of shoot (46.47 g), fresh weight of root (158.33 g), dry weight of root (78.61 g), root length (5.77 m), total biomass (125.08 g), phenolic content (3.26 mg GAE/100 g), saleable plants (82.16%), N (274.94 kg/ha), P (98.72 kg/ha), K (497.33 kg/ha), dehydrogenase activity (8.03 µg TPF g^{-1} h^{-1}), and significantly followed by T9 (*Bacillus subtilis* @1.5 litres/plant) and superior to all other treatments. Hence, the application of PGPR strains *Bacillus pumilus* and *Bacillus subtilis* @1.5 litres/plant can be recommended for enhancing nursery production of walnut.



Theme

7

Protected cultivation and precision farming

IHS/T-7/OP-701

Comparative performance of lettuce cultivars under different media in an aggregate hydroponic system

Ankita Mohapatra, Prativa Sahu, Pradyumna Tripathy and Nityamanjari Mishra

College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha
Corresponding author: ankitamohapatra799@gmail.com

Abstract

The present study was conducted during the Rabi season 2024 in a naturally ventilated polyhouse under the climatic conditions of eastern Odisha. On lettuce (*Lactuca sativa* L.) the experiment aimed to assess the growth, yield and quality of three lettuce cultivars grown in two contrasting media: conventional soil, cocpeat and cocopeat-perlite mixture. A factorial completely randomized design (FCRD) was employed and observations were recorded on various vegetative traits, yield performance and quality attributes. The results revealed distinct and consistent advantages of the cocopeat-perlite medium over soil. Across all the cultivars, this substrate significantly improved seedling establishment, plant height, leaf development, biomass accumulation and overall yield. Thus, study clearly establishes cocopeat combined with perlite as a substantially better growing medium than soil for aggregate hydroponic production of lettuce. Its positive influence on plant growth, enhanced quality and improved economic viability highlights its potential for wider adoption in protected and soilless farming systems.

IHS/T-7/OP-702

Effect of soil and substrate composition on cultivation of kagzi lime grown under rooftop farming

Akash Sharma, Vikas Tandon, Parshant Bakshi and Vishal Gupta

Division of Fruit Science, Faculty of Horticulture & Forestry, SKUAST of Jammu, Chatha, Jammu, JKUT
Corresponding author: akash61@skuastj.org

Abstract

The expansion of urban agriculture necessitates the development of optimized growing media for high-value perennial crops like 'Kagzi' lime (*Citrus aurantifolia Swingle*) in spatially restricted environments, such as rooftops. Traditional soil often proves too heavy and prone to compaction in container-based systems, while soilless media require precise nutrient management. This study investigated the comparative effects of different substrate compositions—ranging from a standard soil-based mixture (soil:sand:FYM) to various soilless organic mixes—on the vegetative growth, yield, and fruit quality of containerized 'Kagzi' lime plants under rooftop conditions. This experiment was carried out at the rooftop at SKUAST, Jammu. The results indicated that the soilless and highly amended organic substrates significantly improved the fruit weight (36.80 g), fruit yield/ plant (2.94 kg), with the application of T_8 treatment {vermicompost+ cocopeat: vermiculite: perlite (5:2:1). followed by t_7 treatment {vermicompost + cocopeat: vermiculite: perlite (4:2:1)} while, minimum values were recorded in T_1 treatment {FYM + Cocopeat: vermiculite: perlite (2:1:1)}. Therefore, treatment T_8 {vermicompost+ cocopeat: vermiculite: perlite (5:2:1)} is recommended as the best treatment that integrating lightweight organic amendments is essential for maximizing the horticultural performance of 'Kagzi' lime in urban rooftop settings, thereby contributing to urban food security and greening initiatives.

Oral Presentation

IHS/T-7/OP-703

Optimization of micronutrient doses for aster (*Callistephus chinensis*)

Sudha Patil, S. L. Chawla, Dipal Bhatt, M. A. Patel and A. P. Chaudhary

ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat

Corresponding author: drsudhapatil@nau.in

Abstract

The experiment was conducted aster (*Callistephus chinensis* (L.) variety Arka Archana was at the Floriculture in RBD with three replications and nine treatments containing different micronutrient doses and application methods. The pooled data of three years revealed that T_2, i.e. Zn (2.5 kg/ha) + Mn (2.5 kg/ha) + B (1 kg/ha) + Fe (1.25 kg/ha) soil application (at planting) recorded maximum height but significantly maximum plant spread was reported in plants treated with T_7 while T_6 recorded maximum duration of flowering. In shelf-life of flowers, it was observed maximum in flowers produce by plants treated with T_1- Zn (5 kg/ha) + Mn (5 kg/ha) + B (2 kg/ha) + Fe (2.5 kg/ha) soil application (at planting). Maximum number of flowers was produced by plants treated with T_2 i.e. Zn (2.5 kg/ha) + Mn (2.5 kg/ha) + B (1 kg/ha) + Fe (1.25 kg/ha) soil application (at planting) during individual years and pooled analysis (54.67, 53.53, 54.87 and 54.36, respectively). Same treatment recorded maximum flower yield per plant (107.73 g, 109.00 g, 111.37 g and 109.37 g), flower yield per plot (2.50 kg, 2.48 kg, 2.58 kg and 2.52 kg) and flower yield per ha (8.17 t, 8.12 t, 8.44 t and 8.24 t) during all three individual years and pooled analysis, respectively. Moreover, T_7 recorded maximum available phosphorus in soil, potash was in T_8, Fe and B in T_4 and Zn in T_6. Whereas, N, Zn, Mn, Cu content in plant was recorded maximum in T_3, P and B in T_6, K in T_5 and Fe in T_2. Total dry matter content was found maximum in T1. Hence, application of FYM @ 20 t/ha and 180:120:60 kg NPK/ha as RDF along with 200 kg of neem cake enriched with 1 kg of *Trichoderma harzianum* was found best. However, full dose of P and K should be applied as basal, N in three equal splits-first as basal, second dose at pinching and third dose one month after pinching. Wherein, micronutrients, Zn (2.5 kg/ha) + Mn (2.5 kg/ha) + B (1 kg/ha) + Fe (1.25 kg/ha) should be applied in soil at the time planting to get higher yield and net realization.

IHS/T-7/OP-704

Optimization of LED quality parameters to enhance antioxidant potential and quality attributes in microgreens

Rekha Meena

Corresponding author: rekha.kr110@gmail.com

Abstract

This study applied response surface methodology (RSM) to assess the interactive effects of LED spectral composition (white, blue–red, red–far-red, blue–red–far-red), light intensity (100–300 µmol m^{-2} s^{-1}), and photoperiod (12–20 h) on antioxidant potential of radish and mungbean microgreens. In radish, blue-red–far-red spectrum at 300 µmol m^{-2} s^{-1} and 20 h photoperiod (L4(BRFr)-300-20) maximized antioxidant activity (50.52 ± 1.45% DPPH) and total phenolic content (355.77 ± 8.42 mg GAE/100 g), showing 51% and 59% increases over control. In mungbean, maximum antioxidant activity (81.27 ± 1.22%) was achieved under blue-red–far-red spectra at 100 µmol $m^{-2}s^{-1}$ and a 20 h photoperiod (L4(BRFr)-100-20), with TPC (205.78 ± 2.30 mg GAE/100 g) comparable to control. Overall, radish exhibited greater relative gains in both antioxidant activity and TPC under optimized light regimes compared with mung bean, indicating a higher responsiveness to spectral manipulation. Red–far-red light promoted elongation and fresh biomass in both species, whereas blue-red–far-red spectra at high intensity enhanced dry matter accumulation. The optimized treatments also reduced oxidative stress and stimulated stress-adaptive metabolism, supporting cellular stability under extended lighting. Improved pigment content under optimized lighting in mung bean and reduced nitrate accumulation (up to 35%) in both species indicate enhanced product quality and consumer safety.

IHS/T-7/OP-705

Real-time nitrogen estimation and automated foliar spraying system for polyhouse cultivation

Dilip Jat, Yogesh Rajwade, Narendra Singh Chandel and Abhijit Sarakar

ICAR-Central Institute of Agricultural Engineering, Bhopal, Madhya Pradesh
Corresponding author: dilipjat2000@gmail.com

Abstract

A real-time nitrogen estimation and foliar spraying system has been designed for tomato cultivation in a polyhouse environment. The system features a constant-pressure vertical spraying boom equipped with a nozzle assembly consisting of a hollow cone nozzle, solenoid valve, and auxiliary nozzle, ensuring uniform spray pressure during operation. The system integrates an Arduino Mega and Raspberry Pi with ultrasonic and proximity sensors, DC motors, a touch display, DC pump, encoder, power bank, and an 8-channel relay module. The machine operates autonomously on fixed railing system, detecting each plant and capturing leaf images in real time. Nitrogen concentration in leaves is estimated using deep learning models, including Vision Transformer, AlexNet, and EfficientNet. Leaf detection is performed with over 95% accuracy using the YOLO model. The nitrogen estimation models were trained on a dataset of 2500 tomato leaf images collected across three growing seasons, achieving a R^2 of 0.86 and an error range between 1.5% and 12.3%. Once a plant is detected, the Raspberry Pi processes the captured leaf images to determine the nitrogen concentration of each leaf and computes an average value for the entire plant. This data is then sent to Arduino, which calculates the precise spraying duration required to deliver the appropriate amount of nitrogenous foliar spray. The Arduino controls the solenoid valves for accurate application, while the auxiliary nozzles maintain stable pressure throughout. Spraying is adjusted dynamically based on plant height, ensuring targeted and efficient nutrient delivery. The system advances sequentially from plant to plant, enabling real-time, site-specific foliar application tailored to individual crop needs. The complete process of nitrogen estimation and foliar spraying for a single plant takes approximately 12-15 seconds, and the system can cover a 500 m^2 polyhouse area in about 3.0-3.25 hours.

IHS/T-7/OP-706

Harnessing UAV-based multispectral sensing, growth simulation, and machine learning for precision onion crop management

Sagar Wayal, **Sanket J. More, Kiran Khandagale, Pranjali Gedam, Bhushan Bibwe and *Suresh J. Gawande

**Corresponding author: sureshgawande76@gmail.com,*
***Presenting author: sanketmore1818@gmail.com*

Abstract

This study integrated ground-based morphological observations with UAV-derived multispectral vegetation indices (VIs) to simulate onion (Allium cepa L.) growth and identify growth thresholds associated with higher yield under protected and unprotected management conditions. Field experiments were conducted during 2024 growing season across four transplanting dates, treated as independent trials to capture temporal variability in crop establishment and development. Crops were categorized into protected plots, receiving need-based or calendar-based plant protection measures, and unprotected plots serving as untreated controls, while maintaining uniform agronomic practices. Weekly ground observations were recorded for plant height, leaf length, number of leaves, and pseudostem width. Concurrently, UAV-based multispectral imagery was acquired at weekly intervals, and vegetation indices including NDVI, NDRE, GNDVI, SAVI, and leaf area index (LAI) were derived to assess canopy vigor. Crop growth dynamics were simulated using Gompertz and Logistic growth models for individual morphological traits. The Gompertz model provided biologically meaningful parameterization by identifying the inflection point marking the transition from transplant establishment to active vegetative growth, occurring approximately 13–19 days after transplanting. This phase was characterized by rapid canopy expansion and

increased leaf initiation. Protected crops consistently exhibited higher growth rates, delayed saturation, and prolonged canopy persistence across traits compared to unprotected crops, indicating enhanced physiological activity and reduced stress. To capture nonlinear relationships among morphological traits, UAV-derived indices, and yield, machine learning models were developed. Feature importance and stage-wise analyses revealed shifts in dominant predictors across phenological stages. Morphological traits were more influential during vegetative and bulb initiation stages, whereas UAV-derived vegetation indices emerged as stronger predictors during bulb development, emphasizing the increasing importance of canopy-level signals for yield prediction. Overall, integrating UAV sensing, nonlinear growth modeling, and machine learning provides a robust decision-support framework for precision onion management.

IHS/T-7/OP-707

Global research trends in protected cultivation: a bibliometric analysis of horticultural crops

M. Ramesh Naik, R. Ravi Teja, Ramasubramanian V, Umesh Hudedamani and Gopal Lal

ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad, Telangana
Corresponding author: ramesh.naik@naarm.org.in

Abstract

The bibliometric analysis examined 17,490 research articles indexed in Scopus during 2000-2025, focusing on global research trends in protected cultivation of fruits, vegetables, ornamental crops, and controlled environment agriculture (CEA). The study evaluated scientific growth patterns, influential journals, key authors, leading institutions, collaboration networks, and the thematic evolution of research using R Studio and Biblioshiny. Results indicate a steady annual publication growth rate of 9.37%, with scientific output increasing from 161 articles during 2000 to 1511 in 2025. *Scientia Horticulturae*, *Acta Horticulturae*, and *HortScience* emerged as the most prominent publication destinations. Keyword analysis highlights a strong research emphasis on greenhouses, tomato, yield, fruit quality, sustainability, and biological control, reflecting a shift towards climate-smart practices and precision horticulture. China, USA, Spain, Brazil, Italy, and India lead global research output, with China and USA demonstrating the highest collaborative Connectivites. Highly cited works predominantly focus on environmental sustainability, life-cycle assessments, input-use efficiency, and greenhouse management. Author collaboration networks reveal major global clusters led by researchers such as Youssef Rouphael, Giuseppe Colla, and Marisa Gallardo. Life-cycle modelling predicts a research to peak around 2036, followed by gradual stabilization, signalling maturity and diversification of the field. Thus, the findings underscore that protected cultivation research is rapidly expanding, interdisciplinary, and increasingly aligned with global priorities such as climate resilience, input efficiency, and sustainable intensification in horticultural production. The present analysis provides a comprehensive foundation for researchers, policymakers, and industry stakeholders to identify knowledge gaps, strengthen collaborations, and guide future innovations in controlled horticultural environments.

IHS/T-7/OP-708

Advancing sweet potato production through soilless systems

J. Suresh Kumar, K. Sunilkumar and M. Nedunchezhiyan

ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvanathapuram
Corresponding author Email: sureshkumar.jabu@gmail.com

Abstract

Extensive work has since been carried out by the Chinese Academy of Agricultural Sciences and ICAR-CTCRI, Thiruvananthapuram, Kerala. The CTCRI has developed low-cost, crop-specific nutrient formulations, tested the technology in controlled environments, and standardized production protocols for sweet potato. The results demonstrate significant varietal-dependent yield potential, with high-quality planting material, a 4–8-fold

increase in vine multiplication rate, and a 2–3-fold increase in marketable tuber yield compared to conventional soil-grown crops—all with negligible pest and disease incidence. Sensory evaluation and proximate analysis confirmed that tubers produced in soilless systems are comparable in quality to those grown conventionally. This research highlights the strong potential of protected soilless cultivation for sustainable production of quality vines and tubers in sweet potato. As the technology has now been made cost-effective and is undergoing rigorous multi location testing across different agroclimatic zones, it shows great promise for widespread adoption, enabling growers to produce healthier crops with higher yields and minimal pest and disease incidence.

IHS/T-7/OP-709

Impact of bio-botanicals on yield and fruit quality of okra

Moomal Bhardwaj and M.C. Jain

Agriculture University, Kota (Rajasthan)
Corresponding author: moomalbharadwaj@gmail.com

Abstract

A field experiment was conducted during Kharif for 2022 and 2023 at Certified Organic Unit, Agricultural Research Station, Ummedganj, Kota, and Rajasthan. The experiment was laid out on clay loam soil to study Impact of bio-botanicals on yield and fruit quality of okra [*Abelmoschus esculentus* (L.) Moench] var. Pusa Bhindi-5 in a randomized block design with three replications. The ten treatments comprised of T0 (control), T1 (vermiwash @ 10 % at 30, 45 and 60 DAS), T2 (Jeevamrut @500 litres/ha at sowing), T3 (Jeevamrut @ 500 litres/ha at 30, 45 and 60 DAS), T4 (Cow urine @ 10 % at 30, 45 and 60 DAS), T5 (Panchgavya @ 5% at 30, 45 and 60 DAS), T6 (Amritpaani@ 500 litres/ha at 30, 45 and 60 DAS), T7 (Jeevamrut @ 500 liters/ha at sowing+ Vermiwash @ 10% at 30, 45 and 60 DAS), T8 (Jeevamrut @ 500 liters/ha at sowing+ Cow urine @ 10% at 30, 45 and 60 DAS), T9 (Jeevamrut @ 500 liters/ha at sowing+ Amritpaani@500 liters /ha at sowing + foliar spray of Panchgavya 5% + Vermiwash 10% at 30, 45 and 60 DAS). The pooled result of the experiment is showed that the application of treatment T9 (Jeevamrut @ 500 litres/ha at sowing+ Amritpaani@500 litres/ha at sowing + foliar spray of Panchgavya 5% + Vermiwash 10% at 30, 45 and 60 DAS) profoundly improved the yield parameters viz., Number of fruits per plant (14.56), average fruit length (15.74 cm), average fruit weight (15.25 g), days taken to first picking (35.67), number of pickings (11.20), yield per plant (223.13 g) and yield per hectare (123.96 q/ha) along with quality parameters viz., Crude fibre (2.21%), Crude protein content (8.6%), Total chlorophyll content (2.21 mg/mL), TSS (2.36°Brix) and Total ash content (10.08%). Further this treatment has also given the maximum net returns (184888 Rs./ha) including gross return (260753 Rs./ha) and B:C ratio (2.43) as compared to the minimum in Control viz. gross return (164892 Rs./ha) net returns (102377 Rs./ha) and B:C ratio (1.64).

IHS/T-7/OP-710

LED-based growth chamber module for crop regulation in *Chrysanthemum morifolium* cv. Zembla

Neeraj Singh Negi and Mam Chand Singh

RLBCAU, Jhansi, Uttar Pradesh
Corresponding author: neerajgbpuat5@gmail.com

Abstract

LEDs (Light Emitting Diodes) are increasingly becoming popular as an artificial source of light, used both as supplemental source and as night break in various crops. To assess their effect on morphological aspects as well as to quantify endogenous gibberellic acid levels in potted Chrysanthemum morifolium 'Zembla', an experiment was conducted in CPCT, IARI (New Delhi). A total of 4 LED treatment combinations with PAR (Photosynthetically Active Radiation) at 120 ± 5 µmol m−2 s−1 irradiance were selected, i.e. 100% red (R), 100% blue (B), 100% white (W), 80% red and 20% blue (80R: 20B) and fluorescent light (FL) as a control treatment. These treatments were subjected as artificial long days in chrysanthemum for 14-hour duration. Potted chrysanthemum plants were

placed below the LED lights in a plant growth chamber after a 30-day healing phase under a semi-automated greenhouse. Plant height was significantly affected with the LED treatments. The stem length was found to be highest (59.76 cm) under 100% red (R) treatment, followed by 80% red and 20% blue (80R: 20B); while plants with reduced height were observed under 100% blue (B) treatment of LED lights. However, flowering was significantly delayed in 100% blue (B) treatment (102.6 days) compared to control (fluorescent light) (82.2 days). To further investigate the impact of LEDs on endogenous gibberellic acid levels in individual treatments, the plants were subjected to HPLC-MS facility at Division of Plant Physiology, IARI, New Delhi. The results were indicative of highest levels of GA3 in 100% red (R) treatment, while the levels were found to be minimum under 100% blue (B) treatment. This study highlights the importance of LEDs for augmenting stem length along with flower programming in crops like chrysanthemum, where the market price of cut flower is largely dependent on the stem length and off season production.

IHS/T-7/PP-701

Optimization of seed production technology of cucumber (*Cucumis sativus* L.) under naturally ventilated polyhouse condition

Raju Yadav, Balraj Singh, M.K. Sharma, Basant Dadarwal

Department of Horticulture, SKN College of Agriculture, Jobner, Jaipur, Rajasthan
Corresponding author: rajuyadav15082000@gmail.com

Poster Presentation

Abstract

Optimization of seed production technology of cucumber (*Cucumis sativus* L.) *cv*. Pusa Parthenocarpic Cucumber-6 under naturally ventilated polyhouse condition was conducted during *Kharif* season-2023 and summer season-2024 under naturally ventilated polyhouse condition at Department of Horticulture, S.K.N. College of Agriculture, Jobner, Jaipur. Three chemicals, *viz.* gibberellic acid (500 & 1000 ppm), silver nitrate (300 and 500 ppm) and silver thiosulphate (300 and 500 ppm) were used and total seven treatments including control were applied as foliar applications on parthenocarpic cucumber *cv*. 'Pusa Parthenocarpic Cucumber-6 (PPC-6) The flowers were further pollinated at 7, 8, 9, 10 and 11 AM. The harvesting was done at 25, 35 and 45 days after pollination and post-harvest ripened for 0, 10, 20 and 30 days for standardization of above three quality seed production. Among three chemicals, silver thiosulphate @ 300 ppm exhibited superior results for days taken to appearance of first staminate flower, total number nodes induced staminate flower and number of staminate flower over other treatments except flower diameter which was found to increase with silver nitrate @ 500 ppm. All the seven treatments were found to produce staminate flower, except control. Further pollination at 9 AM gave superior results as it had maximum percentage of fruit setting (90.91%), percentage of fruits to develop physiological maturity (74.93 %), seed setting percentage (81.43 %). The maximum fruit length (22.81 cm), fruit breadth (5.58 cm), filled seeds, (284.28), seed yield per plant (8.52 g), seed recovery per cent (82.54 %), 100 seed weight (2.48), seed germination per cent (83.57 %), seed vigour index-I (1903.25) and seed vigour index-II (11.73) and minimum number of unfilled seeds (83.61) were registered under treatment combination HS_3PHR_4 (HS at 45 days from pollination and 30 post-harvest ripening periods). Further, significantly higher net returns of (1730893 ₹/500 m^2) and ICBR (9.75) were fetched in same treatment combination in PPC-6 cultivar.

