



5. TECHNOLOGY ASSESSED AND TRANSFERRED

Impact Assessment of Institute Technologies

Leaf webber infestation was found severe in mango orchards. Surveyed through PRA, beneficiaries and non beneficiaries both found affected, while 63% beneficiaries used Institutes device and proper dose of chemicals for leaf webber controlling. However 21 per cent non beneficiaries also followed neighbour of beneficiaries.

The average yield of mango at the orchards beneficiaries for the demonstrations was 110.6 kg per tree with gross return of about Rs.1106/- against an average yield of mango 71.0 kg per tree and a gross return of Rs. 710/- at non-beneficiaries as per survey.

Only 19 per cent farmers followed our recommendations in the neighborhood of adopted orchards. The adopted farmers fully adopted our recommendations.

Approximately 76 per cent farmers adopted the polythene banding of mango trees for the control of Mealy Bug in Mohan area. They wrapped polythene sheet around the mango tree stem during December .

About 89 per cent farmers used self-made mango harvester for harvesting the fruits while only 11 per cent farmers used improved harvester developed by the CISH.

About 33% orchards are old and dense. For overcoming from this problem, rejuvenation technology evolved by this Institute is very vital. But this is not

being adopted by the orchardists mainly due to administrative clearance, lack of power chain saws inadequate support from the state department and financial constraints ,etc.

It is found that farmers did not use ethereal for the ripening of mango due to complexity

Extension Intervention for Technology Change

Gosthi: Institute organised a gosthi at village Bhatoya, Malihabad (Lucknow) on November 15, 2008 for providing the information pertaining to latest developments in cultivation technologies of mandate fruit crops in which about 400 farmers participated. The scientists of the institute delivered lectures on various aspects such as establishment of orchards, nursery management, rejuvenation of old/ unproductive mango orchards, high density planting, nutrient management, intergated insect, pests and disease management, organic farming and post-harvest management of fruit crops.

Besides, the Institute also participated in various gosthi organised by other agencies within and outside the state.

The Institute also participated in different State and National Level exhibitions and displayed the achievements and technologies on mandate crops as per details given below in the table.

Sl	Event/Occasion	Place	Organiser	Participants (No.)	Date
1.	Virat Kisan Mela evam Krishi Pradarshini	SIMA, Rehmankhara, Lucknow	NAFED, New Delhi & Directorate of Agriculture, Govt. of U.P.	8000	May 8-12, 2008
2.	All India Litchi Show and Kisan Gosthi	NRC, Litchi, Mushehari, Muzaffarpur	NRC Litchi, Muzaffarpur	1000	June 8-11, 2008
3.	Rastriya Krishak Mela evam Pradarshini-2008	CISH, Rehmankhara, Lucknow	CISH, Rehmankhara, Lucknow	500	June 20, 2008
4.	Second Green Revolution Summit and Agro. Protech - 2008	Science City, Kolkata	Indian Chamber of Commerce & Govt. of West Bengal	4000	September 24-26, 2008
5.	Kisan Mela	KVK, Dhaura, Unnao	KVK, Dhaura, Unnao	5000	November 8, 2008
6.	National Farmers Fair and Vegetable Exhibition	IIVR, Varanasi	IIVR, Varanasi	5000	January 29-30, 2009
7.	Farmers Fair	KVK(IIVR), Sargatia, Kushinagar	IIVR, Varanasi	2000	March 01, 2009



Demonstrations, Growers-Scientists Interaction/Meet:

Rejuvenation technology of mango was demonstrated in unproductive mango orchard at Saidpur Mehari village, Kakori. Four interaction/grower-scientists meet were arranged during the visits in the mango and guava growing belts of Lucknow, Barabanki and Unnao districts (U.P.).

Exposure visit: About 2340 farmers and 61 students from across the country visited the Institute. They were taken around the experimental farms and different laboratories and technical information centres of the Institute to acquaint them about the technologies developed and on-going research activities.

Counseling: Thirteen farmers and extension functionaries visited the Institute from different. They were apprised of the advanced scientific cultivation technologies of different subtropical fruit crops and their queries were responded.

