



NRCB NEWS

National Research Centre for Banana
Tiruchirapalli - 620 102, Tamil Nadu



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FROM THE DIRECTOR'S DESK



India is the largest producer of banana in the world, contributing about 25 per cent to the global production. Banana is grown almost in all the states with 7.5 lakh ha area producing 27.0 million tonnes. Postharvest management plays a crucial role in the availability of the produce as farm fresh without affecting the quality. Banana being a climacteric fruit and highly perishable, it has got a shorter shelf life after harvesting. A sizeable quantity of bananas and plantains (20-25%) are going as waste every year due to improper handling practices by farmers, traders and retailers during harvest, transport, packing, storage, ripening and sale of produce. Since fresh bananas and plantains are available throughout the year, processing and value addition has not gained much momentum yet. Moreover, urban pressure, changes in lifestyle and food habits have opened up new avenues for processed foods. There is a great scope and demand for development of value added products in banana and plantain and commercialization in domestic and international markets. In this endeavor, concerted efforts have been made by the NRC Banana to reduce the postharvest losses whereby enhancing the shelf life and development of value added products. To popularize, commercialize and transfer the technologies, short-term training programmes namely 'Production of Value Added Products from Banana', 'Extraction of Banana Fibre and Production of Handicrafts' and 'Postharvest Handling, Packing, Storage and Ripening in Banana for Domestic and Export Markets' are being organized at regular intervals for the benefit of large various stakeholders, besides sponsored ones. The technologies/products developed at NRCB were disseminated through various media (booklets / bulletins / leaf folders, TV, Newspaper, popular articles, exhibitions, etc.) in national and local languages for benefit of large section of the people.

RESEARCH HIGHLIGHTS

Postharvest Management

Bananas and plantains are staple food for millions of people in more than 130 countries across the globe. Banana and plantains are consumed in various forms. The dessert bananas are generally eaten as fresh fruit, while plantains and cooking bananas are boiled, steamed, fried or roasted. India is the largest producer of banana in the world, contributing about 25 % to the global production. Apart from banana and plantain, leaf and fibre are also emerging as an industry and gaining importance. Banana being a highly perishable commodity, the postharvest losses are estimated to the tune of 22-30%, valued at more than Rs.1300 crores annually, due to improper handling practices adopted by farmers, traders and retailers during the process of harvest, transport, storage and ripening of banana. To reduce the postharvest losses and to increase the shelf life of banana, various studies have been conducted at National Research Centre for Banana and the salient achievements are presented.

Storage studies in banana

Ripening of fruits at ambient temperature was faster as compared to 18-22°C in both Rasthali and Karpuravalli bananas, when harvested at 90% maturity and sprayed with 500 ppm Ethrel. Rasthali had 3 days green life at ambient and 8 days at 18-22°C, while Karpuravalli had 3 days at ambient and 5 days at 20°C. Subsequent yellow life was also longer at lower temperatures than at ambient, thereby increasing the overall shelf-life of fruits. The quality changes are also supported these findings. Moreover, Rasthali fruits stored at 22°C had the best acceptability as compared to those stored at 18°C.

Small unit packages for retail marketing of bananas

The quality of Karpuravalli and Robusta hands packed in one kg CFB boxes and stored at room temperature (28.5±2°C) and 22°C indicated that fruits stored at 22°C with or without packaging had longer shelf life of 11 days as against 4 days at room temperature. The quality of fruits stored at low temperature had higher starch and lower sugar contents at the end of the shelf life.

Identification of banana cultivars for low sugar content

Twelve commercially cultivated varieties of banana were evaluated for physio-chemical parameters to identify varieties having low sugar and carbohydrate contents. The total carbohydrate content varied from 9.60% (Robusta) to 24.4% (Nendran) and total sugars from 15.46% (Grand Naine) to 23.86% (Nendran). Among the varieties, Grand Naine and Robusta were identified for low sugar and carbohydrate content respectively.

Processing and value addition

Since fresh bananas and plantains are available throughout the year, yet the scope for processing and value addition has not gained real momentum. A sizeable quantity of banana is going as waste every year due to improper handling, transportation, storage and ripening practices. This has warranted for processing and product development through value addition of banana. Moreover, due to urban pressure and changes in lifestyles and food habits, many people are driven to consume processed foods. Thus, there is a better future for processing and value addition of banana and plantain. During market glut and excess production, processing into various value added products may fetch better prices. There is great scope and demand for development of value added products in banana and plantain and commercialization in domestic and international markets.