IHS/T-7/PP-702

New age farming technologies in vegetable crops with special emphasis on protected cultivation

Dhaneshvari Arya, B. Singh and B. Kumar

Corresponding author: arya081998@gmail.com

Abstract

Protected cultivation has emerged as a vital strategy for improving vegetable production under the pressures of climate change, resource scarcity, and pest outbreaks. Structures such as polyhouses, shade nets, tunnels, and rain shelters provide controlled environments that protect crops from unfavorable weather, enable off-season production, and improve yield and quality. These systems promote efficient resource use by conserving water, reducing pesticide applications, and allowing precise nutrient management. The integration of micro irrigation and fertigation technologies within protected structures ensures targeted input delivery, enhancing productivity while lowering costs. Advanced tools such as climate sensors, automated controllers, and remote monitoring systems further optimize crop growth and minimize production risks. In addition, nanotechnology-based inputs for fertilizers and crop protection, when used in enclosed environments, improve effectiveness and reduce environmental losses. Integrated pest management approaches, particularly the use of biological control agents, are also more effective under protected conditions, supporting eco-friendly production. Recent incorporation of automation, robotics, and artificial intelligence into protected farming has further strengthened vegetable cultivation by enabling real-time crop monitoring, predictive pest surveillance, and labor-efficient operations. Together, these innovations make vegetable farming more resilient, profitable, and sustainable. By combining protected cultivation with precision inputs and digital technologies, future vegetable production can meet rising consumer demand while safeguarding natural resources and ensuring climate adaptability.

IHS/T-7/PP-703

Enhancing income through vertical farming of vegetables under protected cultivation

R. K. Singh, A. L. Ola, B. B. Sharma, Saurabh Singh and Manish Shrivashtva

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh
Corresponding author: rksrlbcau@gmail.com

Abstract

A single plant of tomato (NS-4266) give 4.0-7.5 kg fruits in under vertical farming. Whereas, under tomato umbrella, white cauliflower, Safeda F1, Lucky and Sharad Shusma given compact curd, weighting about 0.900 kg and 0.850 kg respectively. The coloured cauliflower, i.e. Valentina and Carotena gives 0.950 kg and 1.05 kg respectively. Broccoli Batavia F, and NS-50 F 0.900 kg and 0.800 respectively of compact curd. Cabbage Goody Ball F and Gaytri F provides 1.00 kg and 0.900 kg respectively. Brussels Sprout, Franklin F recorded 0.450 g. Thus, farmers of Bundelkhand region can cultivate high-values vegetable crops under the umbrella of indeterminate tomato to increases their income.

IHS/T-7/PP-704

A review on the impact of drip irrigation on growth, yield, and economic viability of Maize (*Zea mays*)

Krishna, S. K. Verma, G. Sharma, Pushpalata Tirkey and Neha Sahu

BTC CARS, Bilaspur, IGKV, Raipur, Chhattisgarh
Corresponding author: drkrishnadahre919@gmail.com

Abstract

Drip irrigation has emerged as a vital technology for improving water-use efficiency and sustaining crop productivity, particularly under increasing water scarcity. This review examines the influence of drip irrigation on maize growth, yield attributes, resource use efficiency, and economic feasibility. Research findings across different agro-climatic regions demonstrate that drip irrigation enhances soil moisture uniformity, reduces conveyance and evaporation losses, and creates a favourable root-zone environment. These improvements contribute to better germination, enhanced leaf area expansion, sustained photosynthetic activity, and greater biomass accumulation compared with conventional surface irrigation. Studies consistently report that drip-fed maize exhibits improved root development and more efficient nutrient uptake, leading to higher cob size, grain weight, and overall yield. In addition to growth and yield benefits, drip irrigation significantly increases water-use efficiency by delivering water directly to the root zone at critical crop stages. This precise application reduces water wastage and supports stable crop performance even under limited irrigation. Economic analyses reviewed in the literature indicate that, although the initial cost of installing drip systems is relatively high, the technology results in higher net returns, reduced labour costs, savings in fertilizer through fertigation, and an overall improvement in the benefit–cost ratio. Thus, drip irrigation provides both productivity and economic advantages, making it a promising technology for sustainable maize cultivation. The combined improvements in yield, resource conservation, and profitability highlight the potential of drip irrigation as an essential component in modern maize production systems.

IHS/T-7/PP-705

Effect of Plant Growth Regulators on Yield, Quality and Economics of Onion (*Allium cepa* L.)

S. K. Verma, Pushpalata Tirkey, Krishna and Neha Sahu

BTC CARS, Bilaspur, IGKV, Raipur, Chhattisgarh
Corresponding author: drkrishnadahre919@gmail.com

Abstract

A field investigation was conducted to evaluate the effect of plant growth regulators on yield attributes, quality parameters and economics of onion (Allium cepa L.). The study comprised various foliar applications of Gibberellic Acid (GA_3) and Naphthalic Acetic Acid (NAA) at different concentrations. Results revealed that the combined foliar application of GA_3 @ 60 ppm + NAA @ 30 ppm (T_8) consistently recorded the highest values for polar diameter (50.46 mm), equatorial diameter (55.97 mm), bulb shape index (0.90), average bulb weight (65.12 g), total yield (19.35 t ha^{-1}), gross return (₹ 348241.62 ha^{-1}), net return (₹ 270901.62 ha^{-1}) and B:C ratio (3.50). This treatment was statistically at par with T_7 (GA_3 @ 40 ppm + NAA @ 20 ppm) for most parameters but significantly superior to other treatments. The lowest performance for all attributes was recorded in the control (T_9). Application of GA_3 and NAA significantly enhanced bulb dimensional attributes, yield and sugar accumulation (TSS), indicating improved physiological activities such as enhanced cell elongation, division and assimilate translocation. Although bolting percentage was higher in treatments receiving GA_3 and NAA, the positive impact on yield and profitability outweighed the negative effects. Overall, the results confirm that foliar spray of GA_3 @ 60 ppm + NAA @ 30 ppm is most effective for improving yield, quality and economic returns in onion cultivation.

IHS/T-7/PP-706

Evaluation of precision farming for resource-efficient vegetable production

Baldev Jayani and Rakesh Kumar

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh
Corresponding author: baldevjani1999@gmail.com

Abstract

The key precision farming strategies in vegetable production include precision soil and nutrient management, precision irrigation and real time crop monitoring. Soil mapping, nutrient diagnostics and sensor-based information enable accurate estimation of crop nutrient requirements and support targeted fertilizer application through fertigation and variable rate technologies, thereby improving nutrient-use efficiency and reducing losses. Precision irrigation systems such as drip and micro-irrigation combined with soil moisture sensors and weather based scheduling ensure optimal water supply while minimizing wastage through evaporation, runoff and leaching. Although high initial costs, technical complexity and limited accessibility remain especially for smallholding farmers. The development of affordable technologies, training programme, and policy support can enhance adoption. Overall, precision farming strategies provide a sustainable and economically-viable approach to resource-efficient vegetable production, helping meet the growing demand for quality vegetables while conserving soil, water and other essential agricultural resources.

IHS/T-7/PP-707

Protected cultivation of vegetables to enhance productivity and quality

Naveen Ola

Agriculture University, Jodhpur, Rajasthan
Corresponding author: Naveenola530@gmail.com

Abstract

The adoption of protected cultivation has significantly improved yield potential, produce quality and crop uniformity in several high-value vegetable crops such as tomato, capsicum, cucumber, brinjal, lettuce and other leafy vegetables. The integration of advanced irrigation systems like drip irrigation and fertigation allows precise application of water and nutrients, resulting in improved water-use efficiency and reduced nutrient losses. Moreover, protected cultivation enables off-season and year-round production, leading to higher market prices and better income stability for farmers. Protected cultivation also plays a crucial role in mitigating the impacts of climate change by reducing crop exposure to extreme temperatures, heavy rainfall, and frost and wind damage. It minimizes the incidence of pests and diseases, thereby lowering the dependence on chemical pesticides and promoting safer and more sustainable vegetable production.

IHS/T-7/PP-708

Protected cultivation meets precision farming

Sourabh Sherawat

Corresponding author: sourabh7078@gmail.com

Abstract

Precision farming integrates advanced technologies such as GPS, GIS, remote sensing, sensors, drones, and variable-rate application systems to optimize input use based on spatial and temporal crop requirements. This site-specific crop management approach minimizes wastage of water, fertilizers, and pesticides while enhancing crop productivity and environmental sustainability. The convergence of protected cultivation with precision farming tools offers significant potential for maximizing resource-use efficiency, improving decision-making, and enabling climate-resilient horticulture. Together, these approaches contribute to enhanced profitability, reduced production risks, and sustainable intensification of agriculture, making them crucial strategies for future farming systems.

IHS/T-7/PP-709

Vertical hydroponic cultivation of strawberry (*Fragaria* × *ananassa*) for enhanced productivity

Nitu Kumari and Deepa H. Dwivedi

Rani Lakshmi Bai Central Agricultural University, Jhansi
Corresponding author: nitukumari171998@gmail.com

Abstract

The study evaluated the performance of strawberry (*Fragaria* × *ananassa* Duch.) cultivars, Sweet Charlie and Winter Dawn, grown under a closed-loop vertical hydroponic Nutrient Film Technique (NFT) system in protected conditions with special emphasis on precision nutrient management using bio-organic and nano-based inputs. The experiment was conducted duration 2023–24 at Babasaheb Bhimrao Ambedkar University, Lucknow, using a Factorial Completely Randomized Design with six nutrient treatments and three replications. The treatments included control, jeevamrit (10%), homa ash (400 ppm), nano urea (2%), hoagland solution (4%), and nano zinc (25 ppm). The results revealed significant effects of cultivars, nutrient treatments, and their interactions on growth, yield, and fruit quality parameters. Among all treatments, 'Winter Dawn' supplied with homa ash exhibited superior vegetative growth, enhanced root development, increased flowering and fruit set, and recorded highest fruit yield (329.81 g/plant), representing a 120.56% increase over the control. Improvements in fruit size, weight, and volume reflected enhanced nutrient bioavailability, likely due to the nano-scale mineral composition and slow-release characteristics of homa ash, which complemented the vertical NFT system.

IHS/T-7/PP-710

Performance of vegetable crops under different protected cultivation structures

Rohitashv Sharma and K. D. Ameta

MPUAT, Udaipur, Rajasthan
Corresponding author: rohitashv1999sharma@gmail.com

Abstract

Protected farming is an advanced agricultural technology increasingly adopted for the cultivation of high-value crops such as vegetables, flowers, and other perishable commodities. In modern agriculture, protected cultivation plays a crucial role in enhancing productivity and ensuring crop quality by mitigating the adverse effects of climatic variability. Structures such as polyhouses, shade net houses, low tunnels and shadow halls create a favourable microclimate that promotes better crop growth, higher yields and improved produce quality. Vegetables grown under protected conditions exhibit superior quality, reduced pesticide residues and increased productivity compared to open-field cultivation. Additionally, protected cultivation significantly improves water-use efficiency, reducing irrigation requirements by 35.6% in shadow halls, 35.2% in polyhouses and 25.5% in shade net houses. Among structures, shadow halls proved most effective for vegetable cultivation, followed by polyhouses and shade net houses. Overall, protected structure-based farming enhances agricultural productivity, profitability, resource-use efficiency, and sustainability, resulting in substantially higher gross and net returns compared to open-field farming.

IHS/T-7/PP-711

Effect of different colour mulching on growth and flowering of strawberry under organic condition

P. D. Solanki, J. S. Chaudhari, Dixita Prajapati and Bhumi Lad

ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat
Corresponding author: pdsolanki@nau.in

Abstract

The effect of different colour mulching on growth and flowering of strawberry under organic condition was carried out during 2022-23, at ASPEE College of Horticulture, Navsari Agricultural University, Navsari. The experiment was laid out in randomized block design with three replications and eight treatments, viz. black plastic mulch (T_1), Silver plastic mulch (T_2), Red plastic mulch (T_3), Yellow plastic mulch (T_4), Blue plastic (T_5), White plastic mulch (T_6), Transparent plastic mulch (T_7) and Control-Paddy Straw mulch (T_8). The application of different colour mulches showed significant effects on growth and flowering parameters. The experimental findings revealed that the highest plant spread in both directions at 30 DAP {E-W (16.91 cm) and N-S (14.39 cm)}, 60 DAP {E-W (24.53 cm) and N-S (24.07 cm)} and 90 DAP {E-W (29.62 cm) and N-S (28.40 cm)}, number of leaves at 30, 60 and 90 DAP (7.53, 16.80 and 20.33 plant-1, respectively) and number of flowers (29.80 plant-1) were obtained with Silver plastic mulch (T_2) and lowest results were observed in Control-Paddy Straw mulch (T_8) under organic condition.

IHS/T-7/PP-712

Chrono-regulatory effects of ethephon on growth and reproductive performance in bottle gourd (*Lagenaria siceraria*)

Prakash Mahala, Babanjeet, Dilpreet Talwar and Navjot Singh Brar

J.C. Bakhshi Regional Research Station, Abohar, PAU, Ludhiana, Punjab, India
Corresponding author: pmahala@pau.edu

Abstract

Plant growth regulators play a pivotal role in modulating growth, flowering behavior and yield potential in cucurbitaceous crops. In this context, in Kharif season 2022–2023 a field experiment at PAU, Abohar was conducted to evaluated stage-specific foliar application of ethephon (200 ppm) in bottle gourd. Spray was done at the two-leaf stage, four-leaf stage, bud initiation stage, two-leaf + four-leaf stage, two-leaf + four-leaf + bud initiation stage and a control. The experiment was laid out in randomized block design having four replications. At the two + four leaf + bud-initiation stage (T6) the most effective was the combined one which yielded the highest number of branches (7.19), the earliest female flower appearance (53.58 days), the delay male flower initiation (48.70 days), the lowest count of male flowers (126.42) and the highest count of female flowers (21.06). Morphological characteristics of fruits and yield were improved also under T6 and reached the highest polar diameter (15.63 cm), equatorial diameter (13.84 cm), fruit weight (564.17 g and fruits per vine (7.71). T6 yield attributes were also better with early fruit yield (13.01- kg/plot), total fruit yield (39.03kg/plot), productivity (520.48q/ha) and higher total soluble solids (2.56 o Brix). Ethephon application as compared to the control, decreased the number of days to first fruit harvest, increased the period of harvesting, augmented sex ratio and improved quality of the fruit. Thus, stage-specific foliar application of ethephon (200 ppm) at two-leaf + four-leaf + bud-initiation stages emerged as a cost-effective and sustainable approach for improving growth, yield, quality and overall productivity of bottle gourd.

IHS/T-7/PP-713

Performance evaluation of lettuce varieties under aeroponic and geoponic growing systems: an interaction study

Anand Sahil, SR Singh, AK Singh, Anil and Abhay Kumar

ICAR- Central Horticultural Experiment Station, CIAH RS, Godhra, Gujarat
Corresponding author: anandmaharana19981998@gmail.com

Abstract

The study investigated the interaction effects of different lettuce (*Lactuca sativa* L.) varieties grown under aeroponic and geoponic systems to identify the most suitable variety and production system for subtropical conditions. The experiment was conducted during 2021–2022 at ICAR–Central Institute for Subtropical Horticulture, Rehmankhera, Lucknow. Five lettuce varieties Tango, Summer Star, Grand Rapid, Bingo, and Black Rose were evaluated for yield and quality attributes under both cultivation systems. Among varieties, Black Rose recorded the highest dry matter content (7.03% under aeroponics and 6.89% under geoponics) and the highest total carotenoid content (7.87 and 8.06 mg 100 g^{-1} under aeroponic and geoponic systems, respectively). In contrast, Summer Star was the highest-yielding variety, producing 234.85 and 191.44 q ha^{-1} of leaf yield under aeroponic and geoponic systems, respectively. Overall, the aeroponic system consistently outperformed the geoponic system in terms of yield per unit area, highlighting its strong potential for efficient and sustainable lettuce production in subtropical regions.

IHS/T-7/PP-714

Influence of inorganic, organic and biofertilizer-based nutrient management on growth and yield of tomato (*Solanum lycopersicum*)

Abhishek Kumar, Shakti Khajuria, Kanak Lata and Renu Godara

Corresponding Author: kabhishek15072000@gmail.com

Abstract

A field experiment was conducted during the kharif season of 2025 at Krishi Vigyan Kendra (KVK), Panchmahal, to study the influence of inorganic, organic, and biofertilizer-based nutrient management on growth and yield of tomato (*Solanum lycopersicum* L.) cv. Gujarat Tomato-5. The experiment was laid out in a randomized block design with four treatments and three replications. The nutrient management treatments comprised T_1: recommended dose of fertilizers (RDF @ 150:60:60 kg N: P: K ha? ¹), T_2: vermicompost @ 25 q ha?¹, T_3: Phosphorus solubilizing bacteria (PSB @ 2 ml L?¹ as seedling treatment), and T_4: control (no nutrient application). Growth parameters recorded at 60 days after transplanting (DAT) were significantly influenced by the nutrient management treatments. Treatment T_1 recorded the highest plant height (93.50 cm), maximum number of primary branches per plant (18.65), and greatest plant spread (68.80 cm), and indicating enhanced vegetative growth under balanced nutrient availability. In comparison, vermicompost treatment (T_2) resulted in moderate growth with plant height of 70.10 cm, 14.00 primary branches per plant, and plant spread of 63.30 cm. Application of PSB (T_3) produced similar plant height (70.51 cm) and number of primary branches (13.90), though plant spread was comparatively lower (60.40 cm). The control treatment ($_{T4}$) exhibited the lowest growth performance due to the absence of external nutrient supplementation.

The results indicated that inorganic nutrient management through RDF was most effective in improving growth and yield of tomato cv. Gujarat Tomato-5. However, organic and biofertilizer-based treatments also enhanced crop performance over the control, demonstrating their importance in sustainable nutrient management strategies and their potential role in integrated nutrient management practices.

IHS/T-7/PP-715

Advances in Production Technology for Strawberry under Protected Conditions through Plant Growth Regulator Application

Shubhangi Shekhar, Devi Singh, Saurav Vats, Avantika Anand and Anita Kumari

Department of Horticulture (Fruit & Fruit Technology), Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India
Corresponding author: shubhangin171128@gmail.com

Abstract

Strawberry (*Fragaria* × *ananassa* Duch.) is a high-value horticultural crop with increasing importance under protected cultivation; however, its productivity is highly sensitive to physiological regulation. The present study evaluated the effect of plant growth regulators (PGRs) on growth, yield, and fruit quality of strawberry cv. Winter Dawn under naturally ventilated polyhouse conditions. The experiment was conducted in a randomized block design with ten PGR treatments comprising different concentrations of cycocel and naphthalene acetic acid (NAA), along with a control. Results revealed that PGR application significantly influenced vegetative growth, flowering, fruiting behaviour, yield, and quality attributes. Among all treatments, NAA 125 ppm exhibited superior performance by recording maximum plant height, leaf area, number of flowers and fruits per plant, fruit size, fruit weight, and yield per plant and per hectare. The same treatment also resulted in early harvesting and improved quality parameters such as total soluble solids and ascorbic acid content, along with a favourable acidity balance. Economically, NAA at 125 ppm produced the highest benefit–cost ratio (3.25), indicating its commercial viability. The study highlights the role of plant growth regulators as an effective production technology for enhancing strawberry productivity under protected environments. These findings contribute to recent advances in crop management practices and offer a sustainable approach for improving yield and quality in horticultural crops cultivated under controlled conditions.