Farmer's Helpline and Postal Queries: Growers' queries related to different aspects of subtropical fruits were attended through correspondence. Farmers' queries (107 calls) attended and provided with solutions through Kisan Call Centre. The queries of the farmers were primarily pertaining to nursery, insect pests and diseases management in mango. Extension folders and bulletins related to scientific cultivation of mango,

aonla, guava, bael and papaya were provided to the farmers.

Trainings: Fourteen training programmes sponsored by NHB Gurgaon, Horticulture Technology Mission of U.P. and Uttarakhand, Federation and Samaritan Social Service Society, Madhya Pradesh on production, protection and post harvest technology of fruits, were organized by the Institute and 325 farmers from Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, Uttarakhand, Tamil Nadu, Orissa and Pondicherry were trained. Thirty-five officials, sponsored by IFFCO Foundation, New Delhi, from all over the country were trained on establishment of scientific nursery/ programme.

A three-day training programme sponsored by Directorate of Extension & Training, Ministry of Agriculture and Cooperation, Government of India, New Delhi on Rejuvenation and Canopy Management of mango, guava and aonla was organised at the Institute for fourteen development workers from all over the country.

An international training (4 days), sponsored by Afro-Asian Rural Development Organisation, on 'Care of mango' tree was organised at the Institute for scientists from Sultanate of Oman.



6. EDUCATION AND TRAINING

Training

India

Dr. R.P. Shukla, Principal Scientist and Incharge, RCMU was deputed to attend Management Development Programme of PME for Agricultural Research held at IIM, Lucknow, July 7-11, 2008.

Dr. S. Rajan, Pr. Scientist was deputed to attend Management Development Programme on Data mining and GIS for decision support in agriculture at IIM, Lucknow August 25 - September 5, 2008.

Dr. (Mrs.) Anju Bajpai, Scientist (Sr. Scale) was deputed to attend training on Molecular methodologies for assessing and applying genetic diversity in crop breeding at ICRISAT, Hyderabad, November 17 - 28, 2008.

Dr. Tarun Adak, Scientist attended a winter school on Recent advances in diagnostic technologies and management of poor quality water/soils at CSSRI, Karnal, November 18 - December 8, 2008.

Drs. R.M.Khan, A.K.Singh, D. Pandey, Ram Kumar and S.K.Shukla, Principal Scientists were deputed to attend ICAR Training-cum-workshop on IP and technology management held at NBFGR, Lucknow, December 18 - 20, 2008.

Shri Vikram Singh, Scientist was deputed to attend training on *In vitro* techniques in plantation crops held at CPCRI, Kasargod, Kerala, January 15-24, 2009.

Dr. S.R.Bharguvanshi, Head, Division of Crop Production attended management development programme on Leadership for innovation in agriculture held at NAARM, Hyderabad, January 19 - 23, 2009.

Shri M. Muthukumar, Scientist was deputed to attend Summer School on Application of RAPD and AFLP markers in horticultural crops held at University of Agricultural Sciences, GKVK, Bangalore, February 17- March 9, 2009.

Dr. Ram Kumar, Principal Scientist was deputed to attend management development programme on IPR: Protection of plant varieties - procedures and methodologies held at NAARM, Hyderabad, February 23 - 26, 2009.

Shri S.K. Saxena, T7-8 (Library) was deputed to attend Krishi Prabha : Indian Agricultural

Doctoral Dissertations Repository-cum-training at Nehru Library, CCSHAU, Hisar, February 24-25, 2009

Abroad

Dr. Gorakh Singh, Principal Scientist was deputed for Agribusiness Programme Module-I at Goa (May 25-30, 2008) and for Module-II at Ithaca, New York (June 18-26, 2008) under the aegis of Cornell University, New York, USA and Sathguru Management Consultants, India.

Lectures Organized

Under lecture series programme following scientists/experts delivered lectures on emerging scientific areas:

Dr. (Mrs.) Anju Bajpai, Scientist (SS) – “Molecular techniques for assessing genetic diversity in fruit crops” April 30, 2008.