Banana flower based soup

A recipe was standardized for preparation of ready to serve soup from banana flower (cv. Karpuravalli).



Banana flower, carrot, cabbage, garlic, pepper, cashew nut, sugar, mustard seed, citric acid, salt, banana flour and corn flour are added in one litre of water and boiled for ten minutes to make one litre soup.

Standardization of banana wine

The fermentation of wine process was completed within 8 days at 24°C, while it was 20 days at 10°C. However, the alcohol concentration increased at lower temperature. By cold stabilization at 4-8°C, the astringent taste of the wine mellowed down and the aroma and taste improved. Besides, the acidity of the wine was also brought down. In juice extracted from ripened Karpuravalli fruits, fermentation took 13 days at 10°C for the total sugars to come below 1% and alcohol to 15%.



Comparative evaluation of banana - flower, fruit, stem and peel pickles



Comparative quality analysis was carried out in four types of banana based pickles. Flower and peel pickles were accepted immediately after preparation, while stem and

fruit pickles were preferred for consumption after two months of storage by allowing sufficient time for curing.

Development of 'Sip-up'



A new product banana pulp based 'Sip-up' was prepared with and without pasteurization and stored at 0°C. The product without pasteurization was accepted moderately, which was further refined by adding condensed milk and ginger for improving its flavour and consistency. The product could

be stored up to 15 days at 0°C and was accepted under organoleptic evaluation.

Waste Utilization

Storage of banana stem

A storage method using steeping solution was developed for storage of banana stem, which can be used for further product preparation or culinary purposes. The fresh stems are cut into small pieces and steeped in a solution with 6% salt, 3% acetic acid and 1000 ppm potassium metabisulphite. In this steeping solution, the stems can be stored up to one month.

Standardization of chemical retting process for fibre extraction from banana sheath

A chemical retting process for banana pseudostem sheath using NaOH at 0.5 - 1% was standardized. A combination of 0.5% NaOH and 1% citric acid was found to be the best to get fiber with good color and fine texture. Besides, the fibre obtained through 0.5% NaOH had the highest tenacity and thus highly suitable for yarn making.

Evaluation of banana varieties for fibre extraction



Of the various methods employed for extraction of banana fibre from pseudostem sheath, 1% NaOH and machine extraction provided the good quality fibre based on biochemical parameters.

However, machine extraction is highly beneficial in view of its high output than other methods.



Banana flower pickle commereized by the agents.

When the peduncle and midribs of cv. Poovan were utilized for extraction of fibre with machine, midribs yielded higher quantity of fibre (1.63%) with better quality, as compared to peduncle (0.672%) based on chemical constituents in the fibre.

Commercialization and Transfer of Technologies

Under transfer of technology, six value added products viz., banana fig, RTS, flower pickle (Thokku), flour, flour based health drink and biscuits were transferred to 20 firms which are located at different parts of the country.



Short-term Training on Production of Value-added Products from Banana to the Farmers of Baruch district, Gujarat from 14th to 19th March 2011

So far, 550 stakeholders were trained in 19 batches on 'Production of Value Added Products from Banana' through sponsored/centre organized training programmes. Apart from these, two short-term training programmes viz., 'Extraction of Banana Fibre and Production of Handicrafts' and 'Post harvest Handling, Packing, Storage and Ripening of Banana for Domestic and Export Markets' were organized for the benefit of stakeholders based on the demands received. A Model Training Course (MTC) on 'Advances in Postharvest Handling and Value Added Products in Banana for Export' from 18th to 25th October 2010



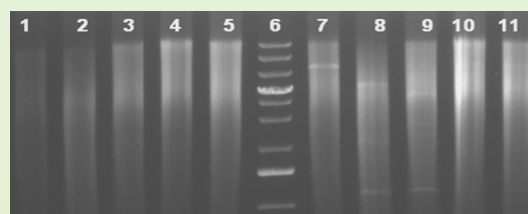
A Model Training Course (MTC) on 'Advances in Post Harvest handling and Value Added Products in Banana for Export' from 18th to 25th October 2010

and Value Added Products in Banana for Export' [Sponsored by Directorate of Extension, Ministry of Agriculture, Government of India, New Delhi) was also conducted at the Centre.