IHS/T-7/PP-716

Smart precision horticulture: role of remote sensing, gis and machine learning in vegetable production

Kaushalya Choudhary

Department of Vegetable Science, College of Agriculture, SKRAU, Bikaner, Rajasthan
Corresponding mail: kaushalyachoudhary303328@gmail.com

Abstract

Precision horticulture revolutionizes vegetable crop management through cutting-edge technologies and data analysis. It boosts efficiency, conserves resources and maximizes yields by customizing treatments to individual plant requirements at a fine scale. Essential techniques encompass variable rate technology (VRT), remote sensing, geographic information systems (GIS) and informed decision-making processes. Multispectral and hyperspectral imaging in remote sensing enables real-time tracking of plant vitality, soil status, soil status and nutrient profiles. Such tools reveal crop heterogeneity, supporting targeted strategies for fertilization, irrigation and pest mitigation. GIS mapping offers spatial insights into field dynamics, pinpointing soil and crop performance disparities. Automation, robotics and drones further enhance operations by streamlining planting, pruning, harvesting and field surveillance, slashing labour expenses and accelerating responses to environmental shifts. Machine learning and predictive models refine yield forecasts and early issue detection, while sensor integration empowers proactive, data-backed choices to elevate output.

IHS/T-7/PP-17

Smart floriculture for sustainable development

Md Faishal Ahmad

Corresponding author: faishalahmad947@gmail.com

Abstract

Floriculture is a vital branch of horticulture that focuses on the cultivation, production, and marketing of flowers and ornamental plants. In recent years, the sector has undergone rapid transformation owing to the integration of advanced technology. Smart floriculture refers to the application of modern digital tools, including precision agriculture, sensors, the Internet of Things, automation, artificial intelligence, and data-driven decision support systems, to enhance productivity, quality, resource utilization efficiency, and sustainability. This study highlights the roles of precision agriculture, greenhouse automation, genetic engineering, vertical farming, post-harvest technologies, and e-business models in modern floriculture. Next-generation technologies, such as artificial intelligence, nanotechnology, sustainable and circular floriculture, and gene-editing technologies, indicate the industry's growth potential. Smart floriculture has emerged as a promising pathway to ensure sustainable growth in the floriculture industry by integrating advanced technologies to meet the increasing global demand for superior-quality ornamental plants.



SOCIETY FOR HORTICULTURAL RESEARCH AND DEVELOPMENT
SHRD

Theme 8

Diseases and pest management of horticultural crops



4th Indian Horticulture Summit-Cum-International Conference-2026

Book of abstracts

IHS/T-8/OP-801

Antimicrobial efficacy of volatile compounds from antagonistic yeast *Hanseniaspora uvarum* LE-1 against postharvest pathogens

Amrita Das, Pratibha Murmu, Rinchen Angmo, Deeba Kamil and Aditi Kundu

Division of Plant Pathology, ICAR-IARI, New Delhi
Corresponding author: amritapatho@gmail.com

Abstract

Phytopathogenic fungi are a major cause of postharvest losses in fruits and vegetables, accounting for approximately 20–25% of production decline. Volatile organic compounds (VOCs) have emerged as safe and ecofriendly alternatives to synthetic pesticides for managing these pathogens. Antagonistic yeasts exert biocontrol activity through multiple mechanisms, among which the production of bioactive secondary metabolites plays a pivotal role. In this study, VOCs produced by the yeast strain Hanseniaspora uvarum LE1 were evaluated for antifungal efficacy against *Alternaria alternata* (74% inhibition), *Colletotrichum musae* (85%), and *Penicillium italicum* (54%). Gas chromatography–mass spectrometry (GC/MS) analysis revealed that the VOCs were predominantly alcohols and aldehydes. Representative pure metabolites from these groups exhibited significant antifungal activity, suppressing both spore germination and mycelial growth under *in vitro* conditions across all the pathogens. Furthermore, in vivo biofumigation assays demonstrated a marked reduction in disease incidence, confirming the antifungal potential of yeast-derived VOCs. These findings highlight biofumigation with yeast-produced volatile metabolites as an environmentally sustainable strategy for postharvest disease management and provide a promising foundation for future biocontrol applications.

IHS/T-8/OP-802

Management of twister disease of *kharif* onion from nursery stage

Rakesh Sonawane, Ravindra Patil, Hemant Patil and Ravindra Gaikwad

Onion Grape Research Station, Pimpalgaon Baswant, Nashik, Maharashtra, India
Corresponding author: rbsonawane21@gmail.com

Abstract

The management of twister disease of onion by using new chemical fungicides was conducted on onion, Baswant 780 for 3 years at Onion and Grape Research Station, Pimpalgaon Baswant, Nashik (Maharashtra) during *kharif* season of 2023-24 to 2025-26. The experiment was conducted in randomized block design with nine treatments which includes eight fungicides with one untreated control treatments, viz. T_1 - Azoxystrobin 18.2% + Difenoconazole 11.4% SC @ 0.1%, T_2 - Pyroclostrobin 5% + Metiram 55% WG @ 0.1%, T_3 - Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.1%, T_4 - Azoxystrobin 18.2% + Cyperoconazole 7.3% SC @ 0.1%, T_5 - Hexaconazole @ 0.1%, T_6 - Azoxystrobin 23 Sc @ 0.1%, T_7 - Tebuconazole 25.9% EC @ 0.1%, T_8 - Carbendazim 12% + Mancozeb 63% WP @ 0.2 % and T_9 - Untreated control in three replications. The seed treatment copper oxychloride @ 0.25% and soil application of copper oxychloride @ 50 g/bed at the time of sowing of onion seed were utilised and four sprays of treatment T_1 - Azoxystrobin 18.2% + Difenoconazole 11.4% SC @ 0.1% at an interval 15 days after transplanting recorded the minimum Per cent disease index (PDI) of twister disease (7.23 %) which was at par with the treatment T_3 - Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.1% (8.77%). The Per cent disease reduction over control was ranged from 53.06% to 72.26%. The treatment T_1 recorded 72.26 per cent reduction of twister disease of onion which was followed by per cent disease reduction in the treatment T_3 (69.06). The maximum onion yield of 134.59 q/ha was recorded in the treatment T_1 - Azoxystrobin 18.2% + Difenoconazole 11.4% SC @ 0.1% which was statistically at par with the treatment T_3 (129.68 q/ha.), T_7 (125.35 q/ha) and T6- (122.47 q/ha). The economics of onion cultivation showed maximum B: C ratio of 1.75 in the treatment T_1 which was followed by the treatment T_3 (1.63) whereas, control treatment reported lowest ratio of 1.06. Therefore, it is concluded that seed treatment of copper oxychloride @ 0.25% and soil application of copper oxychloride @ 50 g/bed at the time of sowing of onion seed and four sprays of Azoxystrobin 18.2% + Difenoconazole 11.4% SC @ 0.1% or Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.1% at an interval of 15 days after transplanting were found most effective for management of twister disease of onion.

IHS/T-8/OP-803

Employing resistant *Citrullus* sp. rootstocks for sustainable management of Fusarium wilt and enhanced productivity of watermelon

Saheb Pal, Eguru Sreenivasa Rao, S. Shankara Hebbar and Subbaraman Sriram

ICAR-Indian Agricultural Research Institute, Gauria Karma, Hazaribagh, Jharkhand
Corresponding author: saheb.pal@icar.org.in

Abstract

An experiment was conducted at the ICAR-IIHR, Bengaluru, to characterize root parameters of 18 Fusarium wilt-resistant *Citrullus* sp. accessions and their performance as rootstocks on earliness, vigour, quality and yield traits of susceptible scion grafted on them. The performance of grafts was compared with that of non-grafted control and grafting on conventional rootstocks, viz. hybrid squash and bottle gourd. Based on correlation analysis, the hypocotyl length and diameter of the rootstock were identified as the key indicators of the robustness of the root system. Significant effects were recorded on vine length, fruit shape, total soluble solids and carotenoid content when grafted onto different rootstocks, while the pulp pH remained largely unaffected by rootstock-scion combinations. RS-11, RS-18 and RS-10 improved the fruit yield by 82.37%, 107.06% and 112.15%, respectively, over non-grated control without any detrimental impact on fruit quality traits. However, the grafts onto the bottle gourd and hybrid squash yielded flat-globe to spherical-shaped fruits. Thus, grafting susceptible watermelon scions onto the RS-11, RS-18 and RS-10 would reduce pesticide use, increase farmers' income through improved productivity and expand the cultivation to Fusarium wilt-affected areas.

IHS/T-8/OP-804

Bioefficacy of insect pest management modules against tomato insect pests and their potential predators

Jaydeep Halder, Kuldeep Srivastava and Pratap A. Divekar

ICAR-Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh
Corresponding author: jaydeep.halder@gmail.com

Abstract

A number of insect pests, including tomato fruit-borer (*Helicoverpa armigera* (Hübner), Spodoptera litura Fabricius and Tuta absoluta Meyrick), Whitefly (Bemisia tabaci (Gennadius)), leaf hoppers (*Amrasca biguttula biguttula* Ishida) and Aphids (*Aphis gossypii* Glover) are important in Varanasi region. For the management of these nefarious insect pests the effects of three distinct pest management modules were assessed against the main insect pests of tomatoes in Varanasi, Uttar Pradesh, during 2021 and 2024. The integrated pest management module (IPM module), comprised spraying of Imidacloprid 17.8 % SL @ 0.33 ml/L; Spiromesifen 22.9% SC @ 1.25 ml/L; Indoxacarb 14.5% SC @ 0.8 ml/L; Cyantraniliprole 10.26% OD @ 1.8 ml/L; Chlorantraniliprole 18.5% SC @ 0.35 ml/L; Beauveria bassiana + Neem oil @ 2.5 g/L + 2.5 mL/L; Lecanicillium lecanii + neem oil @ 2.5 g/L + 2.5 mL/L and neem seed kernel extract (NSKE) @ 4 ml/L from 30 DAT onwards to till 100 DAT at 10 days intervals found superior than the chemical (CPM module) and biointensive pest management (BIPM) modules. The IPM module had suffered lowest average fruit damage (9.61%) followed by minimum whitefly (0.30/leaf), jassids (0.31/leaf) and aphid (1.08/leaf) population with maximum 69.73, 77.10, 69.90 and 64.71 per cent reduction over control (PROC), respectively. Chemical pest management module was next best module for controlling whitefly, jassids and aphid population. The number of beneficial fauna, i.e. predatory spider (1.38/plant) and mirid bugs (1.09/twig) were also higher in IPM module. Additionally, integrated pest management module produced highest healthy fruit yield (502.4 q/ha) accompanied with highest cost:benefit ratio of 1:5.13, followed by chemical pest control module (1:4.07).

IHS/T-8/OP-805

Integrated strategies for the management of root-knot nematode, Meloidogyne incognita on cucumber grown under protected conditions

Manjunatha Gowda Thondihalu, Gowri G. Lal, Arvind Nath Singh and Rajesh Kumar

Corresponding author: goudru9@gmail.com

Abstract

Cucumber (*Cucumis sativus*) ranks among the top ten most cultivated vegetables globally, known for its rich nutritional profile, which includes dietary fiber, vitamins, minerals, and beneficial bioactive compounds with antioxidant properties. Nonetheless, the quality and off-season production of cucumbers face a major challenge due to the threat posed by root-knot nematode in protected cultivation environments This research investigates the efficacy of African marigold (*Tagetes erecta*) and silver hydrogen peroxide, along with two fungal bioagents i.e., Purpureocillium lilacinum and Trichoderma viride and four bacterial bioagents i.e., Pseudomonas fluorescens, *Bacillus subtilis, Bacillus pumilus, and Bacillus amyloliquefaciens* enriched with by neem cake. The study aim is to evaluate their ability to suppress root-knot nematode, Meloidogyne incognita, and to develop integrated management strategy for effective management under nematode infested protected structure conditions. Over three years of experimentation on cucumber (cv. Kashi Nutan) grown under protected conditions, the results revealed that among the different treatments, treatment comprising of planting African Marigold at 45 days before sowing + Application of bio-agents (2 kg Purpureocillium lilacinum, 2 kg Trichoderma viride, 2 kg Pseudomonas fluorescens) enriched with neem cake (1 t/ha) + drenching bio-agent enriched with neem cake suspension 10% once in 10 days was found most effective by reducing final nematode population in soil (60.7%) and root population (58.2%) with least gall index (2.0) and recorded 21.6% increase in cucumber yield (9.2 t/ha) with maximum C: B ratio was 1:1.21 under protected conditions. In summary, the developed integrated strategy proves to be an effective management module for suppressing against root-knot nematode, Meloidogyne incognita and ensuring safe cucumber production under protected cultivation environment.

IHS/T-8/OP-806

A novel hydroponic approach for efficient screening and rapid phenotyping for identification of Fusarium wilt resistance in brinjal (*Solanum melongena*) and wild Solanum species

Ananya P Kumar, J. K. Ranjan, B. S. Tomar, Jameel Akhtar, Pragya Ranjan, Ritu Tiwari, Pardeep Kumar, Gayacharan, G. P. Mishra, Suman Lata and Jogendra Singh

Corresponding author: jkranjan2001@yahoo.co.in

Abstract

Fusarium wilt, caused by *Fusarium oxysporum* f. sp. *melongenae* (Fomg), has become a serious threat to brinjal production. The soil-borne nature of the pathogen, combined with environmental variability and poor reproducibility, makes traditional soil-based screening for resistance both laborious and unreliable for breeding programs. To enable consistent screening and rapid phenotyping, we adopted a novel hydroponic approach. In this study, 90 brinjal genotypes including diverse cultivated accessions and wild relatives were grown in Hoagland solution and inoculated with Fomg isolated from a Fusarium wilt-endemic field at the host institute. Disease index (DI), area under disease progress curve (AUDPC), and area under disease progress stairs (AUDPS) were used to assess disease progression and identify resistant sources. Phenotypic trait evaluation and histopathological analysis further supported resistance characterization. Five genotypes (BR-40-7, Pink, Bouldar, *Solanum sisymbriifolium* and *S. torvum*) were found to be immune, while fifteen genotypes each were categorized as highly resistant and resistant. Immune genotypes remained asymptomatic; highly resistant genotypes wilted late, and resistant genotypes wilted slowly. In contrast, highly susceptible genotypes showed early, rapid and severe wilting. Resistant genotypes also displayed better root and shoot development than susceptible ones. The broad applicability of this hydroponic screening approach across plant species and root pathogens highlights its potential to address major agricultural challenges. This work represents the first Fusarium-specific hydroponic screening of brinjal and wild *Solanum* germplasm.

IHS/T-8/OP-807

Transmission dynamics of squash leaf curl china virus associated with yellow mosaic and leaf curl disease in pumpkin

Bichhinna M. Rout, Amish K. Sureja, Sabtharishi Subramanian, Prasanta Kumar Dash and Anilabha Das Munshi

ICAR-Indian Agricultural Research Institute, Pusa, New Delhi
Corresponding author: aksureja@gmail.com

Abstract

The study was conducted to standardize an effective mechanical inoculation technique for SLCCNV in pumpkin and to examine its transmission through whiteflies. Mechanical inoculation was evaluated using three different buffers (I, II, and III) for virus sap preparation. Among these, Buffer III, containing phosphate buffer, β-mercaptoethanol, and Na2SO3, resulted in the highest disease incidence and symptom severity in the susceptible pumpkin cultivar Pusa Vishwas. Seasonal variation studies indicated that summer season was most favourable for SLCCNV transmission. Among different plant parts tested, expanded leaves, middle leaves, and stem tissues showed higher infectivity than other parts. Whitefly transmission experiments revealed that a minimum of two whiteflies per plant were sufficient to transmit the virus, producing yellow mosaic symptoms and plant stunting. Transmission efficiency increased proportionally with the number of whiteflies per plant. A minimum acquisition access period (AAP) of 10 minutes and an inoculation access period (IAP) of 24 hours were found to be optimal for successful whitefly-mediated transmission of SLCCNV. These findings underscore the importance of effective vector management strategies, including insecticidal and physical control measures, to limit whitefly-mediated spread of SLCCNV in pumpkin. Notably, this study provides the first report of sap transmission of SLCCNV in pumpkin, highlighting the need for integrated management approaches targeting both mechanical and vector-mediated transmission routes.

IHS/T-8/OP-808

Genetic mapping and molecular insights into powdery mildew resistance for sustainable disease management in bottle gourd (*Lagenaria siceraria*)

Jogendra Singh, J.K. Ranjan, B.S Tomar, A.K. Singh, G.S. Jat, G.P Mishra, Jameel Akhtar, Manjusha Verma, Pragya and Raj Kiran

ICAR-Indian Agricultural Research Institute, New Delhi
Corresponding author: jogendra169@gmail.com

Abstract

The investigation carried out to identify stable resistance sources from diverse bottle gourd germplasm, elucidate the inheritance of resistance, and identify map based genomic regions of powdery mildew resistance using QTL-seq approach. The pathogen was isolated from naturally infected plants of bottle gourd cv. Pusa Naveen, maintained under controlled conditions, and confirmed as Podosphaera xanthii through ITS sequencing and phylogenetic analysis. Eight-two genotypes were screened during four years (2021–2024) using artificial inoculation, and disease intensity were quantified through percent disease index (PDI), area under disease progress curve (AUDPC), and area under disease progress stairs (AUDPS). Among the four resistant genotypes identified, EC 800996 exhibited the highest and most stable resistance, showing a near-complete absence of disease symptoms (PDI = 0.00, AUDPC < 65.00). The other resistant genotypes, EC 800998, EC 800995 and IC 337078, also showed resistant reactions, though with slightly higher PDI (<10.00) compared to EC 800996. Genotypes, Pusa Santusthi, IC 296733, EC 1085231, EC 1085257, IC 567534 and IC 567545, were classified as moderately resistant, and consistently maintaining PDI below 20.0% across all years. However, most commercial cultivars were highly susceptible (PDI > 80.0%, AUDPC > 1500). Inheritance analysis indicated that resistance is governed by two complementary recessive genes, validated through expected segregation ratios in F2 and backcross generations. The QTL-seq analysis revealed a major candidate region on BgLG08 (6–8 Mbp) significantly associated with resistance, along with additional loci on BgLG04 (25.06 Mbp) and BgLG06 (26.47 Mbp).

IHS/T-8/OP-809

Genome-wide identification and functional characterization of odorant-binding proteins in red pumpkin beetle, *Aulacophora foveicollis*

Ramesh K. B., RudraGouda M N., Pushpendra Pratap Singh., Gangaraj R., Viveka Nand Singh., Vikas Singh and Rajesh Kumar

ICAR-Indian Institute Vegetable Research, Regional Research Station, Sargatia, Kushinagar, Uttar Pradesh
Corresponding author: rameshjayaveera@gmail.com

Abstract

The red pumpkin beetle, *Aulacophora foveicollis* (Coleoptera: Chrysomelidae), is a major pest of cucurbitaceous crops, causing substantial yield losses across Asia. Odorant-binding proteins (OBPs), are essential components of the insect olfactory system, mediate the detection of host plant volatiles and mating cues, making them attractive targets for sustainable pest management strategies. In this study, we employed genome-wide bioinformatic approaches to identify and characterize OBP genes from A. foveicollis. Phylogenetic analysis revealed close evolutionary relationships with OBPs from related coleopteran species, suggesting conserved olfactory functions. Structural modeling and molecular docking analyses predicted strong interactions with key cucurbit volatiles such as (E)-β-ocimene, linalool, hexanal, (Z)-3-hexenol and nonanal, providing insights into ligand-binding preferences. This comprehensive characterization of A. foveicollis OBPs offers a molecular foundation for developing advanced olfaction-based pest management strategies, including lure-based attractants, repellents, and RNAi-mediated control methods.

IHS/T-8/OP-810

Potato dry rot –the silent threat to post-harvest quality

Vaishali Singh, Shwetank Singh, Ramji Singh and Rajesh Kumar Singh

SVPUAT, Meerut, Uttar Pradesh
Corresponding author: vaishalisingh1711@gmail.com

Abstract

The study aims to investigate the diversity, pathogenicity, and molecular characterization of *Fusarium* spp. associated with dry rot of potato. A systematic survey was conducted to collect infected potato tubers exhibiting typical dry rot symptoms from farmers' fields, storage structures, wholesale markets, and cold storage facilities across selected regions. The pathogens were isolated from diseased tissues, purified, and maintained under laboratory conditions. Cultural and morphological characterization of the isolates was carried out based on colony growth, pigmentation, texture, and conidial characteristics. Pathogenicity of the isolates was evaluated through tuber inoculation assays to assess virulence and confirm Koch's postulates. For precise identification, molecular characterization was performed using internal transcribed spacer (ITS) region-based PCR amplification and sequencing. The obtained sequences were analyzed through BLAST and phylogenetic tools to determine species-level relationships among the *Fusarium* isolates. The integration of morphological, pathogenic, and molecular data enabled accurate identification of *Fusarium* species involved in dry rot development. The findings of this study provide valuable insights into the pathogen diversity associated with potato dry rot and highlight the importance of molecular tools in disease diagnosis. This work contributes to improved understanding of dry rot epidemiology and supports the development of effective post-harvest disease management strategies to minimize losses and enhance potato storage quality.