Mr. B.K. Singh, Regional Manager (North) of Labindia Instruments Pvt. Ltd., Lucknow – ‘Application and Technology of LCMS/MS’ May 6, 2008.

Dr. Achal Singh, Scientist (SS) – “Roles of statistical analysis in agricultural research” May 15, 2008.

Dr. A.K. Singh, Principal Scientist – “Neutraceutical value of underutilized fruits” May 30, 2008.

Dr. A.K. Singh, Sr. Scientist – “Mushroom production in India – an overview” August 30, 2008.

Er. Anil Kumar Verma, Scientist (SG) – “Tools and equipments for Horticulture” September 15, 2008.

Shri Atul Singha, Scientist – “Bioremediation : a credible technology” October 30, 2008.

Dr. B. Lal, Principal Scientist – “High density orcharding in mango” December 30, 2008.

Shri Prem Narain, Registrar General, Protection of Plant Varieties & Farmers’ Rights Authority – DUS guidelines for mango February 21, 2009.

Dr. B.P. Singh, Emeritus Scientist – “Maturity indices and harvesting methods in relation to shelf-life of fruits” March 31, 2009.

Dr. A.K. Misra, PC (STF) – “Variability in guava pathogen and their distribution” February 28, 2009 on the occasion of National Science Day.



7. AWARDS AND RECOGNITIONS

AWARDS

Dr. J C Anand Gold Medal

Dr. D.K. Tandon, Principal Scientist received the prestigious Dr. J. C. Anand Gold Medal for his contributions in the field of Post-harvest Technology of Horticultural Crops for the year 2008. The award was presented to him at the Inaugural Session of the 3rd Indian Horticulture Congress – 2008 held at Orissa University of Agriculture and Technology, Bhubneswar.

Amrood Pandit Award

Dr. Gorakh Singh, Principal Scientist was bestowed with the prestigious Amrood Pandit Award by Hon'ble Union Minister for Agriculture, Shri Sharad Pawar at the National Guava Symposium held at Shridi, Maharashtra. The award was conferred on him for his outstanding contributions in the sphere of guava.



Dr. Gorakh Singh receiving Amrood Pandit Award from Hon'ble Union Minister for Agriculture, Shri Sharad Pawar Ji

Rajbhasha Patrika Award

Udyan Rashmi, the Rajbhasha Patrika of the Institute, was given the second prize by the Nagar Rajbhasha Karyanvayan Samiti, Lucknow at its 60th half yearly meeting held at Central Drug Research Institute, Lucknow.



Dr. B.M.C. Reddy, Director (in the middle), Dr. D.K. Tandon (left) and Shri Dhiraj Sharma along with the shield

Best Paper Award

Dr. Ramesh Chandra and Dr. Maneesh Mishra were awarded judged best poster entitled, 'Studies on genetic transformation of guava (*Psidium guajava* L.)' Third Indian Horticulture Congress – 2008 held at Orissa University of Agriculture and Technology, Bhubaneswar, November 6 to 8, 2008.

Dr. Neelima Garg was awarded 2nd prize for the poster entitled, 'Production and characterization of extracellular cellulases from a cellulolytic *Bacillus* sp using mango peel as substrate' presented at National Conference on Eco-friendly Approaches in Sustainable Agriculture and Horticulture Production held at Amity University, Lucknow, November 28 to 30, 2008.

Fellowship

Dr. Ramesh Chandra, Head, Crop Improvement Division was conferred Fellowship of Horticulture Society of India (HSI).



Dr. V. K. Singh, Principal Scientist was conferred Fellow of Indian Society of Plant Physiology (ISPP).

RECOGNITIONS

Member Editorial Board/Executive Committee of Journals/Society

Dr. D. K. Tandon was nominated as an Executive Councillor (2009-2011), HSI, New Delhi.

Dr. D. K. Tandon was nominated as Member, Editorial Board (2008-2010), Indian Journal of Horticulture, HSI, New Delhi.

Seminars/Symposia/Meetings

Dr. Ram Kishun acted as Chairman of the Technical Session-VI of the 18th AICRP Workshop held at Institute's Rehmankhara Campus from June 29 to July 2, 2008.