The products and technologies developed under PHT were popularized through various media (booklets/bulletins/leaf folders, TV, Newspaper, popular articles, exhibitions, etc.) in Hindi, English and Tamil languages.

Other Research Findings

- ◆ For germination of hybrid embryos of 3x X 2x (Manoranjitham X Pisang Lilin and Manoranjitham X Calcutta-4), modified MS medium with either GA₃ at 1.5mg l⁻¹ and BAP at 1.0mg l⁻¹ or GA₃ 2.0mg l⁻¹ and BAP at 1.0mg l⁻¹ was found optimum.
- ◆ Among 52 *Musa* germplasms accessions evaluated, five diploids (Kunnan, Borkal baista, Gragric sarpara, Elavazhai and *M. a.ssp. burmanica*) and eight triploids (Dasaman, Chirapunji, Kalibow, Amrithapani, Terabun, Thenkadali, Ladan and Ennabenian) were resistant to both root-lesion and root-knot nematodes.
- ◆ Genetic diversity analysis of 91 isolates of *Foc* by RFLP of elongation factor α -1 region identified the presence of 15 different groups and also clearly distinguished the VCGs of race-1 and race-2 from VCGs of race-4 isolates but failed to distinguish the pathogenic *Foc* from the non pathogenic *Foc*.
- ◆ Rolling circle amplification (RCA) approach was applied for detecting the Banana Streak Mysore Virus (BSMysV) and BBTv. The amplified products were subjected to RFLP using specific single cutter enzymes. This approach could detect the episomal virus of BSMysV in Poovan and BBTv in Hill banana.



Detection of BSMysV using RCA-RFLP approach: Lane 1-5-Poovan Healthy; Lane-6 1kb ladder; Lane 7-11 Poovan Symptomatic; Lane 1, 7-BamHI; Lane 2, 8-HindIII; Lane 3, 9 - NcoI; Lane 4, 10-SallI; Lane 5, 11-XhoI

Awards and Recognitions

Awards

Uma, S., Lakshmi, S., Saraswathi, M.S., Akbar, A. and Mustaffa, M. M. received the 'Best Poster Award' for the research paper entitled 'Refining the protocol for zygotic embryo culture in banana hybrids' in Global Conference on banana, 10-13, December 2010, at Trichy, Tamil Nadu, India.

Saraswathi, M.S., Uma, S., Backiyarani, S., Punniakotti, E. and Kannan, G. received the 'Best Poster Award' for the research paper entitled 'Preliminary screening of induced mutants of cv. Rasthali using PCR based markers' *ibid*.

Lakshmi, S, Uma. S and Akbar, A. received the 'Best Oral presentation Award' for the research paper entitled *In-vitro* studies on the factors affecting plant germination in zygotic embryos of *Musa* species in the National Symposium on *In silico* and *in-vitro* studies in biology, 11-13 October, 2010, at Holy Cross College, Trichy.

Shiva, K.N., Mayil Vaganan, M. and Mustaffa, M. M. received 'Best Poster Award' for the research paper entitled 'Quality evaluation of banana varieties for Specific target groups' in the 4th interactive workshop on biotechnological applications for sustainable development, 12-13 March, 2011, at PRIST University, Thanjavur, Tamil Nadu.

Recognitions

Dr. S. Uma has been recognized as a member and Co-Chair of the 'Working Group 1: Genetic diversity, gap filling, taxonomy and characterization' of the Global MusaNet programme.

Dr. S. Uma was invited as banana taxonomic expert to finalize the classification of Pacific bananas involving Moia, Popuolu, Moia- Popuolu and Fei bananas of Asia and Pacific.

Dr. R. Selvarajan has been recognized as one of the reviewers for an international journal "Virus Genes" and for an "Indian Journal of Virology" to review research articles.

Dr. R. Thangavelu has been recognized as one of the reviewers for an international journals 'Plant Disease' and 'Plant Pathology' to review research articles.

Abroad visit

Dr. V. Kumar Sr. Scientist, visited the Commonwealth of Dominica and the Republic of Trinidad and Tobago as Horticulture Expert during 21st December, 2010 to 24th January, 2011.