IHS/T-8/OP-811

To evaluate the bio efficacy of *Beauveria bassiana* by using different substrates against the *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae) under laboratory condition

Yogendra Kumar Mishra, Jayesh Karodi and Akhilesh Kumar Singh

Department of Entomology, Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh

Corresponding author: yogendramishra5926@gmail.com

Abstract

Helicoverpa armigera is a polyphagous pest which poses a significant threat to the yields of fruit and vegetable crops, resulting in reductions of 27.9% to 80 % in overall production. The government is actively encouraging natural and organic farming practices in India. In this regard, Bundelkhand has been recognized as an organic corridor due to its considerable potential for the advancement of organic and natural farming in the region. To address pest control, new methodologies are being explored, particularly the use of bio pesticides, with a focus on the entomopathogenic fungus *Beauveria bassiana*. In the present study, conidia of *Beauveria bassiana* was harvested from different solid substrates (broken rice and broken sorghum) and liquid substrates (potato dextrose broth and Sabouraud dextrose broth) under laboratory conditions. Among the substrates tested, broken rice supported the maximum conidial yield of *B. bassiana* recorded 16.47 × 10? CFU/g along with the highest viability (98.33%) and 100% purity. In bioassays, rice-based conidia exhibited superior pathogenicity of *B. bassiana* achieved 74.94%, 89.14%, and 100% larval mortality at 1×10?, 1×10?, and 1×10¹? conidia/ml, respectively.

IHS/T-8/OP-12

Title: biosafety norms for handling horticultural pathogens: ensuring plant health and biosecurity

Naval Kishor Sepat[1] and Saroj Rolania Sepat[2]

[12]Defence Research and Development Establishment (DRDE), DRDO, Gwalior, India
Corresponding author: sepatnaval.hqr@gov.in

Abstract

Horticulture plays a pivotal role in ensuring nutritional security, employment generation, and economic sustainability in India. However, the sector is increasingly challenged by a wide spectrum of plant pathogens, including bacteria, fungi, viruses, nematodes, and phytoplasmas, which cause significant yield losses and threaten agro-ecosystem stability. In this context, the implementation of robust biosafety norms for handling horticultural pathogens is essential to prevent their accidental dissemination, ensure safe research practices, and protect plant health and the environment. This paper highlights the principles, practices, and regulatory aspects of biosafety relevant to horticultural pathogen research and diagnostics. Biosafety measures begin with systematic risk assessment of horticultural pathogens based on pathogenicity, host specificity, transmission pathways, and potential economic impact. Appropriate containment strategies, aligned with national and international biosafety frameworks, are necessary for laboratory, greenhouse, and field-based activities. These include controlled access to facilities, designated pathogen-handling zones, use of biosafety cabinets, and maintenance of quarantine and containment greenhouses for infected plant material. Standard operating procedures (SOPs) for sample collection, transport, storage, and disposal are emphasized as critical components for minimizing cross-contamination and environmental release. The use of personal protective equipment (PPE), proper labeling, segregation of infected materials, and effective waste management practices—such as autoclaving and chemical disinfection—are essential operational requirements. Molecular diagnostic techniques, including PCR-based pathogen detection, require stringent contamination control measures to ensure both biosafety and analytical reliability. Human resource development and capacity building are identified as key pillars of biosafety compliance. Regular training programs, biosafety audits, documentation, and incident reporting mechanisms foster awareness and accountability among researchers and technical personnel. Institutional

Biosafety Committees and national plant protection authorities play a crucial role in regulatory oversight, protocol approval, and periodic updating of biosafety guidelines in response to emerging horticultural threats. In conclusion, adherence to comprehensive biosafety norms is indispensable for sustainable horticultural research and biosecurity. Strengthening biosafety infrastructure, harmonizing regulations, and promoting best practices will significantly contribute to resilient horticultural systems.

IHS/T-8/OP-13

Pathogenicity of citrus nematode, *Tylenchulus semipenetrans*, on acid lime (*Citrus aurantifolia* Swingle) var. Pusa Udit

Vikas Bamel and Mahendra Singh

Division of Nematology, ICAR-IARI, New Delhi
Corresponding author: ms_nema@rediffmail.com

Abstract

Citrus nematode (*Tylenchulus semipenetrans*),the causal agent of slow decline of citrus, is found in most citrus producing areas and diverse soil textures in India and elsewhere and causes severe damage to citrus. In the present study the relationship between different initial densities of *T. semipenetrans* and growth parameters of acid lime(*Citrus aurantifolia*Swingle) was examined under greenhouse conditions using completely randomized design. Seedlings of acid lime (var. Pusa Udit) were inoculated with *T. semipenetrans* at the rates of 0; 1,000; 2,000; 4,000; 8,000 and 16,000 second stage juveniles/pot in the greenhouse. Data were collected on fresh and dry weights of the shoot and root, shoot length, nematode populations in the roots and soil and reproduction factor. All the data were subjected to analysis of variance and means were compared by Duncan's Multiple Range Test at 5%. The relationships between growth variables and nematode infestations were determined. It was observed that all the inoculum densities caused reductions in growth parameters and were found directly proportional to the inoculum density. Similarly, a direct relationship was observed between root and soil populations of the nematode and inoculum levels. On the other hand, the nematode build up was the maximum at lower inoculum level and an inverse relationship was observed between reproduction factor and inoculum densities of the nematode.

IHS/T-8/OP-14

Integrated strategies for sustainable management of root-knot nematode (*Meloidogyne incognita*) in vegetable crops under protected cultivation systems

Mahendra Singh

Priority Setting Monitoring and Evaluation Cell, ICAR-IARI, New Delhi
Corresponding author: ms_nema@rediffmail.com

Abstract

Protected cultivation has emerged as a key technology for enhancing vegetable productivity, quality, and resource-use efficiency. However, the intensive and continuous cropping systems practiced under protected structures create highly favorable conditions for soil-borne pests, particularly root-knot nematodes (*Meloidogyne incognita*). This nematode is considered one of the most economically important constraints in protected vegetable production, causing severe root galling, impaired nutrient and water uptake, increased susceptibility to secondary pathogens, and substantial yield losses. Chemical nematicides alone are neither sustainable nor environmentally acceptable under modern horticultural systems. Therefore, integrated management strategies combining preventive, cultural, physical, biological, host resistance, and need-based chemical approaches are essential. This review synthesizes current knowledge on the biology and epidemiology of *M. incognita* under protected cultivation and critically evaluates integrated management practices with special emphasis on their applicability, effectiveness, and sustainability in greenhouse and polyhouse vegetable production. The review highlights soil solarization, grafting onto resistant rootstocks, biological control agents, organic amendments, and precision nematicide use as key components of a successful integrated nematode management (INM) strategy. Future research needs and practical recommendations for sustainable nematode management under protected horticulture are also discussed.

IHS/T-8/OP-815

Emerging pathogen of kharif onion in North Indian plains and their management strategy

Sabina Islam, Amrita Das and B.S. Tomar

Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, New Delhi -110012

Corresponding email: sabina_veg@iari.res.in

Onion is an indispensable everyday culinary item in Indian kitchen known for its food value, nutritional and phytochemical benefits. Kharif onion, which are grown in warm summer and humid months contrary to cool and dry rabi onion, are harvested during October-December plays a crucial role in maintaining the domestic supply and stabilizing the prices. Earlier kharif onion was grown in parts of Maharashtra, Karnataka, Gujarat and Andhra Pradesh. The development of improved genotypes and better management practices led to area expansion in non-traditional areas of North Indian plains like parts of Rajasthan, eastern part of Uttar Pradesh. The production is affected by new diseases which were hitherto not reported. The disease started with yellowish brown spots at the middle of the leaf which later expanded and covered the entire leaf resulting in leaf collapse and large scale mortality of the plants. The disease symptom did not match with the characteristic disease symptoms of onion. The symptomatic leaves were collected and culture was purified by single spore isolation technique and maintained in Potato Dextrose Agar medium. Morphological characters such as radial growth and culture color was recorded. Microscopic observation of conidia bearing structures, macro-conidia and micro-conidia (shape, length and width) was recorded using a compound microscope with a mounted camera. The identity of fungus was confirmed through amplification and sequence similarity of glyceraldehyde-3-phosphate dehydrogenase gene (GAPDH). The polymerase chain reaction (PCR) was performed to amplify the glyceraldehyde-3-phosphate dehydrogenase gene (GAPDH) with the primer GDF (5′ - GCC GTC AAC GAC CCC TTC ATT GA - 3′) and reverse primer GDR (5′ - GGG TGG AGT CGT ACT TGA GCA TGT - 3′). The PCR product was sequenced and the sequenced product was checked for Sequence similarity in the NCBI database. The pathogenicity test was carried out using leaf detach method. Conidia were single celled, hyaline, cylindrical with smooth rounded ends, and 12.6 to 18.5 × 3.5 to 5.6 µm (n= 50). The morphology (shape and size of conidia) resembled the characteristic morphology of Colletotrichum gloeosporioides species complex. The obtained sequence showed 99% similarity with the nucleotide sequences database of Colletotrichum siamense. To identify resistant source, 17 onion genotypes and 3 allied genotypes were screened under challenge inoculation condition with a spore suspension of 106 conidia/mL. The disease severity index at 4 WPI ranged from 52 - 76% in the onion genotypes. Among onion genotypes, lowest DSI of 52% was recorded in Pusa Shobha. The lowest DSI was recorded in the allied species A. tuberosum (8.0%) followed by A. galunthum (40.0 %) and A. fistulosum (44.0 %). The study suggests that new species are emerging due to intensive cultivation and requires timely management and development of resistant variety to counter the loss.

IHS/T-8/PP-801

Effect of cyantraniliprole against sap feeder insect pests infesting pomegranate

Suresh Kumar Jat and Anchal Sharma

Agriculture University, Kota, Rajasthan
Corresponding author: ento89suresh@gmail.com

Abstract

Field experiments were conducted to evaluate the bio-efficacy of cyantraniliprole 10.26% OD 200, 250, 300, 400 g/ha along with two standard checks, i.e. Lambda-cyhalothrin 4.9% CS and fipronil 5% SC @ 2000 ml/ha against sap feeder insect pests infesting pomegranate at KVK, Jhalawar, during the years 2021 and 2022. The pomegranate and Sindhuri was transplanted in a Randomized Block Design with seven treatments with three replications. Cyantraniliprole 10.26% OD was equally effective @ 400 and 300 g/ha to control major sap feeder insects like aphid, thrips and whitefly on pomegranate and better than other standard treatments. The mean maximum yield of pomegranate was recorded in treatment of cyantraniliprole 10.26% OD@ 400 g/ha which was 98.20 q/ha and 109.20 q/ha during respective year comprised to the control.

IHS/T-8/PP-802

Integrated pest management approaches in Horticulture

Prahlad Sahay Sharma, K.K. Sharma, Rohitash Sharma and Sanjay Seemawat

Department of Horticulture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan
Corresponding author: pcsorthiya@gmail.com

Abstract

The study presents a comprehensive overview of IPM practices applicable to fruit crops (mango, banana, citrus, apple, guava, sapota, pomegranate, papaya and jackfruit), vegetable crops (tomato, chilli, brinjal, okra, potato, cruciferous vegetables, garlic and legumes), plantation crops (areca nut, cashew, coconut and oil palm) and spice crops (black pepper, coriander, cumin, fennel and ginger). Emphasis is placed on preventive cultural practices such as crop rotation, soil solarization and use of resistant varieties, alongside mechanical measures including trap cropping, pheromone traps and field sanitation. Biological control strategies, particularly conservation and augmentation of natural enemies and the use of biopesticides, are highlighted as key components for sustainable pest suppression. Chemical control measures are recommended only when pest populations exceed economic threshold levels, ensuring judicious pesticide use with minimal environmental impact. The integrated adoption of these strategies enhances pest management efficiency, reduces pesticide resistance, improves crop productivity and conserves biodiversity. This serves as a practical guide for farmers and extension personnel seeking to implement eco-friendly and sustainable pest management practices across diverse horticultural cropping systems.

IHS/T-8/PP-803

Rhizosphere microbial communities as biocontrol agents against insect pests of onion (*Allium cepa*)

Dhananjay V. Shirsat, Praveen B. Roylawar and Soumia P.S.

SN Arts DJ Malpani Commerce and BN Sarada Science College, Sangamner, Ahilyanagar
Corresponding author: dhananjayvshirsat@gmail.com

Abstract

In this study, rhizospheric microbes were isolated from underutilized Allium species—*Allium fistulosum, Allium tuberosum*, *Allium macranthum*, and *Allium hookeri*—which are recognized for their resilience and unique bioactive properties. These microbial isolates were evaluated for their ability to suppress major onion pests and enhance crop health through metabolite production, pest deterrence, and plant defence modulation. Harnessing these microbes not only offers an eco-friendly alternative to synthetic pesticides but also highlights the unexplored potential of underutilized Allium species as reservoirs of beneficial microbial communities. The findings are expected to advance sustainable pest management approaches and contribute to resilient onion production systems.

IHS/T-8/PP-804

Validation of markers linked to major genes/QTLs resistance to major biotic stresses in tomato

Suresh Reddy Yerasu, Nitesh Kumar Singh, Jagesh Kumar Tiwari, Nagendra Rai and Rajesh Kumar

Corresponding author: yerasusureshreddy@gmail.com

Abstract

Tomato (*Solanum lycopersicon* L.) is one of the most widely grown and consumed vegetables in the world. Carotenoids, phenolic compounds, vitamins, and other nutrients are abundant in it. Its successful production in India is challenged by many biotic stresses including tomato yellow leaf curl disease caused by TYLCV, late blight caused by Phytophthora infestans, bacterial wilt caused by Ralstonia solanacearum, root knot nematode (Meloidogyne spp) (RKN) etc. With the help of known resistant and susceptible checks, screening for respective diseases, reported markers linked to the major genes/QTL offering resistance to these major diseases were validated for their use in marker assisted selection. Gene based markers AW910upF2R3 and Ty3-SCAR1 of TYLCV resistance genes Ty2 and Ty3 genes, respective were found reliable; for late blight resistance genes, dTG-63 linked marker to Ph2 and Ph3-SCAR gene-based marker to Ph3 were found reliable. Similarly, Mi2.3 gene-based marker to RKN resistance genes Mi-1 and linked marker SLM12-2 to bacterial wilt resistance QTL Bwr-12 were validated. Theses markers can be used in markers assisted selection for developing resistant varieties for targeted disease and in bringing together two or more mentioned genes to develop multiple disease tomato cultivars.

IHS/T-8/PP-805

Validation of integrated disease management technologies for little leaf disease in brinjal

Shakti Khajuria, Renu Godara, Kanak Lata and J.K. Jadav

Corresponding author: shaktikhajuria@gmail.com

Abstract

On farm testing was conducted during 2023–24 and 2024–25 to validate the effectiveness of Integrated Disease Management (IDM) strategies for management of little leaf disease in brinjal. The trials were conducted at farmers' fields with active participation of growers to compare existing farmers' practices with improved IDM interventions. Three treatments were evaluated in 12 trials each year. T_1 (farmers' practice) involved no specific measures for little leaf disease management, except insecticide application against shoot and fruit borer. T_2 comprised seedling treatment with Streptomycin sulphate + Tetracycline hydrochloride (150 ppm), removal of infected plants, and need-based foliar sprays of the same antibiotics along with Imidacloprid @ 0.3 ml/l. T_3 included all practices of T_2 along with installation of yellow sticky traps @ 15/ha for effective management of the insect vector. Results from both years clearly demonstrated the superiority of the integrated approach. During 2023–24, T_3 recorded the lowest disease incidence (17.5%), highest yield (285.5 q/ha), maximum gross return (1,71,300/ha), and highest benefit–cost ratio (3.76), outperforming T_2 and T_1. A similar trend was observed during 2024–25, where T_3 resulted in minimum disease incidence (16.0%), higher yield (272.5 q/ha), better gross return (1,18,000/ha), and an improved B:C ratio (3.59). Farmers' practice consistently recorded the highest disease incidence and lowest economic returns during both years. The study revealed limited awareness among farmers regarding IDM practices for little leaf disease. However, continuous field monitoring, demonstrations, and interaction enhanced farmers' knowledge and adoption. Farmers expressed high satisfaction with the IDM technology due to visible reduction in disease and improved profitability. The results confirmed that seedling treatment, timely removal of infected plants, judicious chemical application, and use of yellow sticky traps together constitute an effective, economical, and farmer-friendly strategy for managing little leaf disease in brinjal under rainfed conditions.

IHS/T-8/PP-806

Evaluation of IPM modules against sucking pests in *Hibiscus* (*Rosa-sinensis*)

Rayapu Sai Theja, Arundhati Sasmal, Kavimugilan S and Kari Dinesh

Corresponding author: rayapusais.s@gmail.com

Abstract

A field experiment was conducted in experimental plot of AICRP on Floriculture in Biotechnology-cum-Tissue Culture Centre, OUAT, Bhubaneswar for evaluation of IPM modules against sucking pests in *Hibiscus rosa-sinensis* L. during 2023-24. This experiment was conducted with eight treatments including untreated control. The treatments were : T_1 –Yellow sticky trap (YST) + alternate spray of neem oil (1500 ppm azadirachtin) @3ml/litre and horticultural oil @10ml/litre; T_2 - YST + alternate spray of neem oil (1500 ppm azadirachtin) @3ml/litre and apple cider vinegar @10ml/litre; T_3 - YST + alternate spray of neem oil (1500 ppm azadirachtin) @3ml/litre and diatomaceous earth @50gm/litre; T_4 - YST + alternate spray of neem oil (1500 ppm azadirachtin) @3ml/litre and isopropyl alcohol @10ml/litre; T_5 - YST + alternate spray of neem oil (1500 ppm azadirachtin) @3ml/litre and lemon grass oil @2.5ml/litre; T_6 - YST + alternate spray of neem oil (1500 ppm azadirachtin) @3ml/litre and insecticidal soap @10ml/litre; T_7 - imidacloprid 17.8 SL @0.3ml/litre (farmers practice) and T_8 -untreated control. Three foliar sprays were given at 10 days interval and the population of sucking pests like mealybug, aphid, whitefly and thrips were assessed after 3 and 7 days of each spray. The results revealed that T_7 effectively controlled mealybug, aphid, whitefly, and thrips. This treatment recorded the minimum population of mealybug (1.99/twig), aphid (1.94/twig), whitefly (0.88/ leaf) and thrips (0.80/leaf). The order of efficacy of different treatments against sucking pests like mealybug, aphid, whitefly, and thrips is $T_7 > T_5 > T_4 > T_3 > T_6 > T_1 > T_2$. Treatment T_1 showed least toxic effect on coccinellids beetle (3.60 beetles/plant) and found safer for predators. T_7 recorded maximum values for vegetative characters like, plant height (279.25 cm), number of primary branches

(13.0), number of secondary branches (41.16) and number of tertiary branches (57.66) and is statistically at par with T_5. Maximum number of flower buds (16.4 flower buds/day/plant) was observed in T_7 (imidacloprid 17.8 SL @0.3ml/litre) which is statistically at par with T_5 (YST + alternate spray of neem oil (1500 ppm azadirachtin) @3ml/litre and lemon grass oil @2.5ml/litre). Moreover, T_5 was effective in controlling sucking pests and is least toxic to beneficial insects, hence, is considered as the best treatment with respect to pest control and yield.