Dr. B.M.C. Reddy acted as a Co-chairman of the Plenary Session of the 18th AICRP Workshop held at Institute's Rehmankhara Campus from June 29 to July 2, 2008.

Drs. R. P. Shukla, A. K. Mishra, Ghanshyam Pandey, S. Rajan, V. K. Singh, Devendra Pandey, A. K. Singh and S. K. Shukla acted as a Rapporteur of the different Sessions of the 18th AICRP Workshop held at Institute's Rehmankhara Campus from June 29 to July 2, 2008.



8. LINKAGES AND COLLABORATION

Linkages were developed with Sultanate of Oman and other organizations including APEDA, ICAR-APCESS, DBT, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India, NHB, New Delhi, NMPB, UPCAR, UPCST, Directorate of Horticulture and Food Processing, U.P., ICAR Institutes (Networking Mode Project), SAUs

(Pantnagar, Faizabad & Kanpur), Lucknow University, Allahabad Agricultural Institute (Deemed University), APS University, Rewa, BBAU, Lucknow, Bundelkhand University, Jhansi, A total and Kali and Salz, New Delhi (Indo-German Programme). The externally funded projects in operation at the Institute are listed below :

Sl. No.	Title of project	Funding agencies
1	Clonal multiplication of interspecific wilt resistant rootstock (<i>P. molle</i> x <i>P. guajava</i> L.) for grafting guava cultivars.	ICAR-APCESS
2	Multiplication and sale of commercial and elite clones of mango, guava, aonla and bael.	Revolving fund scheme
3	National integrated fruit fly surveillance programme.	APEDA
4	Characterization and assessment of genetic diversity in mango cultivars using DNA markers: Sequence Tagged Microsatellite Site (STMS) and Random Amplified Polymorphic DNA (RAPD).	DBT
5	Development of genetic resource database and information system for mango.	DBT
6	Studies on use of potassium for improving yield and fruit quality of mango grown in Uttar Pradesh.	Indo-German Programme of Kali and Salz
7	Hi-tech horticulture for efficient utilization of resource through precision farming.	DAC, NCPAH, Ministry of Agriculture, GOI
8	Network project on wilt of crops with special reference to cultural, morphological, molecular characterization and pathogenic variability of isolates.	ICAR
9	Nutritional and physiological disorders in mango.	ICAR
10	National network project on underutilized fruits.	ICAR
11	Seed production in agricultural crops and fisheries.	ICAR
12	Network project on transgenics in crops (papaya).	ICAR
13	Mass sex screening of papaya for improved production.	UPCST
14	Organic/biodynamic cultivation of horticultural crops in N.E. Region including Sikkim.	Technology Mission, GOI
15	Physiological and nutritional studies associated with the softening of tissues around stone in Dashehari mango and develop control measures.	UPCAR
16	Survey, collection, evaluation and conservation of germplasm of underutilized fruits.	UPCAR
17	Establishment of leaf/ tissue analysis laboratory.	UPCAR
18	Establishment of model nursery for fast multiplication of elite clones and new varieties of mango, guava, aonla and bael.	UPCAR
19	Establishment of bio-control laboratory and production of bio-agents.	UPCAR
20	Management studies for irregular bearing in mango.	UPCAR
21	Application of microorganisms in agriculture and allied sectors	AMAAS, Mau
22	Intensification of research on bael (<i>Aegle marmalos</i> Corr.) with reference to medicinal value.	National Medicinal Plants Board
23	Anti-diabetic activity guided fractionation and associated attributes in potential germplasm of jamun (<i>Syzygium cumini</i> Skeels).	National Medicinal Plants Board
24	Mango Tree Encyclopedia Project.	Sultanate of Oman



9. AICRP (STF) / COORDINATION UNIT

All India Coordinated Research Project on Subtropical Fruits (AICRP, STF) with its headquarters located at Central Institute for Subtropical Horticulture (CISH), Lucknow has 18 centres working on mango, guava, litchi and grapes. Out of these, 5 centres are based at different ICAR Institutes, 12 in SAUs and one in a governmental agency. Two ICAR based centres are regular centres, while 3 are co-opted centres. The research on grapes is being carried out at 4 centres under the supervision of NRC on Grapes, Pune. A new centre on grape at JNKVV, Mandsoor (M.P.), was also added in XIth Plan. Research activities on mango, guava, and litchi are implemented under the guidance and supervision of AICRP (STF) headquarters situated at CISH, Lucknow.