Linkages and Collaborations in India and Abroad

- ◆ NRC for Banana has been recognized as one of the official Indian partner of 'Global *Musa* Genomics Consortium' by France.
- ◆ NRC for Banana has collaborated with Bioversity International, France and QDPI, Australia for conducting a ring test for validating the indexing protocol for banana viruses.

Consultancy Services and Commercialization of Technologies

- ◆ Technical consultancy project on 'Development of tissue culture protocol for the multiplication of banana variety 'Sabri' costing Rs. 2.76 lakhs has been approved and initiated at HRC, Nagicherra, Tripura

- ◆ Technologies of three value added products of banana, namely Flower pickle, Banana flour and Banana soup-mix have been transferred to M/s ROAD Development Trust (SHG), Tirunelveli, Tamil Nadu.
- ◆ The technologies for 'Banana flower pickle' was transferred to 'Mangal' and 'Laxman' of Namakkal and Trichy district respectively, during 2010-11.

Publications

Papers published in Journals International

Sangeetha, G., Thangavelu, R. and Usha Rani, S. 2010. Evaluation of plant oils for suppression of crown rot disease and improvement of shelf life of banana (*Musa* spp. AAA subgroup, cv. Robusta). International Journal of Food Science and Technology. 45: 1024-1032.

Sangeetha, G., Thangavelu, R., Usha Rani, S., Muthukumar, A. and Udayakumar, R. 2010. Induction of systemic resistance by mixtures of antagonist bacteria for the management of crown rot complex on banana. Acta Physiologia Plantarum. 32:1177-1187.

Saraswathi, M.S., Uma, S., Prasanya Selvam, K., Ramaraj, S., Durai, P. and Mustaffa, M.M. 2011. Assessing the robustness of IRAP and RAPD marker systems to study intra group diversity among Cavendish (AAA) clones of banana. Journal of Horticulture Science and Biotechnology. 86: 7-12.

Thangavelu, R. and Mustaffa, M.M. 2010. A potential isolate of *Trichoderma viride* NRCB1 and its mass production for the effective management of Fusarium wilt disease in banana. Tree and Forestry Science and Biotechnology. 4:76-84.

Thangavelu, R. and Mustaffa, M. M. 2010. First report of corm rot disease caused by *Sclerotium rolfsii* in banana. Australasian Plant Disease Notes.5: 30-33.

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Jeyabaskaran, K.J. and Mustaffa, M.M. 2010. Integrated nutrient management in banana. Indian Journal of Fertiliser. 6: 24-31.

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Sundararaju, P. 2010. Identification of nematode resistant gene sources against root-lesion nematode (*Pratylenchus coffeae*) in banana. *Indian Journal of Nematology*. 40: 48-54.

Popular Articles

Backiyarani, S., Uma, S., Arunkumar, G., Saraswathi, M.S. and Sundararaju, P. 2010. Identification and characterization of nematode resistance gene(s) through SSH approach. Global Conference on "Meeting the Challenges in Banana and Plantain for Emerging Biotic and Abiotic Stresses" held at Tiruchirapalli, Tamil Nadu, India during 10-13, December, 2010. pp. 17.

Backiyarani, S., Uma, S. and Saraswathi, M.S. 2010. *Musa* genome sequencing: Current status and future perspectives. *ibid.* pp. 20-24.

Jeyabaskaran, K.J. and Mustafa, M.M. 2010. Importance of sulphur in banana cultivation. *ibid.* pp. 41-44.

Kumar, V. and Mustafa, M.M. 2010. 'Improved preharvest cultivation practices for ensuring high quality bunch for domestic and export markets'. *ibid.* pp. 52-55.

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Ravi, I. and Mustafa, M. M. 2010. Impact of climate change on Banana. *ibid.* pp. 45-49.

Padmanaban, B. and Mustafa, M.M. 2010. Semiochemicals - An eco-friendly control strategy for insect pests of Banana. *ibid.* pp. 50-51.

Saraswathi, M. S. and Uma, S. 2011. New advances for production of disease free planting material in banana. *ibid.* pp. 156-162.

Saraswathi, M. S., Uma, S. and Backiyarani, S. 2010. DNA barcoding in *Musa* - Applications and limitations. *ibid.* pp. 31-35.

Selvarajan, R. and Mustafa, M.M. 2010. Managing banana viruses for conservation of banana biodiversity and increased productivity. *ibid.* pp. 60-64.