IHS/T-8/PP-07

HWT and fungicide treatments for reduction of postharvest anthracnose disease in guava (*Psidium guajava* L)

Sangeeta Pandey and Arvind Kumar*

Department of Plant Pathology, Narain Degree College, Shikohabad, Uttar Pradesh
**Department of Entomology, Kishan PG College, Simbhaoli, Hapur, Uttar Pradesh*
Corresponding author: sangeetap2810@gmail.com

Abstract

Guava (*Psidium guajava* L.), a member of the family Myrtaceae, is commonly referred to as the “poor man’s apple” due to its high nutritional value and affordability. Guava cultivation is constrained by several fungal, bacterial, and viral diseases, whose pathogens—ranging from unicellular to multicellular organisms—degrade complex organic compounds into simpler substrates for nutrition. Among these, anthracnose is one of the most destructive diseases, affecting almost all parts of the plant and causing substantial economic losses to growers. Anthracnose, caused by *Colletotrichum* spp., is particularly severe at the postharvest stage and represents a major limitation to fruit quality and marketability. In India, postharvest losses of fresh guava fruits are estimated to range between 25–30%. The present investigation was conducted in the Department of Plant Pathology, Narain College, Shikohabad, Firozabad, Uttar Pradesh, to evaluate the efficacy of different postharvest treatments in managing anthracnose of guava. The treatments included dipping of fruits in calcium chloride ($CaCl_2$) solution, carbendazim, hot water treatment (HWT), and combinations of HWT with $CaCl_2$ and carbendazim. Among the two cultivars evaluated, Allahabad Safeda exhibited a higher incidence of anthracnose compared to the L-49 cultivar. The results revealed that the combined treatment of hot water treatment along with $CaCl_2$ (2%) and carbendazim (0.1%) significantly reduced anthracnose incidence during the postharvest storage period. In Allahabad Safeda, disease incidence was reduced to 8.30% compared to 43.30% in the untreated control up to 10 days of storage. Similarly, in the L-49 cultivar, disease incidence was limited to 5.30% as against 20.60% in the control. Thus, the integrated postharvest treatment proved highly effective in extending the postharvest life of guava fruits by minimizing anthracnose infection.



SOCIETY FOR HORTICULTURAL RESEARCH AND DEVELOPMENT
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Theme 9

Climate-resilient horticulture production

4th Indian Horticulture Summit-Cum-International Conference-2026

Book of abstracts

IHS/T-9/OP-901

Harnessing native endophytic microorganisms to enhance salt stress resilience in sweet potato (*Ipomoea batatas*)

Disha Baishnabi, Hanume Gowda, R. Arutselvan, Pradyumna Tripathy and M.R. Sahoo

College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha
Corresponding author: dishabaishnabi.rs25@ouat.ac.in

Abstract

This study was aimed at isolating and characterizing the indigenous endophytes from diverse sweet potato genotypes of (*Ipomoea batatas* L. Lam) to evaluate their potential in mitigation of salt stress. Eighteen endophytic strains were isolated from eleven sweet potato genotypes and characterized on the basis of their morphological and microscopic studies. They were then subjected to salt stress of varying concentrations (0-1.5% NaCl) to study their growth pattern. Three superior performing endophytes, *Trichoderma*, *Cephalosporium* and *Bacillus cereus*, were selected for inoculation into sweet potato plants using a factorial completely randomized design. The inoculation trials involving four cultivars (BX15, S-783, SPW-1 and Bhu Krishna) revealed significant synergistic effects on plant growth parameters under salt stress conditions. The response of each cultivar varied depending upon specific endophytes inoculated, giving insights on the cultivar-specific nature of plant-endophyte interaction. These findings emphasize the necessity for further in-depth studies to interpret the molecular and physiological mechanisms involved in plant-endophyte interactions. This will provide critical insight for optimizing endophyte-based strategies tailored to different sweet potato cultivars under saline environments.

IHS/T-9/OP-902

Potential of horti-silvi-pasture-based-land-use system in Bundelkhand

Prabhat Tiwari, M.J. Dobriyal and Manish Srivastav

Department of Silvi culture & Agroforestry, RLBCAU, Jhansi, Uttar Pradesh
Corresponding author: prabhatbhu033@gmail.com

Abstract

The study assesses a fruit-centered horti-silvi-pasture land-use system, focusing on growth and yield-enabling environment of *Annona squamosa* (custard apple) and *Punica granatum* (pomegranate) integrated with *Holoptelia integrifolia* and an understory BN hybrid grass. Results from a three-year-old system indicated that both fruit species exhibited satisfactory growth under integrated conditions, with *Punica granatum* outperformed *Annona squamosa* in height and basal girth, reflecting its superior adaptability to moisture-limited environments. The presence of tree component did not impose adverse competition; instead, it contributed to microclimate moderation, reduced soil exposure, and improved resource-use efficiency, which are critical for sustaining fruit growth and future yield stability. Tree spacing significantly influenced system performance, with wider spacing (5 m × 5 m) enhancing light penetration and minimizing interspecific competition, thereby creating favourable conditions for fruit canopy development and reproductive potential. Although pasture yield ranged from 38.36 to 40.18 tonnes/ha, its primary horticultural relevance lies in soil moisture conservation, organic matter addition, and erosion control, indirectly supporting fruit yield and orchard longevity. The study highlights that strategically designed fruit-based agroforestry systems can improve orchard resilience, optimize land productivity, and diversify farm income without compromising fruit crop performance. Such horticulture-led integrated systems offer a promising pathway for sustainable fruit production and livelihood enhancement in Bundelkhand.

IHS/T-9/OP-903

Genome-wide QTL mapping reveals the genetic architecture of heat tolerance in chilli (*Capsicum annuum*)

Priti Upadhyay, Yoganand M., Aruna T.S., Arpita Shrivastava and Manisha Mangal

Division of Vegetable Sciences, Indian Agricultural Research Institute, New Delhi
Corresponding author: dr.pritiupadhyay84@gmail.com

Abstract

The parental lines, F_1, and F_2 populations derived from a cross between heat-tolerant DLS-161-1 and heat-susceptible PBC-345 were evaluated under natural high-temperature stress, where day/night temperatures ranged from 24.6-44.2°C / 15.8-29.8°C. Observations were recorded for morphological, physiological, and biochemical traits associated with heat tolerance. Genomic profiling through ddRAD-seq using the Illumina NovaSeq-6000 platform generated 121.85 GB of high-quality sequencing output, enabling successful alignment of 381.18 million processed reads to *Capsicum annuum* reference genome. Variant discovery identified 51,266 polymorphic SNPs, which were subsequently assigned to 12 linkage groups corresponding to haploid chromosome number of chilli, facilitating the construction of a high-resolution genetic map essential for quantitative trait analysis. QTL mapping identified 160 loci associated with heat-responsive traits, with LOD values ranging from 2.501 to 7.8674 and phenotypic variance explained between 0.909 and 15.208%. Among these, 7 major QTLs (LOD> 2.5 and PVE>10%) were detected across 11 morphological, 8 physiological, and 5 biochemical traits relevant to heat tolerance. Several QTLs exhibited colocalization, indicating pleiotropy or tight genomic linkage among key heat-response mechanisms. These results reveal complex genetic architecture governing heat tolerance in *Capsicum annuum* and provide valuable SNP-based genomic resources for marker-assisted selection and breeding of heat-resilient chilli cultivars adapted to evolving climatic conditions.

IHS/T-9/OP-904

Standardization of sodium chloride thresholds for salt tolerance screening in vegetable cowpea (*Vigna unguiculata* L. Walp.)

Shivam Kumar Rai, Vikas Singh, Nakul Gupta, Abhinav Dayal, Vaidurya Pratap Sahi, and Rajesh Kumar

ICAR-Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh, India
Correspondence author: vikaschf@gmail.com

Abstract

Soil salinity is a major abiotic stress limiting early seedling establishment and productivity of vegetable cowpea (*Vigna unguiculata* L. Walp.) in salt-affected regions. The absence of a standardised salinity threshold limits the reliability of screening for salt tolerance at early growth stages. This study aimed to identify the optimal sodium chloride (NaCl) concentration for salt tolerance screening in vegetable cowpea using Salt Injury Index (SII)-based median inhibitory concentration (IC_{50}) analysis. Thirty genetically diverse vegetable cowpea genotypes were evaluated under controlled in vitro conditions using a Factorial Completely Randomized Design. Surface-sterilised seeds were placed in Petri plates (25 seeds per plate) lined with germination paper and exposed to six NaCl concentrations (0, 75, 100, 150, 200, and 250 mM), with four replications per treatment. Each plate received 10 mL of the respective NaCl solution and was incubated in a germination chamber maintained at 25 ± 3 °C and 90% relative humidity. Germination percentage was recorded after eight days, and ten randomly selected seedlings per replication were used to measure shoot length, root length, total seedling length, and seedling dry weight. Vigour indices I and II were calculated using standard formulas. Salt Tolerance Index (STI) and Salt Injury index (SII) values were calculated for each trait by comparing performance under salinity stress with that under control conditions. Linear regression analysis of SII values against NaCl concentrations was used to estimate IC_{50} values, defined as the NaCl concentration that induces a 50% reduction in trait performance relative to the control. Increasing salinity resulted in a significant and progressive decline in all measured traits. The estimated

IC_{50} values were 215 mM for germination percentage, 180 mM for shoot length, 210 mM for root length, and 200 mM for both seedling length and seedling dry weight, while vigour indices showed greater sensitivity with IC_{50} values of 130 mM (Vigour Index I) and 160 mM (Vigour Index II). The mean IC_{50} across all traits was 183.57 mM NaCl. Based on the convergence of IC_{50} estimates for key biomass-related traits and adequate phenotypic discrimination among genotypes, 200 mM NaCl was identified as the optimal screening concentration. In future applications, this standardized 200 mM benchmark will facilitate reliable large-scale germplasm screening and accelerate the development of salt-resilient cowpea varieties for sustainable cultivation in saline environments.

IHS/T-9/OP-905

Climate-smart tomato breeding: enhancing resistance to biotic and abiotic stresses

Nagendra Rai, Jagesh Kumar Tiwari, DP Singh, YS Reddy and AK Singh

ICAR-Indian Institute of Vegetable Research, Varanasi
Corresponding author: nrai1964@gmail.com

Abstract

Tomato production is challenged by a range of biotic and abiotic stresses, including insect pests such as whitefly and fruit borer, diseases like tomato leaf curl virus (ToLCV), late blight, early blight, bacterial spot, and bacterial wilt, as well as environmental factors such as high temperature, drought, salinity, and cold stress. Tomato leaf curl virus, a member of the genus Begomovirus and transmitted by whitefly (*Bemisia tabaci*), poses a particularly severe threat, often resulting in total crop loss. Consequently, breeding programs prioritize the identification and incorporation of resistance sources to combat this disease. Both conventional and molecular breeding strategies have been employed to introgress resistance genes (Ty-2, Ty-1/Ty-3, ty-5, and Ty-6) into cultivated tomato backgrounds. Marker-assisted selection (MAS) has facilitated the pyramiding of ToLCV resistance genes mostly Ty-2 and Ty-1/Ty-3 and ty-5, and Ty-6, leading to the development of superior genotypes and cultivars. Abiotic stresses such as drought, salinity, extreme temperatures, and nutrient deficiencies negatively impact plant growth, development, yield, and fruit quality by inducing oxidative stress, membrane damage, reduced photosynthesis, and impaired reproductive development. Given the sensitivity of tomatoes to these conditions, the development of climate-resilient varieties is a critical objective in contemporary agriculture. While traditional breeding has achieved notable progress in enhancing yield, quality, and resistance to diseases such as ToLCV and root knot nematode, advancements in abiotic stress tolerance have been limited. This limitation is primarily due to the quantitative and complex nature of stress responses, restricted genetic variability in cultivated varieties, and the absence of reliable screening methods. Recent progress in molecular biology, genomics, and biotechnology has enabled detailed analysis of the genetic and physiological mechanisms underlying stress responses in tomato. Advanced tools, including MAS, genome-wide association studies (GWAS), genomic selection (GS), genetic engineering, and genome editing technologies such as CRISPR/Cas9, have accelerated the precision and efficiency of breeding efforts. Furthermore, the integration of omics approaches, including transcriptomics, proteomics, and metabolomics, has significantly expanded the understanding of molecular mechanisms governing biotic and abiotic stress tolerance.

IHS/T-9/OP-906

Soil and water conservation measures with good agricultural practices in fruits of Bundelkhand region

R.K. Patel, Dinesh Kumar, M.K. Meena, Deepak Singh and Kripa Shankar

Corresponding author: rkpatelicar@gmail.com

Abstract

In Bundelkhand, soil loss from unprotected land is approximately 120 tonnes/ha/year and may increase up to 300 tonnes/ha/year. Therefore, it is not only important to increase water availability, but also to promote its efficient utilization by adopting techniques such as multiple-use water systems, proper soil and crop management, low-cost

micro-irrigation, and integrated farming systems. The adoption of suitable soil and water conservation measures and the cultivation of fruit crops based on land suitability are among the most important strategies to reduce soil degradation problems. Vegetation cover plays a crucial role in moderating surface runoff and water erosion from agricultural lands. The rate of runoff, soil loss, and nutrient loss is largely determined by vegetation type, canopy cover, slope gradient, and rainfall characteristics. Higher canopy cover and crop residue mulching on the soil surface reduce surface runoff and minimize the impact of rainfall erosivity and soil erodibility. There are two major types of soil and water conservation measures adopted in fruit crops: (i) mechanical (engineering or structural) measures, which include permanent and semi-permanent structures such as terracing, bunding, trenching, check dams, and gabion structures; and (ii) biological (vegetative) measures, which involve agronomic practices such as contour farming, crop rotation, cover cropping, intercropping, strip cropping, mulching, conservation tillage, land configuration techniques (ridge, broad bed and furrow systems), and the plantation of perennial crops such as fruit trees and multipurpose tree species (MPTs) under different agroforestry systems

IHS/T-9/OP-907

Climate-resilient management of fruit cracking and scorching in litchi (*Litchi chinensis*): integrating genotypic selection and orchard microclimate modification

Sunil Kumar, Bikash Das, Ashok Dhakad, Ipsita Samal, Ankit Kumar, Rohit Kumar and Ajay Kumar Rajak

ICAR-National Research Centre on Litchi, Muzaffarpur, Bihar
Corresponding author: mehtasunil98@gmail.com

Abstract

The study summarizes outcomes from a two-year field investigation (2024–2025) conducted at ICAR–National Research Centre on Litchi, Muzaffarpur, involving (i) evaluation of 40 litchi genotypes for cracking and scorching susceptibility and (ii) assessment of climate-adaptive management strategies in cv. 'Shahi'. Substantial genotypic variation was observed, with cracking incidence ranging from 2.16% in tolerant genotypes such as 'NRCL-4' to 16.14% in 'Shahi'. Cracking initiated during rapid aril expansion and peaked near colour break, whereas scorching occurred during late fruit development under high temperature stress. Among management interventions, under-canopy mini-sprinkler irrigation and pre-harvest fruit bagging proved most effective, reducing cracking and scorching by over 80–90% compared to conventional practices. Mini-sprinkler irrigation lowered canopy temperature by ~5°C and improved orchard microclimate during sensitive stages. Bio-stimulants and plant growth regulators further enhanced fruit resilience. The findings highlight the importance of integrating genotype selection with microclimate-based interventions for climate-resilient litchi production. These results provide scalable technologies and actionable strategies for sustaining litchi productivity under changing climatic scenarios.

IHS/T-9/OP-908

Morpho-physiological responses of date palm (*Phoenix dactylifera*) to varying levels of sodicity and salinity in Haryana

Raj Kumar, Nirmal Singh, Ashwani Kumar, Arvind Kumar, Suresh Kumar and RK Yadav

ICAR – Central Soil Salinity Research Institute, Karnal, Haryana
Corresponding author: rajhorticulture@gmail.com

Abstract

A field study was conducted to evaluate the morpho-physiological responses of date palm (*Phoenix dactylifera* L.) cultivar 'Barhee' under diverse sodic and saline agro-ecological conditions prevailing in Haryana, India. The experiment was laid out at three different places i.e. Karnal (Sodic soil), IIWBR research farm, Hisar (Saline soil) and Sajuma, Kaithal (Normal soil) with six replications. Treatments comprised a non-stress control (ECe ~ 0.34 dS/m and pH ~ 7.65), four levels of salinity (ECe ~ 9.6, 13.1, 16.9, and 18.5 dS/m), and four sodicity levels (pH ~

8.38, 8.62, 9.12, and 9.54). Various morphological attributes including plant height, stem diameter, leaf length and width, number of thorns, thorn-to-thorn distance, and thorn length, along with key physiological parameters such as net photosynthetic rate, stomatal conductance, and transpiration rate were assessed. Data revealed that different treatments have significant effects on all traits except stem diameter. All parameters exhibited a consistent and marked declining trend with escalating stress intensity in both sodic and saline conditions. The control treatment recorded the maximum plant height of 139.17 cm and photosynthetic rate of 5.26 µmol m^{-2} s^{-1}, whereas the moderate reductions were observed under high sodicity (pH~9.54; plant height 104.50 cm, photosynthetic rate 4.89 µmol m^{-2} s^{-1}) and highest reductions were observed under extreme salinity level i.e. ECe~18.5 dS/m (plant height 102.00 cm, photosynthetic rate 4.67 µmol m^{-2} s^{-1}). Critical difference (CD at $p<0.05$) values confirmed statistical separation among treatments for most traits, highlighting greater adverse impacts of sodicity and salinity stresses. Physiological traits showed strong positive correlations with morphological attributes, indicating coordinated impairment of growth and development under stress. These findings are preliminary results of experiment that underscore the need for further research.

IHS/T-9/OP-909

Morpho-physiological responses of geranium (*Pelargonium graveolens*) varieties to salinity stress and its alleviation by foliar KNO_3

CB Harisha, Renuka Nagale, SB Chavan, Hanamant M. Halli, KM Boraiah and PS Basavaraj

ICAR-National Institute of Abiotic Stress Management, Baramati, Pune, Maharashtra
Corresponding author: harisha.cb@gmail.com

Abstract

Salinity is a major abiotic stress that limits the productivity of aromatic plants, including rose-scented geranium (*Pelargonium graveolens*), particularly in semi-arid regions. The present study evaluated the effects of saline irrigation and foliar application of potassium nitrate (KNO_3) on growth, physiological, biochemical traits, and essential oil yield of four geranium varieties (Kelkar, Bio-G-171, CIM-Pawan, and CIM-Bharat). The experiment was conducted in a factorial randomized design with four salinity levels (0, 3, 6, and 9 dS m^{-1}) and three KNO_3 concentrations (0, 0.25, and 0.5%). Increasing salinity levels significantly reduced plant height, number of leaves, leaf area, herb yield, and essential oil content, while enhancing sodium and chloride accumulation, canopy temperature, and oxidative stress markers such as proline, superoxide dismutase (SOD), and peroxidase (POD). Among the tested varieties, Kelkar exhibited the highest salinity tolerance, maintaining superior growth, herb yield (109.3 g $plant^{-1}$), and oil yield (0.36 ml $plant^{-1}$) under saline conditions. Foliar application of 0.5% KNO_3 significantly improved physiological attributes, including normalized difference vegetation index (NDVI), relative water content (RWC), and membrane stability index (MSI), and enhanced nutrient uptake, particularly potassium (K^+) and nitrogen (N), while reducing the accumulation of toxic ions. Under moderate salinity (3 dS m^{-1}), application of 0.5% KNO_3 resulted in a higher herb yield (101.9 g $plant^{-1}$), which was comparable to the control treatment (106.2 g $plant^{-1}$ at 0 dS m^{-1} without KNO_3). The findings indicate that the integration of the salinity-tolerant variety Kelkar with foliar application of 0.5% KNO_3 is an effective strategy for sustaining geranium productivity under salinity stress up to 3 dS m^{-1} without yield penalty.

IHS/T-9/OP-910

Underutilized fruit crops of indian arid and semi-arid regions: importance, conservation and utilization strategies

Sonu Nagar, S Patra, A K Panda, D K Sharma and J Gurjar

Department of Fruit Science, ASPEE College of Horticulture, NAU, Navsari, Gujrat
Corresponding author: dksharma@nau.in

Abstract

This review critically examines 19 indigenous underutilized fruit species native to Indian arid zones, including Indian jujube, aonla, bael, kair, karonda, tamarind, wood apple, custard apple, jamun, jharber, mahua, pilu, khejri, mulberry, chironji, manila tamarind, timroo, and khirni. Emphasis was placed on their ethnobotanical importance, adaptive physiology, phytochemical composition, and conservation status. These species exhibit strong xerophytic adaptations such as deep taproot systems, modified stomatal behavior, osmolyte accumulation, and enhanced antioxidant activity, enabling tolerance to drought, salinity, and temperature extremes where conventional crops fail. Phytochemical analyses reveal high nutritional and nutraceutical value, notably in aonla, which contains 500–1800 mg/100 g ascorbic acid, along with abundant polyphenols, flavonoids, carotenoids, and essential minerals. Despite their ecological resilience and nutritional richness, their commercial adoption remains limited due to poor germplasm characterization, lack of improved varieties, insufficient quality planting material, and weak value-chain infrastructure. Conservation efforts have documented 1,717 accessions, and limited breeding programs have produced improved cultivars. Integrating molecular breeding, improved agronomic practices, processing technologies, supportive policies, and stakeholder capacity building is crucial for mainstreaming these species into sustainable horticulture, enhancing nutritional security and livelihoods in arid ecosystems.