Genetic stocks of mango, guava and litchi were collected, evaluated and maintained at nine regular and three voluntary centres for selection of potential cultivars/varieties for different regions and for using them for further crop improvement and production programmes. Cataloguing of genetic stocks of different subtropical fruits was done using various descriptors. A total number of 58 trials, divided into 6 sections related to crop improvement, crop production and crop protection aspects of mango, guava and litchi, were conducted. Besides, work is also in progress in four ad hoc schemes under AICRP (STF) programme.

CROP IMPROVEMENT

MANGO (*Mangifera indica* L.)

Germplasm collection and evaluation

Collection: Out of 78 seedling germplasm of mango collected during the period, 31 at BAC Sabour, 14 at RFRS, Vengurle, 3 at BCKV, Mohanpur, 5 at FRS, Rewa, 8 at IARI, New Delhi, 7 at FRS, Sangareddy and 10 at HC&RI, Periyakulam, respectively, were added. Additionally, out of 15 superior clones of leading varieties of different regions, two of 'Banganpalli' at FRS, Sangareddy, one of 'Langra' at BAC, Sabour, one of 'Alphonso' at AES, Paria, two of 'Dashehari' at GBPUA&T, Pantnagar, three of 'Chausa' at FRS, Rewa and two each of 'Himsagar' and 'Alphonso' at BCKV, Mohanpur and RFRS, Vengurle were also collected.

Three variants comprising of one each in 'Neelam', 'Kalepad' and 'Salem Bangalora' were also identified at HC&RI, Periyakulam.

Evaluation: Out of 273 germplasm accessions, 31 at BAC, Sabour, 28 at GBPUA&T, Pantnagar, 4 at AES, Paria, 12 at FRS, Sangareddy, 64 at RFRS, Vengurle, 20 at IARI, Bangalore, 88 at FRS, Rewa and 15 at IARI, New Delhi were evaluated. Yield of cultivar 'Bangalora' was maximum (115.80 kg tree⁻¹) followed by 'Dholikothi Maldah' (110.20 kg tree⁻¹) at BAC, Sabour. However, maximum fruit yield was recorded in cv. Mallika (70.50 kg tree⁻¹) followed by 'Zafrani Gola' (66.75 kg tree⁻¹), while yield efficiency was maximum in 'Banarsi Betali' (1.24kg/m³) followed by 'Amrapali' (1.14kg/m³) at GBPUA&T, Pantnagar. Yield of 'Suvarnarekha' was maximum (75.00 kg tree⁻¹) at RFRS, Vengurle.

Clonal selections, 'Pedda Baneshan' and 'Allahabad Baneshan', were promising with respect to bigger fruit size at FRS, Sangareddy. However, clones of 'Himsagar' (T 22 & T 23) were found promising in respect of yield (83.33 and 86.83 kg tree⁻¹) and good quality at BCKV, Mohanpur. 'Chausa' clone No.2 was found promising in terms of yield (65.67 kg tree⁻¹) at FRS, Rewa.

Mango 'Mallika' gave higher yield at majority of the centres, while 'Mallika' and 'Langra' were good yielders at BAC, Sabour. On the other hand, 'Bangalora', 'Mallika', 'Langra' and 'Baneshan' were promising at FRS, Rewa.

Evaluation of hybrids

Hybrid-311 ('Alphonso' x 'Neelam') having good yield and quality was free from spongy tissue at RFRS, Vengurle. Five hybrids, viz. H-1-1 ('Amrapali' x 'Lal Sundari'), H-1-6 ('Amrapali' x 'Sensation') and H-2-6 ('Amrapali' x 'Sensation'), H-4-12 ('Dashehari' x 'Sensation') and H-8-11 ('Amrapali' x 'Sensation'), were promising owing to dwarf stature, less incidence of floral malformation and red peel colour. Mango hybrids, viz. 'Neeleshan', 'Mallika' and 'Mehmood Bahar', 'Neeleshan' and 'Mallika' and 'Amrapali' and 'Mallika' provided maximum yield along with good quality fruits, at FRS, Sangareddy, BAC, Sabour, AES, Paria and FRS, Rewa, respectively.