Selvarajan, R., Anuradha, C. and Mustafa, M. M. 2010. Transgenic approaches for virus resistance in banana. *ibid.* pp 65-69.

Shiva, K. N., Mayil Vaganan, M. and Mustafa, M.M. 2010. Value addition in Banana - A potential enterprise. *ibid.* pp. 70-74.

Sundararaju, P., Kumar, V. and Mustafa, M. M. 2010. Enhancing profitability in high density planting system of banana by effective nematode management. Tiruchirapalli, Tamil Nadu. *ibid.* pp. 52-55.

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Mayil Vaganan, M. and Shiva, K. N. 2010. Banana to feed and keep healthy. *Indian Horticulture*. 55: 10-12.

Ravi, I. and Mayil Vaganan, M. 2010. Overcoming abiotic stresses in banana. *Indian Horticulture*. 55: 15-17.

Ravi, I. and Mustafa, M. M. 2010. Ripening bananas the natural way. *Indian Horticulture*. 55: 8-9.

Saraswathi, M. S. and Uma, S. 2011. New advances for production of disease free planting material in banana. *In* : Proceedings of the National consultation meeting on production of disease free quality planting material propagated through tubers and rhizomes held at CPRI, Modipuram, Meerut between 4-5, March 2011. pp. 156-162.

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Selvarajan, R. 2010. Onsite disease detection kits for banana. *Indian Horticulture*. 55:13-14.

Selvarajan, R. 2011. Serodiagnosis, ELISA and different formats. *In*: Manual of NAIP sponsored training on Molecular diagnostic for pathogens infecting crop plants organized at CTCRI, Sreekaryam, Thiruvananthapuram, during 16-25, Feb'11 sponsored by NAIP, ICAR, New Delhi. pp. 30-36.

Selvarajan, R. 2011. Isolation of nucleic acids from infected plants Basics and trouble shooting. *ibid.* pp. 30-36.

Selvarajan, R. 2011. Polymerase chain reaction - basics and different formats. *ibid.* pp. 97-104.

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Selvarajan, R and Balasubramanian, V. 2011. Viral indexing in national certification system for tissue culture raised plants (NCS-TCP) - with special reference to banana. *ibid.* pp. 91-96.

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important full length transcripts against Sgatoka (*Mycosphaerella eumusae*) Leaf Spot and confirmation by semi quantitative real time PCR in *Musa accuminata* cv. *Manoranjitham* (AAA). *In* : XVIII International conference on Plant & Animal Genomes held at Town & Country convention Center, San Diego, CA. during 13-18th January, 2011.

Books/Chapters in books/Technical bulletin

Blomme, G., Eden-Green, S., Mustafa, M. M., Nwauzoma, B., Thangavelu, R. 2010. Major Diseases of Banana. PP, 85-120, *In*: Banana Breeding -Progress and Challenges Eds. Michael Pillay and Abdou Tenkouano. CRC press (Taylor and Francis group) New York. p.363.

Mustafa, M. M. and Ravi, I. 2010. Impact of climate change on adaptation of Banana varieties. *In*: Impact of climate change on Fruit crops. Eds. W.S. Dhillon and P.S. Aulakh. Narendra Publishing House, Delhi, India. pp.349-56.

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Padmanaban, B., Pandey, V. and Mustafa, M. M. 2010. Kele ke keton ka akikruth prabandhan, Thakniki bulletin # 17, National Research Centre for Banana, Tiruchirappalli. p. 13.

Padmanaban, B. and Mustafa, M. M. 2010. Integrated Management of Pests of Bananas and Plantains, Technical bulletin # 9, National Research Centre for Banana, Tiruchirappalli. p. 17.

Ravi, I. and Uma, S. 2011. Phenotyping banana and plantains for drought. *In*: Drought Phenotyping in Crops: From Theory to Practice. CGIAR Generation Challenge Programme (GCP), pp. 417-430.

Ravi, I. and Mustafa, M. M. 2010. Impact analysis of temperature rise and elevated carbondioxide on banana production in India. *In*: Challenges of Climate change - Indian Horticulture. Eds: H.P.Singh, J.P.Singh and S.S.Lal. Westville Publishing House, New Delhi. pp.42-48

Ravi, I. and Mustafa, M. M. 2010. Impact of climate change on growth and development of banana. *In*: Impact of climate change on Fruit crops. *ibid.* pp.87-94.