IHS/T-9/OP-911

Salt injury index and membership function value-based evaluation of salinity tolerance in pea genotypes

P. M. Singh, Jyoti Devi, Brijesh Kumar Maurya and Nakul Gupta

ICAR- Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh
Corresponding aurthor: pmsiivr@gmail.com

Abstract

The study aimed to determine an optimum salt concentration for reliable screening and identify a robust morphological trait for assessing salinity tolerance during germination and early seedling development. Thirty-three pea genotypes were initially evaluated under six NaCl concentrations (50 to 300 mM/L) to establish the threshold stress level using the salt injury index (SII). An average SII of 0.5 across traits identified 100 mM/L NaCl as the optimum concentration for differentiating tolerance levels. Subsequently, 150 diverse genotypes were screened at this concentration, along with multiple seedling traits, including GP, RL, SHL, SL, SFW, SDW and vigour indices (I and II). Salt tolerance was quantified using the fuzzy comprehensive evaluation method, generating membership function values (MFV) for each genotype. Multiple regression analysis produced a predictive mathematical model integrating salt tolerance indices (STI) of all traits, which accurately estimated genotype performance ($R^2 > 0.85$). Seedling length (SL) showed the strongest association with mean MFV, identifying it as the most reliable single trait for early-stage salt tolerance screening. The validated model and identified trait provide a rapid, economical, and reproducible approach for large scale assessment of salinity tolerance in pea, offering valuable tools for selecting superior parental lines and accelerating the breeding for saline environments.

IHS/T-9/OP-912

Unravelling differential mechanisms promoting pollination in white-and red-fleshed dragon fruit varieties

K. M. Boraiah, Priyanka Jadhav, Prakash Kate, V. D. Kakade, P. S. Basavaraj, C. B. Harisha, Hanamant M Halli, K. K. Pal and K. Sammi Reddy

1ICAR-National Institute of Abiotic Stress Management, Baramati, Maharashtra
Corresponding author: bors_km@yahoo.co.in

Abstract

The study elucidates differential pollination-promoting mechanisms operating in white- and red-fleshed dragon fruit varieties and their implications for fruit set and fruit size. Despite pronounced heterostyly and spatial separation between anthers and stigma, both white- and red-fleshed varieties were able to set fruits under bagged or restricted pollination conditions, indicating the possibility of autogamy. However, smaller fruits with fewer seeds, revealing a clear pollination deficit, particularly in white-fleshed varieties indicates limited pollen deposition and incomplete ovule fertilization. These consequences demonstrating that fruit set alone is not a reliable indicator of effective pollination. Distinct temporal and structural mechanisms were found to regulate pollination efficiency. In red-fleshed varieties, early pollination is promoted by rapid unclasping of stigma lobes, timely flower closure, and flower movements such as shaking, which collectively facilitate efficient pollen transfer before pollen viability declines. These mechanisms ensure early fertilization, resulting in higher seed set and larger fruits. In contrast, white-fleshed varieties exhibit delayed pollination associated with prolonged floral openness and late-stage flower bending. Although bending may promote delayed autogamy by reducing anther–stigma distance, it occurs beyond the peak pollen viability window, leading to suboptimal fertilization, reduced seed number, and smaller fruits. Overall, the study demonstrates that while autogamy may safeguard fruit set in heterostylous dragon fruit, it is insufficient for achieving optimal fruit size and yield, particularly in white-fleshed types. The findings strongly highlight the need for supplementary pollination to overcome pollination deficits and unlock the potential yield of dragon fruit cultivation.

IHS/T-9/OP-913

Performance of dragon fruit (*Hylocereus spp.*) and strawberry (*Fragaria × ananassa* Duch.) intercropping model under semi-arid conditions of the Bundelkhand region

Ranjit Pal, Sukanya Misra, Manoj Kundu, Ghan Shyam Abrol and Manish Srivastav

College of Horticulture & Forestry, Rani Lakshmi Bai Central Agricultural University, Jhansi, Utter Pradesh
Corresponding author: ranjit_pal2@yahoo.com

Abstract

The integration of high-value fruit crops through intercropping offers an effective approach to enhance land productivity, resource use efficiency, and farm income in semi-arid regions. The present investigation was conducted to evaluate the performance of dragon fruit and strawberry intercropping model under the semi-arid conditions of the Bundelkhand region. The experiment was laid out in a Randomized Block Design (RBD) with three treatments comprising sole dragon fruit, sole strawberry, and dragon fruit intercropped with strawberry, replicated thrice. Observations were recorded on growth, yield, quality attributes, land use efficiency (LER) and economics. Results revealed that intercropping strawberry under dragon fruit orchard significantly improved overall productivity without adversely affecting dragon fruit performance. Dragon fruit plants under intercropping system recorded a higher yield attributes parameters as compared to sole cropping. However, strawberry grown as an intercrop showed enhanced berry quality with higher total soluble solids, lowest titratable acidity content, ascorbic acid content, over sole strawberry cultivation. Although a slight reduction in strawberry yield per unit area was observed under intercropping, the combined productivity of the system was substantially higher. The intercropping system recorded significant advantages in land use efficiency, evidenced by a higher Land Equivalent Ratio (LER) and a superior Benefit: Cost (BCR) ratio as compared to sole cropping. The study confirms that the dragon fruit with strawberry intercropping model is a profitable, resource-efficient, and sustainable fruit-based farming system suitable for semi-arid regions.

IHS/T-9/OP-914

Effect of different chemicals on seed germination and growth of papaya seedlings under polyhouse condition

Rajesh Singh, Manju Shukla, Rahul Singh Rajawat and Manoj eske

Krishi Vigyan Kendra, Rewa, Madhya Pradesh
Corresponding author: rajeshsinghjnkvv@yahoo.com

Abstract

An experiment was conducted to the find out the role of media and bio-regulators on seed germination and seedling growth of papaya at College of Agriculture, Rewa. The bio-regulator GA^3, Thiourea and KNO^3 and their combinations with 10 treatments. The experimental treatments were laid down in RBD with three replications. The seeds were sown in poly bags filled with respective media and treated with respective bio-regulators. The results showed that the application of treatment T5 [Soil + compost + cocopeat (1:1:1) + thiourea 1%] was found superior for early as well as higher germination percentage, better shoot growth, better growth of tap root, secondary root production content in seedlings of papaya cv. Red Lady.

IHS/T-9/OP-915

Climate-resilient nutrient strategies for green vegetable production under saline irrigation in arid region

Anita Meena, M.K. Jatav, R.C. Balai and Anand Sahil

ICAR-Central Institute for Arid Horticulture, Bikaner, Rajasthan
Corresponding author: anita.meena@icar.org.in

Abstract

The present study evaluated integrated nutrient management strategies involving organic amendments and micronutrient applications to enhance growth, yield, and stress tolerance of green vegetables under saline irrigation in arid agro ecosystems. A field experiment was conducted on coriander (*Coriandrum sativum* L., cv. Coriander-1, ACr-1) to assess the combined effects of irrigation water salinity (0.5, 2.0, and 4.0 dS m^{-1}), organic fertilizers [farmyard manure (FYM) and vermicompost], and micronutrient supplementation through foliar and soil application. The results revealed significant interactions among salinity levels, organic nutrient sources, and micronutrient treatments on crop performance. Application of 50% FYM + 50% vermicompost supplemented with micronutrients ($ZnSO_4$ foliar spray at 0.5% and $FeSO_4$ soil application at 0.5%) under low salinity irrigation (0.5 dS m^{-1}) produced the highest green biomass yield (8.28 t ha^{-1}), outperforming all other treatment combinations. This integrated treatment also recorded maximum plant height (29.03 cm), number of primary branches (4.30), and leaf area (67.95 cm^2) at 45 days after sowing. The combined use of organic amendments and micronutrients significantly improved root and shoot development, facilitating enhanced water and nutrient uptake under saline conditions. Even under elevated salinity levels, the integrated application of FYM and vermicompost with micronutrients consistently maintained superior growth and yield attributes compared to sole or partial nutrient applications. Overall, the study demonstrates that integrated organic and micronutrient management is an effective and climate-resilient approach for sustaining green vegetable productivity under salinity stress in arid regions.

IHS/T-9/PP-901

Differential response of varieties and bio-inoculants on yield, quality and biotic stress traits in pumpkin (*Cucurbita moschata*)

Ayush Gaat, Sandeep Chopra and Anil Bhushan

Division of Vegetable Science, FoH&F, SKUAST, Jammu, Chatha, Jammu and Kashmir
Corresponding author: drsc373@rediffmail.com

Abstract

The experiment was conducted during spring-summer season of 2024-25 to see the the effect of different bio-inoculants on growth, yield and quality, to identify most responsive pumpkin varieties and bio-inoculants against biotic stress traits and to study the interaction effect of varieties and bio-inoculants on the soil ecology. The treatments comprised three varieties, i.e Punjab Nawab, Arka Surymukhi and Jammu Local with six levels of bio-inoculants i.e *Pseudomonas fluorescens*, *Bacillus* spp, PSB, *Trichoderma* spp, Consortia and control replicated thrice in RBD (factorial) design. There was maximum vine length (394.75 cm), minimum days (74.24) taken for first female flower appearance, maximum fruit diameter (25.54 cm.), maximum flesh thickness (3.03 cm), maximum fruit yield (242.1 q/ha), minimum fruit fly infestation (23.5), virus incidence (33.68%) and powdery mildew incidence (34.5%) in Jammu Local. Similarly maximum vine length (392.73 cm), minimum days (73.58) taken for first female flower appearance, maximum fruit diameter (25.19 cm.), maximum flesh thickness (3.12 cm), maximum fruit yield per hectare (255.8 q/ha), maximum ascorbic acid content (7.19 mg/100g), TSS (5.72° Brix), carotenoid content (11.70 mg/g) and total sugars (3.98%) minimum fruit fly infestation (25.15%), virus incidence (33.04%) and powdery mildew incidence (23.4%) was recorded in consortia of all the bio-inoculants. Among the treatment combinations maximum vine length (408.6 cm), minimum days (71.70) taken for first female flower appearance, maximum fruit diameter (25.12 cm.), maximum flesh thickness (3.28 cm), maximum fruit yield (262.6 q/ha), minimum fruit fly infestation (25.5%), virus incidence (33.6%) and powdery mildew incidence (20.3%) were recorded in Jammu local when treated with the consortia of all bio-inoculants. The total microbial load (*cfu/ml*) comprising bacterial, fungal and actinomycetes population varied significantly and was maximum at fruiting stage and decreased marginally as plant progressed towards the harvesting stage.

IHS/T-9/PP-902

Effect of drip irrigation and fertigation schedule on productivity, profitability, water- and fertilizer- use efficiency in strawberry grown under in Rajasthan

Rajendra Kumar Yadav, R.S. Narolia, R.K. Yadav, Arvind Nagar, Rajesh Kumar Sharma, Sunita Yadav, B.S. Meena

Agricultural Research Station, Ummedganj, Kota, Rajasthan
Corresponding author: raj91yadav@gmail.com

Abstract

A field experiment on effect of drip irrigation and fertigation schedule on productivity, profitability, water- and fertilizer- use efficiency in strawberry (var. Winter Dawn) grown under S-E Rajasthan was conducted at Agricultural Research station, Kota, during *rabi* seasons of 2022-23, 2023-24 and 2024-25 to find out the optimal irrigation and fertigation schedule of water-soluble fertilizers for higher production of strawberry and to assess the effect of drip irrigation and fertigation scheduling on water and nutrient use efficiency by strawberry. Experiment consisting of two levels of irrigation schedules (Irrigation at 40 and 60% PE) kept in main factor and five fertigation schedules [F_1-Entire fertilizers applied to soil, F_2–50% NPK as basal + 25% NPK fertigation, F_3–25% NPK as basal+50% NPK fertigation, F_4–75% NPK fertigation and F_5–100% NPK (150:100:120::N:P_2O_5:K_2O) fertigation in sub factor were laid out in factorial RBD with three replications. The irrigation at 60% PE recorded significantly higher total fruit weight per plant (127 g), fruit yield (33.3 q/ha) as compared to irrigation applied at 40% PE. However, water use efficiency (161.4 kg/ha-mm) was significantly higher under 40% as compared to irrigation applied at 60% PE (125.1 kg/ha-mm). In fertigation schedule, 100% NPK applied through fertigation

Poster Presentation

recorded significantly higher total fruit weight per plant (142 g), fruit yield (37.3 q/ha) and water-use efficiency (165.4 kg/ha-mm) over other fertigation schedules. However, yield of strawberry under 25% NPK as basal + 50% NPK fertigation and 50% NPK as basal + 25% NPK fertigation remained at par with each other. Overall, it may be concluded that drip Irrigation at 60% PE with application of 100% NPK through fertigation recorded maximum and significantly higher total fruit weight per plant, fruit yield and water-use efficiency of strawberry grown in *rabi* season in vertisols of southeastern Rajasthan.

IHS/T-9/PP-903

Soil carbon sequestration and its role in sustainable agriculture horticulture

Neha Sahu, P. K. Keshry, G. Sharma, S. K. Verma, Krishna and Pushpalata Tirkey

BTC CARS, Bilaspur, IGKV, Raipur, Chhattisgarh
Corresponding author: drkrishnadahre919@gmail.com

Abstract

Soil carbon sequestration has gained global importance as an effective strategy for mitigating climate change while simultaneously improving soil health and agricultural productivity. This review highlights the processes, influencing factors, and management practices that enhance carbon storage in soils. Soil organic carbon accumulation occurs primarily through the stabilization of plant-derived residues, microbial biomass, and root exudates, which are incorporated into soil aggregates and protected from rapid decomposition. Several edaphic factors—including soil texture, mineralogy, temperature, and moisture—play critical roles in determining the rate and stability of carbon sequestration. Research findings indicate that conservation agriculture practices such as reduced tillage, residue retention, crop diversification, and cover cropping significantly contribute to carbon buildup by minimizing soil disturbance and promoting continuous organic matter inputs. Integrated nutrient management, application of composts and manures, biochar incorporation, and agroforestry systems further enhance soil carbon levels by improving soil structure and supporting long-term carbon stabilization. Additionally, improved pasture management and reforestation have been shown to increase carbon stocks in degraded and marginal lands. The co-benefits of soil carbon sequestration extend beyond climate mitigation. Soils enriched with organic carbon exhibit better aggregation, higher water-holding capacity, improved nutrient availability, and greater resilience to erosion and drought stress. These improvements directly support sustainable crop production and ecosystem functioning. Overall, soil carbon sequestration represents a key pathway toward climate-smart and sustainable agricultural development.

IHS/T-9/PP-904

Influence of biofertilizer and integrated nutrient management on yield and its attributes on brinjal (*Solanum melongena*)

Pushpalata Tirkey, S. K. Verma, Krishna and Neha Sahu

BTC CARS, Bilaspur, IGKV, Raipur, Chhattisgarh
Corresponding author: drkrishnadahre919@gmail.com

Abstract

The present investigation was conducted to evaluate the effect of biofertilizer in combination with integrated nutrient management on post-harvest attributes and yield of brinjal (*Solanum melongena* L.). Nine nutrient management treatments were tested, comprising different combinations of inorganic fertilizers, vermicompost, FYM and NPK consortium. Results indicated that application of 75% RDN through inorganic fertilizer + 25% RDN through vermicompost + NPK consortium (T_7) recorded the highest values for number of flowers/plants, number of fruits/plants, fruit diameter, fruit length, fruit weight and fruit yield (q/ha). This treatment was statistically comparable with T_6 (75% RDN through inorganic fertilizer + 25% RDN through FYM + NPK consortium) and T_1 (100% RDN – 120:80:60 kg ha^{-1}), and significantly superior to treatments receiving partial or no organic nutrient sources. The lowest performance for all parameters was observed in absolute control (T_9). The enhanced

yield and fruit quality observed under integrated nutrient management may be attributed to improved nutrient availability, better physiological activity, enhanced synthesis and translocation of photosynthates and increased dry matter accumulation. The findings clearly highlight that combining inorganic fertilizers with vermicompost and biofertilizer (NPK consortium) plays a pivotal role in improving growth and fruit productivity of brinjal while reducing the dependency on synthetic fertilizers.

IHS/T-9/PP-905

Crop diversification and its role in income and risk management in India

Lal Chand Sarswat and Mahesh

Maharna Pratap University of Agriculture and Technology, Udaipur, Rajasthan
Corresponding author: lalchandsarswat44@gmail.com

Abstract

Crop diversification has increasingly been recognized as an effective approach for enhancing farm income as well as reducing production-related risks. This study analyzes district-level data from 318 districts across 16 Indian states, grouped according to 12 agro-ecological zones and different irrigation categories. The patterns of crop diversification are examined over the period from 1966–67 to 2007–08 using the Simpson Index and Herfindahl Index as measures of crop diversification. The findings indicate that demand-driven factors and rapid urbanization play a significant role in influencing diversification across various agro-climatic regions of India. The study also highlights the need for further investigation to assess whether observed diversification trends can serve as an effective adaptation strategy for managing climate-related risks. Additionally, it emphasizes the importance of formulating supportive policy frameworks that encourage farmers to adopt diversification as a viable tool for climate risk management.

IHS/T-9/PP-906

Amaranthus: A climate-resilient superfood.

Aurosikha Swain, Anita Mohanty, Nityamanjari Mishra, Pragya Uikey, Swati Sulagna Sarangi and Pradyumna Tripathy

Department of Vegetable Science, CA, OUAT, Bhubaneswar, Odisha
Corresponding author: aurosikhaswain.rs22@ouat.ac.in

Abstract

Amaranthus, an ancient crop cultivated for both its leafy vegetable and grain purpose and increasingly recognized for its potential to enhance climate-resilient agriculture. Leafy amaranthus is widely consumed across the tropical and subtropical regions for its rapid growth, adaptability and exceptional nutrient profile. Nutritionally leafy amaranthus contains protein (3.5-4.6 g), iron (3-9 mg), calcium (270-410 mg) per 100g of fresh leaves along with vitamin A and vitamin C. Grain amaranthus on the other hand has gained global attention as a pseudo-cereal rich in high protein (13.56%), Iron (7.61%) and bio active compounds beneficial for human health. both leafy and grain amaranthus demonstrate remarkable tolerance to heat, drought, salinity, and poor soil conditions due to their C_4 photosynthetic pathway, efficient water-use mechanisms, and deep, extensive root systems. These physiological advantages allow the crop to outperform traditional staples under climate-induced stress. Additionally, the genus is characterized by broad genetic diversity, offering significant opportunities for breeding improved varieties suited to emerging environmental challenges. Despite its advantages, amaranthus remains underutilized because of limited awareness, inadequate market development, unavailability of hybrids and package of practices for both vegetable and grain purposes. Strengthening breeding programme that focus on stress tolerance, yield improvement, and nutritional enhancement significantly expand its commercial and nutritional relevance. This review synthesizes current knowledge on the nutritional value, climate-resilient traits of leafy and grain amaranthus. It highlights innovative cultivation approaches, genetic improvement strategies, and the crop's contribution to sustainable farming systems. As a versatile superfood and climate-smart crop, amaranthus holds great potential in addressing future challenges related to nutrition, climate variability, and sustainable horticultural development in tropical world.

IHS/T-9/PP-907

New access to augment the growth of banana

Tulsi D. Gurjar, S. J. Patil, A. K. Pandey, Darshna B. Chaudhari, R. V. Tank and Dixita Prajapati

ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat
Corresponding author: tulsigurjar@yahoo.com

Abstract

The study on response of foliar spray of novel organic liquid fertilizer and micronutrients on yield and quality of banana cv. Grand Nain was laid out in Randomized Block Design with Factorial Concept comprising of two factors, *viz.* different level of novel organic liquid nutrient (0, 1 and 2 %) and Combi – F, Grade – IV micronutrient (0, 1, 1.5 and 2 %). The treatments were replicated thrice. The result indicated that foliar application of 1 % novel organic liquid fertilizer recorded significantly the maximum growth characters at various stages of growth of banana, *i.e*. number of leaves, leaf area, pseudostem girth and height of banana plant at 5th and 7th MAP. While, foliar application of 2 % novel organic liquid fertilizer recorded the maximum leaf nutrient content, *viz.* Fe and Zn. whereas number of days from planting to inflorescence emergence was found non- significant. The foliar application of 1.5 % combi–F, grade–IV micronutrient at 3rd, 5th and 7th month after planting (F_3) exhibited the maximum number of leaves at 7th MAP, leaf area, pseudostem girth and pseudostem height at 5th and 7th MAP. The higher level of leaf Fe and Zn were reported in 2 % combi – F, grade – IV micronutrient.