GUAVA (*Psidium guajava* L.)

Germplasm collection and evaluation

Five accessions each were collected at FRS, Sangareddy and FRS, Rewa. Maximum yield was recorded in 'Sardar' (77.73 kg tree⁻¹) followed by 'Pant Prabhat' (72.77 kg tree⁻¹) at GBPUA&T, Pantnagar. Cultivar 'Guthneewala', 'Safeda' (J-2), 'Surkhee', 'Chittaeneptune' and 'Portugal' gave higher yield at FRS, Rewa. The performance of 'Kohir Safeda' was better in terms of yield and fruit quality at FRS, Sangareddy followed by 'Allahabad Safeda', while cultivars 'Sardar', 'MPUA' & 'T-S-2' and 'MPUA' & 'T-S-1' performed better in terms of yield and quality at RCA, Udaipur and 'Allahabad Safeda' and 'Safed Jam' at BAC, Sabour.

Six progenies were identified at IIHR, Bangalore from cross combination of 'Kamsari' x 'Purple guava' having dark pink (4) and pink (2) flesh.

LITCHI (*Litchi chinensis* Sonn)

Germplasm collection and evaluation

Two clones of Bombai were collected at BCKV, Mohanpur. Evaluation of germplasm revealed that 'Rose Scented' (50.78kg tree⁻¹) out yielded other cultivars at GBPUA&T, Pantnagar, while 'Bombai' (48.71kg tree⁻¹) and 'Muzaffarpur' (46.88kg tree⁻¹) yielded better at BCKV, Mohanpur.

CROP PRODUCTION

MANGO (*Mangifera indica* L)

Evaluation of rootstocks

Rootstock 'Latra' imparted maximum dwarfness to 'Bombai' scion, whereas maximum fruit yield was recorded on rootstock 'Puttu' (50.41 kg tree⁻¹) followed by 'Mylepellian' (48.00 kg tree⁻¹) at BAC, Sabour. The maximum cumulative yield (101.28kg tree⁻¹) was recorded in 'Banganpalli' when grafted on 'Nekkare' rootstock at FRS, Sangareddy, while rootstock 'Olour' and 'Kurukkan' imparted least yield on scion 'Langra' at FRS, Rewa.

Planting system-cum-high density planting

Double hedgerow system of planting produced significantly higher yield in 'Amrapali' (943.88 kg

plot⁻¹) at BAC, Sabour and (291.5 kg plot⁻¹) at FRS, Rewa, 'Neelam' at HC&RI, Periyakulam and 'Kalepad' (212.18 kg plot⁻¹) at Killikulam. On the other hand, square system of planting gave maximum yield in 'Dashehari' (33.68 kg tree⁻¹) at GBPUA&T, Pantnagar.

Pruning

Maximum fruit yield was recorded in the trees pruned at alternate limbs after harvest followed by paclobutrazol application (10 g a.i. tree⁻¹) at most of the centres. However, thinning of crowded branches after fruit harvest along with paclobutrazol application gave maximum yield at BCKV, Mohanpur. Heading back of branches at 50cm level on alternate limbs without application of paclobutrazol gave maximum yield (6.380 kg tree⁻¹) at RFRS, Vengrulu, while heading back of branchlet on the entire tree at 50cm level resulted in maximum yield (37.683kg tree⁻¹) at AES, Paria.

Rejuvenation

Heading back of crowded branches along with centre opening coupled with the application of paclobutrazol (10g a.i. tree⁻¹) during rest period resulted in maximum fruit yield of 49.06, 38.67, 85.50 and 62.90 kg tree⁻¹, at FRS, Sangareddy, AES, Paria, GBPUA&T, Pantnagar and FRS, Rewa, respectively.