Selvarajan, R. 2011. Viral disease diagnostics for production of quality planting material in Banana. *In* : production of disease free quality planting material propagated through tubers and rhizomes (Eds. BP.

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Shiva, K. N., Mustafa, M. M., and Uma, S. 2011. Protection of Plant Varieties and Farmers' Rights & IPRs (in Tamil). Published by the Director, NRCB, Tiruchirappalli & Chairman, PPV&FRA, New Delhi. p.32.

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Sundararaju, P. and Mustafa, M. M. 2010. Nematode Management in Banana and Plantains. Technical Bulletin No.10, NRC for banana. p.22.

Uma, S., Sajith, K.P., Saraswathi, M. S. and Durai, P. 2010. Macropropagation - A farmers' friendly technology. Technical Bulletin No. 18, National Research Centre for Banana, Trichy. *ibid.* p.17.

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Uma, S., Saraswathi, M. S. and Pillay, M. 2011. Evolution and genetic relationships in banana and plantains. diversification, taxonomy and application of molecular markers in banana and plantains. *In*: Banana Breeding - Progress and challenges (Eds. Pillay and Tenkouano). Volume II. pp. 21-40. Taylor and Francis Group.

Extension/Technical folders

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Anuradha, C. and Mustafa, M. M. 2010. Banana health based products- baby food, health drink and soup mix. NRCB - Technical folder No. 3.

Jeyabaskaran, K.J and Mustafa, M. M. 2010. Banana Sakthi - A Micro Nutrient Mixture. NRCB - Technical folder No. 2.

Shiva, K. N., Ravi, I., Mustafa, M. M. and Mayil Vaganan. M. 2010. Ethylene - A Safe Ripening Agent for Banana. NRCB - extension folder No. 17.

Contributions made in compilation / documentation

Jeyabaskaran, K. J., Ravichamy, P. and Mustaffa, M. M. 2010. "NRCB at a Glance". A 10 minute video film document in English, Tamil & Hindi languages.

Transfer of Technology

TV Talks

Jeyabaskaran, K.J. Soil suitability for banana and micronutrient management in banana (in Tamil). Telecasted in Doordharshan TV (Podhigai), Chennai on 06-12-2010 and 07-12-2010.

Padmanaban, B. Pest Control of Banana (in Tamil). Telecasted in Makkal TV (Ponvilayum bhoomi), Chennai, on 7.12. 2010.

Shiva, K.N. Extraction of Banana Fibre and Production of Handicrafts (in Tamil). Telecasted in Doordharshan TV (Podhigai), Chennai, on 18.11.2010.

Selvarajan, R. Viral diseases of banana and their management (in Tamil). Telecasted in Doordharshan TV (Podhigai), Chennai, on 30.11. 2010.

Shiva, K.N. Production of value added products from Banana (in Tamil). Telecasted in Doordharshan TV (Podhigai), Chennai, on 25.11.2010.

Uma, S. Success story of Udhayam Banana (in Tamil). Telecasted in Makkal TV on 05.04.2010 and 06.04.2010.

Uma, S. Production of banana Suckers by simple methods (in Tamil) Telecasted in Makkal TV on 07.04.2010 and 08.04.2010.

Uma, S. Production of banana Suckers by simple methods (in Tamil). Telecasted in Makkal TV on 16.09.2010.

Radio Talks

Selvarajan, R. Interactive meeting on "Certification for banana - a live programme (in Tamil). Broadcasted from All India Radio, Trichy on 8.12.2010.

Uma, S. Farmers' interactive meeting on economical measures in banana production (in Tamil). Broadcasted from All India Radio, Trichy on 08.09.2010.