IHS/T-9/PP-908

Effect of micronutrients on yield and quality of mango (*Mangifera indica*)

Vivek Patel, Manju Shukla, Rajesh Singh, Smita Singh and Ajay kumar Pandey

College of agriculture, Rewa, Madhya Pradesh
Corresponding author: shuklamanju732@gmail.com

Abstract

An experiment was conducted to find out the effect of foliar application of micro-nutrients on fruit yield and quality of mango (*Mangifera indica* L.) cultivars "Dashehari" at Fruit Research Station Farm, Khthuliya, Rewa, Madhya Pradesh, during the year 2024-25. The experiment was laid out in Randomized Block Design with thirteen treatments in three replications for combinations with different micronutrients zinc sulphate, copper sulphate, borax, boric acid and mango special was applied on mango cultivars "Dashehari" at different growth stages. All were fertilized with a recommended dose of NPK (1500:500:1000 g as N, P_2O_5 and K_2O). The spraying was done twice, during mid-October, mid-December, and mid-February before the flowering stage and again in mid-March at the marble stage during both years. Foliar sprays, in general, improved fruit yield. Yields were exceptionally higher in response to foliar application of Zinc (Zn), Copper (Cu) and boron (B) compared to other treatments. Result proved that foliar application of mango trees with [(RDF + zinc sulphate (0.4 %) + copper sulphate (0.2 %) + boric acid (0.2%)] (two sprays applied just before flowering and at marble stage)] was the promising treatment for improvement of vegetative growth, yield and fruit quality. Treatment T13 was recorded maximum yield (98.7 kg/plant) under [(RDF + zinc sulphate (0.4 %) + copper sulphate (0.2 %) + boric acid (0.2%)].

IHS/T-9/PP-909

Litchi under stress: understanding and managing nature's impact on growth and fruit quality

Balreet Kaur, Navprem Singh

Corresponding author: balreet-2497002@pau.edu

Abstract

Litchi (*Litchi chinensis* Sonn.) is an economically important yet climate sensitive subtropical fruit crop whose productivity and quality are strongly affected by abiotic and biotic stresses. Abiotic stresses can reduce yields by up to 70%. Optimal flowering occurs below 25 °C, while temperatures above 30 °C suppress flower initiation. High temperatures, low humidity, and water stress cause sunburn and fruit cracking, whereas cold stress disrupts floral development but can be alleviated using cryoprotectants, such as Bihu and Liangli, which regulate stress-responsive genes. Drought triggers osmotic adjustment via genes such as LcIMT1, enhancing tolerance through D-bornesitol synthesis. Conversely, excessive irrigation and flooding damage roots and may uproot trees. Wind stress during flowering and fruiting leads to fruit drop, mitigable by windbreaks such as eucalyptus. Light intensity and photoperiod affect flowering, pericarp colour, and fruit quality, while excessive shading reduces both yield and colouration. Salinity induces ionic and nutrient imbalances, with optimal growth in soils of pH < 8.0. Deficiencies in macronutrients (N, P, K, Ca) and micronutrients (Zn, B) impair yield and fruit development. Biotic stresses are equally detrimental. Major pests include fruit borers (*Blastobasis* sp., *Conopomorpha* sinensis), leaf curl mites, and bark-eating caterpillars, which damage shoots and fruits. Integrated management combining biological control (*Trichogramma chilonis*), neem-based sprays, and fruit bagging effectively minimizes loss. Fungal diseases like fruit blight and anthracnose further degrade fruit quality but can be managed by timely fungicidal applications. Overall, abiotic stresses such as drought, heat, cold, salinity, and light variation, alongside fungal and insect pests, are major constraints to litchi cultivation. Sustainable production depends on efficient irrigation, balanced nutrition, genetic resistance, and integrated pest management. Phytohormones and molecular insights into stress physiology offer promising avenues for developing climate-resilient litchi production systems capable of sustaining yield and quality.

IHS/T-9/PP-910

Strategies for Cost-Effective and Sustainable Intensification of Horticultural Production Systems

Akanksha Rai, Vikash Tyagi, Surabh,Yashmi Yadav, Shristi Rai and Akarsh Chaudhary

Collage of Horticulture, Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut, Uttar Pradesh
Corresponding author: raiak7068@gmail.com

Abstract

Horticulture plays a crucial role in enhancing farmers' income, nutritional security, and employment generation, particularly in developing and resource-constrained regions. However, increasing input costs, shrinking natural resources, climate variability, and market uncertainties have raised concerns regarding the long-term sustainability and profitability of horticultural production systems. Sustainable intensification provides a viable framework to address these challenges by increasing productivity and profitability without compromising environmental integrity. This abstract highlight key strategies for achieving cost-effective and sustainable intensification in horticultural production systems. Major approaches include efficient resource management through precision irrigation technologies such as drip and micro-irrigation, coupled with fertigation, which improve water and nutrient use efficiency while reducing production costs. Integrated nutrient management, involving the combined use of organic manures, crop residues, biofertilizers, and judicious chemical fertilizers, helps maintain soil health and enhances input efficiency. Integrated pest and disease management practices further contribute to cost reduction by minimizing pesticide use, lowering environmental risks, and improving produce quality. The adoption of improved, high-yielding, and climate-resilient varieties, along with crop diversification and protected

cultivation, enhances productivity and reduces vulnerability to climatic stresses. Low-cost mechanization, digital advisory tools, and decision-support systems improve labor efficiency and farm management, making horticultural practices more scalable and farmer-friendly. In addition, strengthening post-harvest management, value addition, and market linkages reduces losses and enhances net returns. Overall, the integration of affordable technologies with sustainable agronomic practices can significantly improve the productivity, profitability, and resilience of horticultural production systems, supporting environmental sustainability and long-term livelihood security for farming communities.

IHS/T-9/PP-911

Influence of farming systems on organoleptic quality, soil health and economic performance of papaya (*Carica papaya*)

V. M. Parmar, D. R. Kanzaria and J. S. Parsana

Department of Fruit Science, College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat
Corresponding author: jsparasana@jau.in

Abstract

An investigation was carried out at Fruit Research Station, Madhadibaug, Junagadh Agricultural University, Junagadh, during 2022-23 and 2023-24. The experiment was laid out in large plot technique having three treatments of different farming systems, viz. low-cost natural farming, organic farming and conventional farming. Result reveled that the maximum appearance (7.97, 8.15 and 8.06), taste (7.93, 8.18 and 8.06), flavour (8.25, 8.42 and 8.33), colour (8.05, 8.22 and 8.13) score, highest level of available nitrogen (231.76, 251.71 and 241.74 kg/ha), phosphorus (29.11, 34.96 and 32.04 kg/ha) and potassium (238.12, 254.53 and 246.32 kg/ha) in soil were recorded in conventional farming, while highest organic carbon (0.65, 0.77 and 0.71 %) in soil was observed in organic farming during both the years as well as in pooled data, respectively. Other soil parameters like bulk density (Mg/m^3), porosity (%) and water holding capacity (%) recorded non-significant in all farming systems during 2022-23, 2023-24 as well as in pooled analysis. Conventional farming gave highest net return (Rs. 5,63,252/ha) and BCR (2.30), while lowest values were noted in organic farming.

IHS/T-9/PP-912

Pomegranate–melia dubia based climate-resilient and remunerative agroforestry system for emi-arid Bundelkhand region

Ashok Yadav, Sandeep Garg, Satyam Bansal, Asha Ram, G.P. Sandeep, Harish Sharma, Naresh Kumar and Ayyanadar Arunachalam

Corresponding author: ashokcafrihort1@gmail.com

Abstract

The proposed pomegranate–Melia dubia–based climate-resilient and remunerative agroforestry model aims to enhance farm income, improve nutritional diversity, strengthen ecosystem services, and increase resilience to climatic stresses. The system is structured into three functional components: (i) boundary plantations of multipurpose tree species integrated with bajra–napier hybrid grass for fodder and biomass production; (ii) an inner layer of perennial fruit crops; and (iii) a middle layer comprising compatible intercrops. This multi-tier system ensures year-round productivity, minimizes risk of complete crop failure, improves microclimatic conditions, enhances soil health, and promotes carbon sequestration. By emulating the structural complexity of natural forests while remaining farmer-friendly and economically viable, the model offers a sustainable pathway for climate change adaptation and rural development. Large-scale adoption of such climate-resilient agroforestry systems can play a significant role in achieving long-term nutrition security, stable farm incomes, and environmental sustainability.

IHS/T-9/PP-913

Effect of drip irrigation and fertigation schedule on productivity, profitability, water and fertilizer use efficiency in strawberry grown under S-E Rajasthan

Rajendra Kumar Yadav, R.S. Narolia, R.K. Yadav, Rajesh Kumar Sharma, Arvind Nagar, B.S. Meena and M.C. Jain

Agricultural Research Station, Ummedganj, Kota, Rajasthan
Corresponding author: raj91yadav@gmail.com

Abstract

A field experiment on effect of drip irrigation and fertigation schedule on productivity, profitability, water and fertilizer use efficiency in strawberry (var. Winter dawn) grown under S-E Rajasthan was conducted at Agricultural Research station, Kota during rabi seasons of 2022-23, 2023-24 & 2024-25 to find out the optimal irrigation and fertigation schedule of water-soluble fertilizers for higher production of strawberry and to assess the effect of drip irrigation and fertigation scheduling on water and nutrient use efficiency by strawberry. Experiment consisting two levels of irrigation schedules (Irrigation at 40 & 60% PE) kept in main factor and five fertigation schedules [F1-Entire fertilizers applied to soil, F2 –50% NPK as basal + 25% NPK fertigation, F3 –25% NPK as basal+50%NPK fertigation, F4–75%NPK fertigation & F5–100%NPK (150:100:120::N:P2O5:K2O) fertigation in sub factor were laid out in factorial RBD with three replications. The irrigation at 60% PE recorded significantly higher total fruit weight per plant (127 g), fruit yield (33.3 q/ha) of strawberry as compared to irrigation applied at 40% PE. However, water use efficiency (161.4 kg/ha-mm) was significantly higher under 40% PE as compared to irrigation applied at 60% PE (125.1 kg/ha-mm). In fertigation schedule, 100% NPK applied through fertigation recorded significantly higher total fruit weight per plant (142 g), fruit yield (37.3 q/ha) and water use efficiency (165.4 kg/ha-mm) over other fertigation schedules. However, yield under 25% NPK as basal + 50% NPK fertigation and 50% NPK as basal + 25% NPK fertigation had remained on par with each other. Overall, it may be concluded that drip irrigation at 60% PE with application of 100% NPK through fertigation recorded maximum and significantly higher total fruit weight per plant, fruit yield and water use efficiency of strawberry grown in rabi season in vertisols of southeastern Rajasthan.

IHS/T-9/PP-914

Climate-resilient horticultural production: a review

Akanksha Arya and P.K. Yadav

College of Agriculture SKRAU, Bikaner, Rajasthan
Corresponding author: akankshaarya181@gmail.com

Abstract

Climate-resilient horticulture technology utilizes innovative approaches to enhance the production and yield of horticultural crops while protecting them from the adverse effects of climate change. Horticultural production is increasingly affected by drought, erratic and sparse rainfall, salinity, and extreme temperatures, posing challenges to food security. Strategies such as selecting resistant varieties, adopting micro-irrigation, practicing soil reclamation, implementing precision farming, and using protected cultivation help mitigate these impacts. Advanced technologies, including precision horticulture and controlled environment agriculture systems (CEA) like greenhouses and hydroponics, optimize resource use, reduce waste, and provide stable growing conditions. By integrating these approaches, horticultural systems can achieve stable yields, promote sustainable resource use, and support farmer's livelihoods. These innovations contribute to sustainable horticultural production, improved productivity, and long-term food and nutritional security, offering a viable pathway for adapting horticultural systems to increasing climatic uncertainties.

IHS/T-9/PP-915

Soil health management, nutritional security and economic benefit of Dolichos bean cultivation as intercrop in mango orchards

Jyothi R. Raghavendra Yaligar, Mallikarjun Nigadalli, Kavitha Ullikashi, Radha J, Revathi RM and Narappa G

ICAR-Krishi Vigyan Kendra, Koppal, Gangavathi, Karnataka

Corresponding author: jyokiran29@gmail.com

Abstract

Climatic condition of Koppal district created diversification in horticulture crop cultivation. In fruit crops department of horticulture implemented project of horticulture crop area expansion with major emphasis on king of fruit crop Mango. In last two years of period 1000 ha area expanded under mango crop and it was encouraged to adopt high density plating through ICAR-KVK, Koppal. As mango takes minimum of three years period for its canopy expansion and fruit bearing. During this period farmers keep the interspace in mango which one un-utilised. Further mango plantations were established in red soil, the nutritional content as such low in red soil, especially nitrogen. As KVK involved in the technology backstopping with department of horticulture, it has conducted the technology demonstration of Dolichos bean cultivation as inter crop in newly established mango plantations. Pulse crops are helpful in nitrogen fixation, dolichos bean variety Arka Prasiddi from IIHR, Bengaluru was demonstrated in 2024-25 and 2025-26 in 20 farmers mango orchard. Arka Parsidhi is vein type beans which bear healthy pods which are rich in protein and fiber content. Along with nitrogen fixation it has given sufficient quantity of biomass after harvest which was incorporated to the soil to enhance the porosity of the soil. During demonstration on an average the farmers harvested 50 q/ha pods of Dolichos bean with an average net return of Rs.146756/ha, which could be helpful for maintaining the socio-economic status of the mango farmers during the initial period of first three year. Further mango famers can take up the interspace cultivation of dolichos bean during kharif season to enhance the soil fertility with interspace utilisation.

IHS/T-9/PP-916

Influence of changing rainfall regimes on flowering and yield of Nagpur Mandarin in Southeastern Rajasthan

Himanshu Chawla, Jitendra Singh, Dhaneshra Kumar Gurjar and Tendul Chouhan

Department of Fruit Science, College of Horticulture and Forestry, Jhalawar, Agriculture University, Kota, Rajasthan
Corresponding author: hchawla4160@gmail.com

Abstract

The effect of changing rainfall regimes on flowering and yield of Nagpur Mandarin (*Citrus reticulata* Blanco) in Southeastern Rajasthan was studied during the years 2023-24 and 2024-25. This research was carried out in the 12 villages spread along 3 tehsils (Jhalrapatan, Asnawar and Raipur), selected three orchards in each village scattered in all four directions in Jhalawar district. The results indicated that T_4 treatment (Binda orchard plants) required the minimum number of days for initiation of flowering (93.94 days) and flowering duration (23.76 days). Furthermore, treatment recorded the highest flower bud density (67.54), number of flowers per plant (2,37,397.42), fruit set (1.76%), fruit retention (60.86%), fruiting density (16.64 m^3) and fruit yield per tree (140.24 kg), These results were observed under prevailing climatic conditions, with rainfall ranging from 0 to 366 mm during 2023-24 and 0 to 381 mm during 2024-25, rainy days varying from 0 to 26 days (2023-24) and 0 to 22 days (2024-25) and periodicity of rain ranging from 0 to 0.84 (2023-24) and 0 to 0.71 (2024-25).

IHS/T-9/PP-917

Neem-turmeric agroforestry system for enhancing productivity and sustainability in the semi-arid Bundelkhand Region

Toshika Tamrakar, Ram Prakash Yadav, Manmohan J. Dobriyal, and Yalal Mallesh

Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh
Corresponding Author: tamrakar25toshi@gmail.com

Abstract

In the present system, two turmeric (*Curcuma longa L.*) varieties, Azad Haldi 1 and Pratibha, are evaluated under neem-based agroforestry to assess their growth performance and yield potential response under different planting patterns namely flat bed, raised flat bed, ridge furrow, and ridge furrow paired row, to assess their adaptability and productivity. The neem–turmeric agroforestry system is expected to improve microclimatic conditions by reducing temperature stress, conserving soil moisture, and enhancing nutrient recycling through litter addition. Systematic evaluation of growth, yield, quality attributes, biomass production, carbon stock, soil properties, and economic returns of turmeric under neem canopy will help identify efficient planting arrangements for higher productivity. Overall, neem–turmeric agroforestry system offers a climate resilient, resource efficient, and economically viable approach for sustainable agricultural development in the Bundelkhand region.

IHS/T-9/PP-918

Solar orcharding: a climate-smart farming system

Arathi Balan, Ranjit Pal, Manish Srivastav and Manoj Kundu

Department of Fruit Science, RLBCAU, Jhansi, Uttar Pradesh
Corresponding Author: arathikripa@gmail.com

Abstract

In orchard-based agrivoltaics systems, photovoltaic solar panels are installed at an elevated height of approximately 2-4 m above ground level, allowing normal tree growth, farm operations, and adequate light penetration. The panels intercept excess solar radiation and create partial shading, which modifies the orchard microclimate by reducing temperature extremes and evapotranspiration losses. Sunlight reaches the canopy through direct transmission during morning and evening hours, diffused light passing between panel rows, and reflected radiation from panel surfaces. This balanced light environment ensures sufficient photosynthetically active radiation while minimizing heat stress and fruit sunburn. Improved microclimatic conditions enhance soil moisture conservation, increase water-use efficiency, and support stable crop growth under variable climatic conditions. Beyond agronomic benefits, solar orcharding offers economic advantages by providing farmers with an additional and reliable income source through solar electricity generation, thereby improving farm profitability and energy security. Challenges associated with solar orcharding include high initial investment costs, site-specific system design, crop compatibility, and management requirements. However, technological advancements, appropriate system design, and supportive policies can facilitate wider adoption. By integrating food and renewable energy production on the same land, solar orcharding represents a sustainable and resilient agricultural innovation contributing to long-term food security, clean energy generation, and climate adaptation.

IHS/T-9/PP-919

Zinc oxide nanoparticles (ZnO NPs) enhance growth, yield, and curcumin content in different turmeric (*Curcuma longa* L.) genotypes through foliar application

Raman Choudhary, Ram P. Yadav, Manmohan J. Dobriyal, Prabhat Tiwari, Arjun Lal Ola and Rakesh Panday

Department of Silviculture and Agroforestry, Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh
Corresponding author: ramansiraw@gmail.com

Abstract

The present study has been conducted in the semi-arid Bundelkhand region of Uttar Pradesh state of India during two consecutive years of 2023-2024 & 2024-25. The experiment had been established in the split-split plot design. The main factor was the two growing conditions (G1: Under neem, G2; Sole turmeric crop) and the sub plot consists of the 5 different turmeric varieties (V1: NDH 3, V2: Pratibha, V3: NDH 98, V4: BSR 1, V5: Azad haldi-1) and the sub-sub plot is three different (0 ppm, 15 ppm, 30 ppm) foliar application of zinc oxide nano particles. Fresh rhizome yield of turmeric was reported higher in intercropping with neem tree. The experiment has been found that variety NDH 98 has outperformed all the other varieties in the growth and yield parameters. The curcumin content was reported highest in NDH 3. Almost all the varieties performed better under shade than in open conditions. The zinc oxide nanoparticles have showed significant positive impact on the growth, yield and curcumin content of turmeric irrespective of the growing condition and variety in respect to 0 ppm application (only distilled water). The 15 ppm and 30 ppm zinc oxide nanoparticles have showed at par performance for all the growth and yield parameters whereas curcumin content has showen the increasing trend with increasing the nano ZnO concentration. The highest curcumin content was reported with the application of 30 ppm of ZnO nanoparticles.

IHS/T-9/PP-920

Unravelling the potential of biocapsule and nanozeolite for climate-resilient and sustainable production of apple (*Malus domestica* Borkh. cv. HRMN-99) in subtropical regions

Saurav vats, Saket Mishra, Avantika Anand

Department of Horticulture Fruit & Fruit Technology, Bihar Agricultural University, Sabour, Bhagalpur, Bihar
Corresponding author: iamsaurav078@gmail.com

Abstract

Climate-resilient horticulture production requires sustainable nutrient management strategies that enhance productivity while reducing environmental impacts such as nutrient losses and greenhouse gas emissions. Climate-adapted cultivars like HRMN-99 are being used to grow apples, a temperate fruit crop, in Uttar Pradesh's subtropical agroclimatic conditions. The investigation was conducted at the Research Farm of the Department of Horticulture, SHUATS, Prayagraj, during 2021 on 30-month-old apple plants (cv. HRMN-99) to evaluate the effect of biocapsules and nanozeolite in combination with the recommended dose of fertilizers (RDF) on growth, yield and fruit quality under a resource-efficient production system. The experiment was laid out in a randomized block design with three replications and nine treatment combinations involving NPK, biocapsule, and nanozeolite. Treatments were applied through soil drenching at the initiation of the experiment, pre-flowering and fruit setting stages to improve nutrient retention, enhance nutrient use efficiency and minimize leaching losses. The results revealed that the integrated application of NPK (RDF) + nanozeolite @ 250 ppm + biocapsule @ 500 ppm recorded superior performance in terms of plant height (2.8 m), number of primary and secondary branches (3 and 28), flowers (319), fruits (63.6), yield per plant (7.2 kg), and fruit quality attributes such as total soluble solids (11.56 °Brix) and acidity (0.71%), followed by NPK (RDF) + Nanozeolite @ 250 ppm + Biocapsule @ 250 ppm.