Integrated plant nutrient management

Cultivar 'Himsagar' gave maximum fruit yield (12.9kg tree⁻¹), fruit weight (215.7g) and fruit length (9.22cm) following application of NPK (100g each) tree⁻¹ year⁻¹ along with foliar spray of Zn (0.2%), B (0.2%) and Mn (0.1%) at BCKV, Mohanpur, whereas 'Langra' produced maximum yield (101.01kg tree⁻¹) with the application of 200g N, 100g P₂O₅ and 100g K₂O tree⁻¹ year⁻¹ at FRS, Rewa. On the other hand, maximum fruit yield (3.97kg tree⁻¹) and fruits (8.67 tree⁻¹) were recorded in five years old plantation of 'Banganpalli' at FRS, Sangareddy following the application of recommended dose of NPK fertilizers (200, 100 and 100g tree⁻¹, respectively).

Effect of bio-regulator

Pre harvest application of KH₂PO₄ (1%)+ KNO₃ (1%) before bud break stage produced more number of panicles per square meter area and total yield (51.59 kg tree⁻¹) along with good quality fruits in 'Banganpalli' at FRS, Sangareddy.



GUAVA (*Psidium guajava* L)

Effect of fertilizers

Maximum fruit yield (47.17 kg tree⁻¹) was recorded in 'Pant Prabhat' at GBPUA&T, Pantnagar following treatment with the half recommended dose of fertilizers along with 25 kg FYM and 5 kg vermicompost. However, application of 500:200:500g NPK tree⁻¹ along with spray of Zn (0.5%) + B (0.2%) + Mn (1%) twice during the months of August and October gave maximum yield (73.74kg tree⁻¹) in 'Sardar' at FRS, Sangareddy, whereas application of 200:100:250g NPK along with 10 kg FYM enriched *Trichoderma* gave maximum yield (25.28kg tree⁻¹) in 'Sardar' at RCA, Udaipur.

LITCHI (*Litchi chinensis* Sonn)

Planting system-cum-high density

Double hedgerow system of planting resulted in higher yields at RAU, Pusa, GBPUA&T, Pantnagar and BCKV, Mohanpur. Modified central leader system gave maximum yield (121.37kg tree⁻¹) at RAU, Pusa.

Harvesting

Fruit harvesting with 50cm long branches followed by removal of new flushes during November-December at RAU, Pusa effected maximum yield in 'Shahi'. Conversely, maximum yield in 'Bombai' (1134.77kg tree⁻¹) could be obtained following harvesting along with 50 cm long branches only at BCKV, Mohanpur.

Substrate dynamics

Irrigation and sprinkling of water significantly reduced fruit cracking in 'Shahi' and 'Rose Scented' at RAU, Pusa and GBPUA&T, Pantnagar. Similarly, maximum fruit yield (70.49kg tree⁻¹) was obtained in 'Shahi' with the application of half of the recommended dose of fertilizers along with 50kg FYM and 5 kg vermin-compost at RAU, Pusa.

Diagnostic surveys conducted in litchi orchards of Murshidabad revealed maximum yield ('Bombai') in the orchard having soil N (179.44kg ha⁻¹), P₂O₅ (123.15kg ha⁻¹) and K₂O (299.44kg ha⁻¹) and leaf N (1.78%), P (0.34%) and K (0.92%).

Girdling of (50%) of primary branches with 1mm diameter to a 1mm depth of ring resulted in significant

increase in the yield and fruit quality of 'Rose Scented' at GBPUA&T, Pantnagar. Application of 4 foliar sprays of KNO₃ (10g l⁻¹) from September to December significantly increased the fruit size, fruit weight and total yield at GBPUA&T, Pantnagar.

CROP PROTECTION

MANGO (*Mangifera indica* L.)

INSECT PESTS

Surveillance: Hopper population was relatively high during the second fortnight of January-February, February- April, April, II fortnight of January to I fortnight of March-April and October-March, respectively, at FRS, Sangareddy, BAC, Sabour, GBPUA&T, Pantnagar, AES, Paria, BCKV, Mohanpur and RFRS, Vengurle.