Exhibitions

Name of the Events	Organized by/ venue	Date(s)
Banana festival	Ernakulam Dst. Horticulture Association, Cochin, Kerala	28.4 -2.5.2010
Swadesh Prem Jogriti Sangosthi-2010	IIHR, Bangalore, Karnataka	29- 30.5. 2010
Kissan Mela	TNAU & ATMA, Trichy, Tamil Nadu	7 - 8. 7. 2010
Kissan Mela	NRCB Farm, Trichy, Tamil Nadu	21.8.2010
Global Conference on Banana - 2010	AIPUB and NRCB, Trichy, Tamil Nadu	10 -13.12. 2010
Agri Expo - 2010	Dinakaran, TNAU & State Agri. Dept. Trichy, Tamil Nadu	24-26 .9. 2010
Science Exhibition -2010	NRCB & State Govt. School, Ettarai, Trichy, Tamil Nadu	4.10.2010
International Conference on "Coconut Biodiversity for Prosperity"	CPCRI, Kasaragod, Kerala	25-28.10.1010
3 rd Agri Expo- 2011	Dinamalar, TNAU & State Agri. Dept. Tamil Nadu	28-31.2011
NSCFT - 2011	CTCRI, Sreekariyam, Kerala	20-22.1.2011
NCPDPM-2011	CPRI, Modipuram, Uttar Pradesh	5-6.3.2011



Prof. K.V. Thomas, H'ble Minister of State for Agriculture, GOI and Dr. S. Ayyappan, DG, ICAR, New Delhi visit NRCB exhibition stall at CPCRI, Kasaragod, Kerala during International Conference on "Coconut Biodiversity for Prosperity" held on 28.10.10



Visitors at NRCB Stall during the Exhibition organised by Dinakaran & TNAU, Trichy (on 24 -9-10)

More than 1800 banana farmers including Agricultural & Horticultural Officers, Entrepreneurs, SHG members and students from different states and districts in the country visited this Centre.

Topic	Date(s)
Project Orientation and Discussion' for the State Govt. officials of Horticultural Research Complex, Nagicherra, Agartala of Tripura under DUS project.	21 and 24, October, 2010
Training on "Improved production and postharvest technologies in banana". Sponsored by NHB, Gurgaon	4 - 8, October, 2010
Model Training Course (MTC) on 'Advances in Postharvest Handling and Value Added Products in Banana for Export' sponsored by Directorate of Extension, Ministry of Agriculture, GoI, New Delhi	18 - 25, October, 2010
'Awareness cum Training programme' on 'Protection of Plant Varieties and Farmers' Rights	10 th February, 2011
Training on 'Value-added Products from Banana' to the Farmers of Baruch Dist., Gujarat. This was sponsored by Gujarat State Horticulture Mission	14-19, March, 2011
Training on 'Value-added Products from Banana' to the Farmers/ Entrepreneurs/Women	31 st January - 5 th February, 2011
Short-term Training on "Postharvest Handling, Packing, Storage and Ripening of Banana for Domestic and Export Markets",	7-9, March, 2011



Participants of the training Programme on "Improved Production and post harvest technologies in banana"



Prof. S. Kannaiyan, Former Chairman NBDA Chennai, delivering Chief guest address at 'Awareness cum Training Programme' on Protection of Plant Varieties and Farmers' Rights

RAC Meeting



Research Advisory Committee (RAC) meeting of the Centre was conducted during 9th and 10th December, 2010, wherein, all the members of RAC including the Chairman Dr. P. Rethinam, Former Executive Director, APCC, Indonesia, attended the meeting. Recommendations generated from the meeting were approved by the Council and communicated the same to all the members.

S.No.	Name	Position
1.	Dr. P. Rethinam	Chairman
2.	Dr. Y. N. Reddy	Member
3.	Dr. B. M. C. Reddy	Member
4.	Dr. R. Palaniappan	Member
5.	Dr. K. V. Ramana	Member
6.	Dr. Rema Menon	Member
7.	Dr. M. M. Mustaffa	Member
8.	Prof. B. Sivarama Krishnan	IMC Member
9.	Dr. P. Sundararaju	Member Secretary

The following are the salient recommendations of RAC.

- ◆ Study on the low-cost alternatives for tissue culture, mutation breeding in Rasthali using cell lines as explants, development of genetic linkage maps using mapping population are to be carried out
- ◆ Musa germplasm maintained in the field may be evaluated against pest and diseases with special reference to viral diseases
- ◆ A demonstration plot may be undertaken in popular commercial cultivars by adopting all the technologies developed at NRCB for defining the precision farming and General Agricultural Practices (GAP) in banana
- ◆ Studies on crop specific, stage specific and soil specific requirement for banana may be intensified in order to find out the suitable period for the application of fertilizers in banana
- ◆ The effective bio-agents identified under pot culture may be tested under field conditions against Fusarium wilt disease in endemic areas
- ◆ Dip-stick method of diagnosis for CMV may be developed and compared with commercial kits.