The improved performance may be attributed to the slow-release and nutrient-holding capacity of nanozeolite, along with enhanced microbial activity and nutrient fixation facilitated by biocapsules. This integrated approach reduces excessive fertilizer dependency, improves soil health, and contributes to climate-resilient and sustainable apple production systems.

IHS/T-9/PP-921

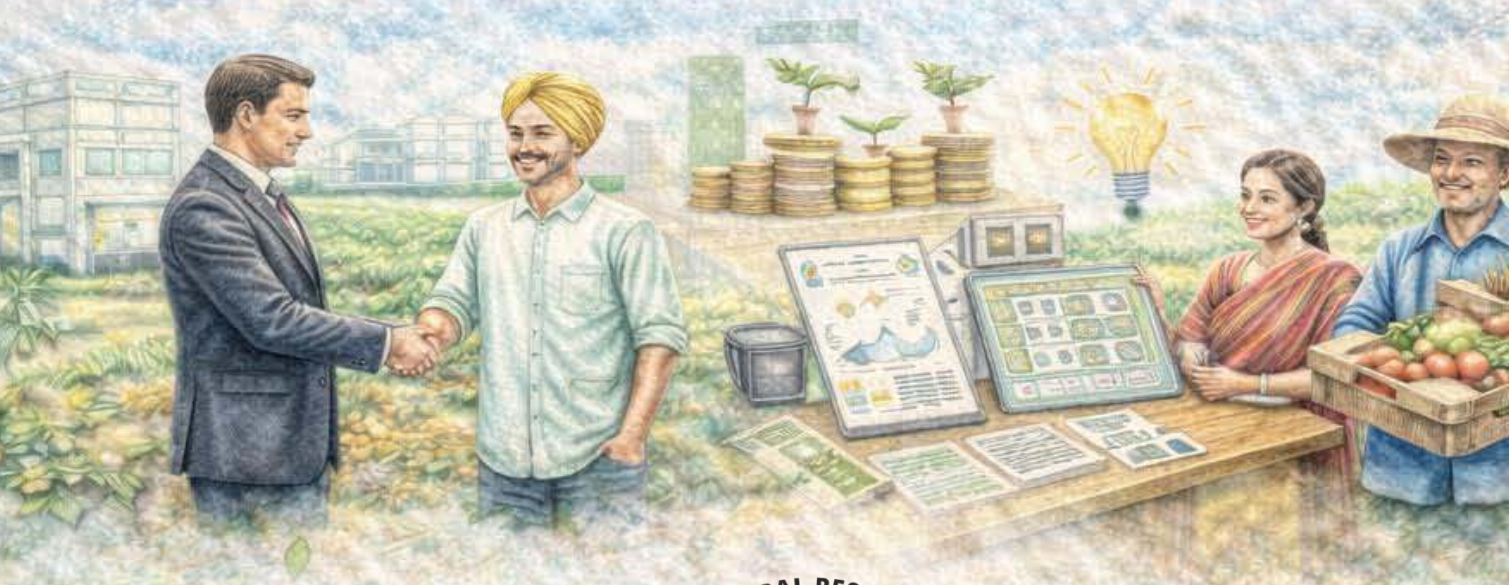
Injection method of NPK fertilization for climate-resilient date palm (*Phoenix dactylifera*) production in arid region

Jitendra Gurjar, Rajendra Singh Rathore, Ramkesh Meena and Deepak Kumar Sarolia

Corresponding author: jitendragurja888@gmail.com

Abstract

The present investigation was carried out at the Date Palm Research Centre, Agricultural Research Station, SKRAU, Bikaner, during 2023 and 2024 to assess integrated trunk and soil injection of NPK fertilizers as a climate-resilient nutrient management strategy for enhancing productivity, fruit quality and stress tolerance of date palm (*Phoenix dactylifera* L.) under arid conditions. Water-soluble NPK fertilizers were applied through trunk and soil injection to ensure efficient nutrient delivery and availability under moisture-limited, heat and drought-stressed environments typical of arid ecosystems. The results demonstrated that integrated trunk and soil injection significantly improved vegetative growth, leaf nutrient status (N, P and K), chlorophyll content, floral development, yield attributes, fruit quality parameters and economic returns compared to conventional practices. Enhanced nutrient uptake through precision delivery reduced physiological stress and contributed to improved plant performance and yield stability under adverse climatic conditions. The study concludes that integrated trunk and soil injection of NPK fertilizers represents a climate-resilient, resource-efficient and environmentally sustainable nutrient management approach, capable of improving stress tolerance, productivity and profitability of date palm cultivation in arid regions.



SOCIETY FOR HORTICULTURAL RESEARCH AND DEVELOPMENT
SHRD

Theme 10

Entrepreneurship development and Farmer Producer Organizations (FPOs)



4th Indian Horticulture Summit-Cum-International Conference-2026

Book of abstracts

IHS/T-10/OP-1001

Farmer producer organizations as catalysts for growth in Indian Horticulture sector.

Kuldeep Choudhary, Sanjiv Kumar and P. C. Meena

Division of Agribusiness Management, ICAR-National Academy of Agricultural Research Management, Hyderabad (Telangana)
Corresponding author: kuldeep@naarm.org.in

Abstract

The study synthesizes evidence from recent academic literature, government schemes, and evaluation studies spanning 2018–2025 to assess the role of FPOs in strengthening India's horticulture sector. The analysis focuses on the contributions of Farmer Producer Organizations (FPOs) in enhancing access to quality inputs, enabling collective aggregation, promoting value addition, facilitating domestic and export market linkages, and supporting risk-sharing among member farmers. The study summarizes empirical evidence on income and price realization impacts, examines institutional and operational models suited to horticultural value chains, and identifies key constraints related to finance, managerial and technical capacity, post-harvest infrastructure, and governance. Overall, findings from empirical studies and program evaluations suggest that while FPOs generate positive outcomes in terms of farmer incomes and market participation, the impacts remain heterogeneous. Successful FPOs are typically characterized by strong market orientation, professional management, effective backward and forward linkages, and sustained public–private support. The said study concludes by proposing the need for a strategic roadmap to strengthen horticulture-focused FPOs and by highlighting critical research gaps where more rigorous and context-specific evidence is required.

IHS/T-10/OP-1002

Agritech start-ups transforming horticultural sector in India

Sanjiv Kumar, Kuldeep Choudhary and P. C Meena

ICAR-National Academy of Agricultural Research Management, Hyderabad
Corresponding author: drsanjivkr@gmail.com

Abstract

Agritech startups are leveraging technologies such as Artificial Intelligence, Internet of Things (IoT), Big Data analytics, and blockchain to revolutionize horticultural practices. In precision horticulture, real-time monitoring systems optimize irrigation, nutrient management, and pest control, significantly reducing input costs while enhancing yield quality. Start-ups are developing solutions for soil health diagnostics, microclimate management, and crop scheduling—critical factors in horticultural production. Data-driven logistics platforms are reducing post-harvest losses through optimized cold chain management and direct farm-to-consumer linkages, enabling better price realization for farmers. These innovations align with sustainability imperatives across economic, environmental, and social dimensions. By enabling resource-efficient farming practices, startups support environmental conservation. Market linkage platforms and data transparency mechanisms enhance economic viability for smallholder growers—the backbone of Indian horticulture. Climate-smart approaches focusing on soil health monitoring and regenerative agriculture strengthen sector resilience against climate risks.

The growth trajectory of horticultural agritech is supported by government initiatives and private accelerators. However, barriers including limited digital literacy among farming communities, insufficient access to affordable credit, infrastructure gaps in rural areas, and fragmented data governance frameworks constrain scaling. Regional variations in horticulture and diverse farmer profiles demand context-specific solutions. Transforming horticultural sector requires collaborative innovation among startups, agricultural enterprises, farmer organizations, and policymakers. Developing inclusive business models that combine technological innovation with farmer capacity building will be essential for scaling agritech solutions across diverse horticultural ecosystems and ensuring sustainable, inclusive growth.

IHS/T-10/OP-1003

Intellectual property protection and management for horticultural crops and products

Umesh Hudedamani, M. Ramesh Naik, Ramasubramanian V. and Gopal Lal

ICAR- National Academy of Agricultural Research Management, Hyderabad, Telangana
Corresponding author: umesh@naarm.org.in

Abstract

Intellectual properties generated in agriculture and horticulture sectors play a pivotal role in giving special characteristics and reputation to the products. Though common farming community may be naïve to the terms and terminologies of intellectual properties, nevertheless, they have been playing an important role in bringing the premium prices to their products owing to the intellectual property tags attached to them. Indian public sector agriculture research organizations have filed 143 patents (including 20 from horticulture sector), 307 copyrights and 111 trademarks applications during the 2024-25. The registration of new plant varieties as per *sui generis* system of plant protection for safeguarding plant varieties is also of prime importance and a total of 83 applications have been submitted to the Protection of (PPV&FRA) from ICAR. Geographical locations tend to impart special features and reputation to some of the agricultural, horticultural and non-agriculture products, which are aptly protected by Geographical indications. The agricultural/horticultural products have the major share (30%) in the total number of GIs registered in India. In terms of total number of GIs registered Maharasthra (16%), Tamil Nadu (10%), Karnataka (9.5%) and Kerala (8.6%) States are leading, with noteworthy contribution (10%) from the Northeastern States. UPL Ltd. is recognised as leader in India for agricultural patents from private sector as it maintains over 3000 granted patents globally mainly focussing on crop protection and digital agriculture. Corteva In., BASF and Fasal are the other important players in the agriculture and horticulture sector with IPs protected in areas of precision farming, Crop protection, Agri-machinery including IoT and smart farming. The intellectual properties in agriculture/horticulture sector play a key role in protection of local produce, cultural heritage and assure quality produce to consumers.

IHS/T-10/OP-1004

Enhancing horticulture income through farmer-producer organisations

Vinayak Nikam and Sahithi Pasupuleti

National Institute of Agricultural Economics and Policy Research, New Delhi.
Corresponding author: vinayakrnikam@gmail.com

Abstract

The fragmented landholdings, limited access to resources, low level of value addition, and inefficient value chains constrain the Indian horticulture sector. Farmer Producer Organizations (FPOs) present viable solutions to these challenges by fostering collective action among smallholder farmers. The presence of horticulture commodities, particularly high-value commodities, enhances the performance of FPOs compared to those involved only in agricultural activities. Moreover, the performance of the horticulture sector or horticulture value chains improves with the involvement of FPOs. In the mango value chain in Andhra Pradesh and Telangana, it was observed that marketing channels involving FPOs provided higher prices and income to farmers than other channels. Horticulture farmers can earn up to 60% more revenue by associating with FPOs than by working individually. Through FPOs, horticulture farmers get better Extension and Advisory Services, specialized training on bagging and harvesting techniques, training related to GAP and other certifications, and value addition. Thus, FPOs help improve the efficiency of horticulture value chains, connect horticultural farmers to national and international markets, enhance the availability and adoption of modern technologies, and increase the value addition and processing of horticulture products. There are more than 44,000 FPOs in the country, and the government is placing great emphasis on collective action through FPOs; therefore, the horticulture sector can leverage this advantage and contribute significantly to the country's agricultural development.

IHS/T-10/PP-1001

Exploring potential of moringa entrepreneurship

Pragya Uikey, Nityamanjari Mishra, G.C. Acharya, Anita Mohanty, S.K. Palai, Aurosikha Swain, Kalyan Kumar Mohanty and Pradyumna Tripathy

Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar, Odhisha
Corresponding author: pragyauikey.rs22@ouat.ac.in

Abstract

The cultivation of Moringa (*Moringa oleifera* Lam.) and value-added processing have been a booming start-up concept in India, particularly in Tamil Nadu, Andhra Pradesh, Karnataka, Telangana, Odisha and Rajasthan. It is mostly due to awareness among people, since world market is fond of moringa leaf powder, seed oil and nutraceuticals, the exports grew from US$ 7.1 million in 2015 -2016 to US$ 32.4 million in 2022 -2023. This results in the emergence of start-ups, farmer producer organisations (FPOs), women headed self-help groups (SHGs) and individual companies. Entrepreneurial patterns are changing to large integrated enterprises, which are now mechanised in drying, cold-pressing, and capsule production (₹5–15 lakh investment, 2-5 tonnes/year). Organic certification, FSSAI licence and direct B2B export to the United States, Europe and Australia have seen successful businesses like Grenera Nutrients (Erode) Moringa India, Genexte Biotech and moringa farms record annual turnovers of 2-25 crore rupees. The NABARD-supported SHGs led by women in Tamil Nadu and Andhra Pradesh develop and commercially sell products, *viz.* tea bags, soup mixes and cosmetics under a brand name like “Moringa Magic” and “Green Virgin”, which increase household income by 25-40 %.The essential success factors are the presence of contract farming (which ensures the buy-back at 80-150 rupees kg^{-1} of dried leaves) and the implementation of solar-biomass hybrid dryers to hit the EU/US residue standards and third-party organic (NPOP/EU/NOP) and fair-trade certifications. The National Horticulture Board and APEDA give the 25- 50 % capital subsidies under MIDH and Agri-Export Policy. Nonetheless, the following factors continue to be problematic to entrepreneurs: seasonal price fluctuations (₹40-180/ kg^{-1} dried leaves), use of local planting material, unavailability of quality planting material and non-availability of cold-chain in the rural location. New directions are e-commerce platforms like Amazon, 1mg and Moringa Market place having partnerships with pharmacy chains (Apollo, 1mg, Med Plus) and functional-food start-ups, which are incorporated in the form of biscuits, noodles, and protein bars. As the domestic and export market is expected to increase by 18-22% CAGR by 2030, moringa entrepreneurship is a viable option, as it presents scalable climate-resilient livelihoods to a variety of stakeholders such as smallholder farmers and rural youth.

Poster Presentation

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E-MAIL: rajdeepagri@yahoo.com, Website: www.rajdeepagri.com

SBPL



तरबूज

सागर किंग
आँवल, आकर्षक काला रंग
3 - 7 किलो तक का फल वजन
सभी मौसम के लिए अनुकुल

तरबूज NEW

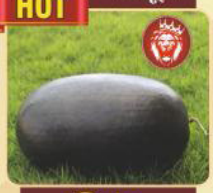
मैग्नम
अंडाकार, गहरा काला रंग
3 - 6 किलो तक का फल वजन
शुगर - TSS 13 से 14%

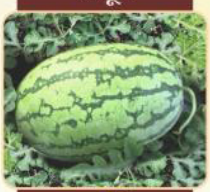
तरबूज

मारवेल
अंडाकार, गहरा काला रंग
सीगल लाईन बुआई
3 - 6 किलो तक का फल वजन

तरबूज

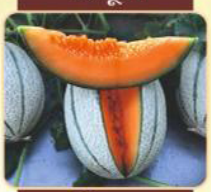
सागर किंग +
अंडाकार, गहरा काला रंग
ज्यादा फ्रुट सेटींग
3 - 5 किलो तक का फल वजन

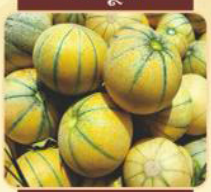
HOT तरबूज

सिंघम
अंडाकार, आकर्षक काला रंग
3 - 7 किलो तक का फल वजन
शुगर - TSS 13.5 से 14.5%

तरबूज

टर्बो
अंडाकार, गहरा लाल रंग का गर
8 - 10 किलो तक का फल वजन
शुगर - TSS 12 से 13%

खरबूजा

चंदन
गोलाकार, डबल जालीदार फल
1.5 - 2.5 किलो तक का फल वजन
शुगर - TSS 14 से 15%

खरबूजा

विजय
लंब-गोलाकार, जालीदार फल
1.5 - 2.5 किलो तक का फल वजन
गडद केशरिया रंग का गर

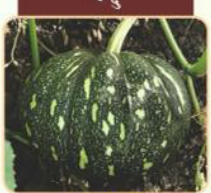
खरबूजा

सागर 60
पीले और हरे रंग की पट्टीया
900 - 1000 ग्राम फल का वजन
उत्कृष्ट स्वाद, बहुत अधिक TSS

खरबूजा

क्रिस्टा
डबल जालीदार का गोलाकार फल
1.25 - 2 किलो तक का फल वजन
शुगर - TSS 13 से 14%

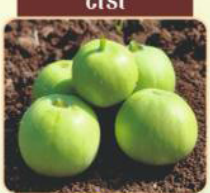
भिंडी

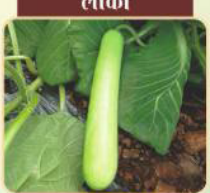
रिद्धिमा
गहरा हरा रंग, अधिक उत्पादन
10 से 12 ग्राम फल का वजन
7 से 8 से.मी. फल की लबांई

कद्दु

कर्ण
हरे रंग का आकर्षक फल
फल का वजन 3 - 4 किलो
सेल्फ लाईफ 4 से 6 सप्ताह

तुरई

वैशाली
गहरा हरा रंग का मध्यम लंबा फल
12 से 15 ग्राम फल का वजन
25 से 30 से.मी. फल की लबांई

टींडा

नरेश
हलका हरा रंग का गोल फल
छोटे बालो वाली त्वचा
130 से 150 ग्राम फल का वजन

लौकी

रसीली
मध्यम लंबी बेलनाकार
800 - 1100 ग्राम फल का वजन
30 से 40 से.मी. फल की लबांई

खीरा

श्रृति
सफेद रंग का फल, मजबूत पौधा
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18 से 20 से.मी. फल की लबांई

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250 ml | 1 L | 5 L

ग्रो



पौधों को सूक्ष्म पोषक तत्व प्रदान करें

250 ml | 1 L | 5 L

नाइट्रो किंग



पौधे की जड़ो, पत्तो, तने, फूलों और फलों की वृद्धि में मददगार।

250 ml | 1 L | 5 L

प्रीमियम



कई सूक्ष्मजीवों जैसे बैक्टीरिया की मदद से मिट्टी का pH को नियंत्रित करे।

250 ml | 1 L

फ्रूटर



कोशिका विभाजन को बढ़ाने में मददगार।

100 ml | 500 ml

स्ट्रैस आउट



आपकी फसल को जैविक एवं अजैविक तनाव से बचाएं।

250 ml | 1 L

एस टी



बीजों के अंकुरण को बढ़ाए तथा बीमारी से बचाए।

250 ml | 1 L

जिंक EDTA 12%



जिंक की कमी को पूरा करे।

500 GMS

मैंगनीज EDTA 12%



पौधे की वृद्धि तथा प्रोटीन बनाने के लिए आवश्यक।

500 GMS

फ़ेरिक EDTA 12%



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500 GMS

कॉपर EDTA 14%



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कैल्शियम EDTA 10%



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300 GMS

ह्युमिक एसिड



प्रतिबंधित पोषक तत्वों को मुक्त करके पौधे तक पहुँचने में मददगार।

500 GMS

पोटेशियम सल्फेट
00 00 50



फसल की वृद्धि, गुणवत्ता तथा पैदावार बढ़ाने में मददगार।

200 GMS

मोनो पोटेशियम फॉस्फेट
00 52 34



फसल की गुणवत्ता बढ़ाने और बीमारी से बचाने में मददगार।

200 GMS

मैक्रोन्यूट्रिएंट्स XX
20 20 20



मिट्टी की गुणवत्ता को बढ़ाकर पैदावार को बढ़िया बनाये।

200 GMS

पोटेशियम नाइट्रेट
13 00 45



जड़ प्रणाली में वृद्धि, तथा पौधे को तनाव मुक्त करने में मदद करता है।

200 GMS

मोनो अमोनियम फॉस्फेट
12 61 00



विकास, तनाव प्रतिरोध और उपज को बढ़ाता है

200 GMS

आर्गेनिक फ़र्टिलाइज़र पोटाश



उत्पादकता के रंग, आकार, आकृति, तथा शेल्फ लाइफ को बढ़ाने में मददगार।

50 GMS

प्रॉम



शुगर और स्टार्च के स्थानांतरण को बढ़ाता है।

25 KG

पोटाश



समग्र स्वास्थ्य, जड़ की मजबूती, रोग प्रतिरोधकता और उपज दर में सुधार, रंग में सुधार करने में मददगार।

25 KG

कैल्शियम नाइट्रेट



कैल्शियम और नाइट्रेट को मिट्टी में बढ़ाता है और मिट्टी का पीएच बनाए रखता है।

2 KG

केएमबी



मिट्टी में पानी तथा पोषक तत्वों को बांध कर रखता है

1 KG

मिशन :धरती माँ को बचाओ।

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