Peak incidence of fruit fly was noticed in cv. Banganpalli during May, June-July, I fortnight of June to II fortnight of July, respectively, at FRS Sangareddy, BAC, Sabour and GBPUA&T, Pantnagar, RFRS, Vengurle and BCKVV, Mohanpur. Methyleugenol trap (4 acre⁻¹) were effective in monitoring the fruit fly population.

IPM : Spray of Imidacloprid (0.05%) at panicle emergence followed by two sprays of Endosulfan (0.07%) after 21 days of first and 15 days of second spray were most effective in managing the hopper population and avoidable crop loss at FRS, Sangareddy, BAC, Sabour, BCKV, Mohanpur and RFRS, Vengurle.

Out of different IPM modules tested for management of hopper on the commercial cultivars in different regions Module I (Imidacloprid-Azadirachtin-Endosulfan) was better at AES, Paria, GBPUA&T, Pantnagar and RFRS, Vengurle, while Module II (Thiamethoxam-Azadirachtin-Ethofenprox) was superior at FRS, Sangareddy, BAC, Sabour and BCKV, Mohanpur.

DISEASES

Germplasm evaluation : About 301 accessions including standard varieties, hybrids and seedling/clones were screened against floral malformation of mango at FRS, Sangareddy (73), AES, Paria (29), RFRS, Vengurle (78), BAC, Sabour (46) and BCKV, Mohanpur(75). Cultivar Meghlantan was found free from malformation at BCKV, Mohanpur.



Epidemiology: The appearance of powdery mildew was noticed during the 2nd week of January to 3rd week of February at FRS, Sangareddy on inflorescence and fruitlets of 'Dashehari' and 'Baneshan'. The mean minimum temperature (11-15° C), maximum temperature (28-30° C) and low relative humidity (42-50%) was prevalent during the period. On the other hand, its maximum incidence was recorded in the 3rd week of March on 'Alphonso' and 'Himsagar' at RFRS, Vengurle and BCKV, Mohanpur.

Management: Chlorothalonil (0.2%), Thiophenate methyl (0.1%), Saaf (0.2%) and carbendazim (0.1%) sprays significantly reduced anthracnose at FRS, Sangareddy, RFRS, Vengurle, BCKV, Mohanpur and BAC, Sabour, respectively. Similarly, application of Thiophenate methyl (0.1%) and Saaf (0.2%) reduced the incidence of mango blossom blight (composite infection of anthracnose and *Alternaria*) at RFRS, Vengurle, BAC, Sabour and BCKV, Mohanpur.

GUAVA (*Psidium guajava* L.)

DISEASES

Survey and surveillance: Fruit spot, anthracnose, *Phytophthora* fruit rot and canker were found important at BCKV, Mohanpur during rainy season while incidence of wilt and dieback were more pronounced in post-monsoon season.

Management: Soil application of bioagent *Trichoderma viride* was found effective in controlling guava wilt at BCKV, Mohanpur.

LITCHI (*Litchi chinensis* Sonn.)

INSECT PESTS

Survey and surveillance: Inflorescence webber, leaf roller, fruit borer and litchi bug were the key pests at GBPUA&T, Pantnagar. Though inflorescence webber caused mild damage but litchi bug infestation was higher (>50%) in young trees as compared to old ones. Litchi mite was the major pest prevalent in litchi growing areas of Bihar and higher infestation was recorded during May. Similarly, fruit borer and litchi leaf roller also caused considerable damage. Incidence of leaf roller was low up to June and increased gradually during July and peaked in October-November at BCKV, Mohanpur. Three species of fruit borer, viz. *Conogethes punctiferalis*, *Platyepela* sp. and *Conopomorpha cramerella*, caused serious damage to crop throughout the year (except December-March). Infestation of *C. cramerella* during the colour break stage affected the fruit quality.

Management: Two sprays of Endosulfon (0.07%), 1st at peanut and 2nd at colour break stage, were effective at GBPUA&T, Pantnagar and BCKV, Mohanpur, while spray of Carbaryl (0.1%) was the best at RAU, Pusa.



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