IRC Meeting

The Fifteenth Institute Research Council Meeting was held on 28th and 29th March, 2010. The salient research



achievements of previous year and technical programmes for the next year and externally funded projects were presented by respective project leaders of the institute. The Director and Chairman of IRC reviewed the research achievements made under each project and gave critical inputs for refinement of the research programmes.

Global Conference on Banana



Global Conference on "Meeting the challenges in Banana and Plantain for Emerging Biotic and Abiotic Stresses" was organized by the Association for the improvement in Production and Utilization of Banana (AIPUB) and the National Research Centre for Banana (NRCB) was held at Tiruchirapalli, Tamil Nadu, during 10-13 December, 2010. Dr. H. P. Singh, DDG (Hort.) presided over the inaugural function and Dr. M. M. Mustaffa, Director, NRC Banana proposed the welcome address. Dr. H. P.

Singh, DDG (Hort.) was awarded with the most prestigious "Kadali Ratna" award for his leadership in Horticulture and also for his contribution made in increasing the productivity and marketing of banana in India. Dr. H. P. Singh was the first person to receive this prestigious award. Dr. Stephan Weise, Programme Coordinator, Bioversity Intl., France, who was the Chief Guest, had distributed various awards such as 'Kadlai Puraskar and Nalla Vazhai' awards to scientists and farmers. Eight persons were honoured as Fellows of AIPUB for their outstanding contributions to Horticulture, especially to banana. A book entitled

"Advances in Horticulture Biotechnology" edited by H. P. Singh and many other institute publications were also released during the occasion. Dr. P. Sundararaju, proposed vote of thanks.



During this four day conference, eight technical sessions, three plenary lectures and four concurrent workshops were held. Eminent scientists from various countries like Germany, Philippines, Uganda, France and England chaired various sessions and also addressed about the Scenario of banana at national and international level and achievements and future strategies to increase the production and productivity of banana.



In the various technical sessions namely 1) Global and National Scenario, 2) Diversity in Banana and Plantain, 3) Production of Disease-Free Planting Material, 4) Breeding for Biotic and Abiotic Stresses and Qualities, 5) Genomics and Biotechnological Tools, 6) Health Management, 7) Production System Management, 8) Pre & Post harvest Management and 9) Value Addition and Delivery System - Marketing and Trade, a total of 19 lead, 16 oral and 145 poster presentations were made. Scientists of NRCB, ICAR Institutes, SAUs and several experts of various organisations presented these technical papers.

Workshops on 'Impact of Climate Change', 'Eco-Friendly Technologies', 'Gene and Genomics

Conservation Technologies' were also held concurrently and 16 lead talks were presented by experts.



Three Plenary Lectures were delivered in the conference by eminent personalities like Dr. H. P. Singh, DDG (Hort.), ICAR on "Dynamics and Co-kinetics of Banana Research and Development in India", Dr. J. S. Heslop Harrison, U. K. on "Genomics Initiatives in Banana" and Dr. Augustin B. Molina, Regional Coordinator, Bioversity International, Philippines on "Pests and Diseases Scenario of Banana in South East Asia". During the plenary lecture, Dr. H. P. Singh emphasized the necessity of banana research and development and to prepare for the future challenges.

"In the open sessions, experts from different disciplines clarified the doubts raised by farmers, traders and exporters. An exhibition was also organized at the conference venue involving six Horticultural Institutes of ICAR, different Input Suppliers, Entrepreneurs, and also the Jain Irrigation System, Jalgoan, Maharashtra.

Staff News

Appointment

1. Mr. M. Bathrinath was appointed as T-3, Technical Assistant w.e. f. 4. 10. 2010.
2. Mr. M. Krishnan joined as Administrative Officer from Central Agricultural Research Institute, Andaman w. e. f. 2. 2. 2011.
3. Ms. A.U. Suja was appointed as LDC w.e. f. 11. 3. 2011

Promotion

Mr. B. Vijayakumar Asst. Admn. Officer was promoted as Administrative Officer w.e.f. 23.3.2011.

Retirement

Mr. C. Kumaran, Mazdoor SSG-I, superannuated on 31.12.2010.