

NRCB NEWSLETTER

(Vol. 26 No. 1&2) 2021 – 22



ICAR - National Research Centre for Banana

An ISO 9001 : 2015 Certified Institute



Traditional Bananas with Export Potential

DIRECTOR'S DESK



I am glad to mention that it was a momentous year for the ICAR-NRCB as the recipient of the prestigious Sardar Patel Outstanding ICAR Institution Award 2020 in the category of small Institutes. This outstanding feat could not have been achieved but for the encouragement and support received from the DG, DDG (HS), ADGs (HS), ICAR, New Delhi, and the hard work and contributions of the scientists, technical, administrative and other staff of ICAR-NRCB.

In a first of its kind, the Centre came up with a sea shipment protocol that enabled the successful export of Nendran bananas to the United Kingdom via sea route. During 2021-22, the Centre established research collaborations with IIITDM, Kancheepuram for effective utilization and value addition of banana pseudostem fibre and MoA / MoU / MoCs were signed with 12 research institutes / colleges / private companies for research collaborations and student exchange. In collaboration with ATMA-SSEPERs, the Centre has initiated a novel training program 'Banana Farmers to Banana Experts (BF-BE)' for effective technology transfer. Under this program,

totally 440 farmers from 11 districts of Tamil Nadu were trained during December 2021–January 2022. In collaboration with KVKs of Tamil Nadu, the Centre initiated 'Kela Melas', a series of training programs consisting of demonstrations, lectures from scientists of the centre and distribution of inputs to banana farmers. During February–March 2022, six Kela Melas were conducted successfully. NRCB licensed and transferred its technology - "A Micronutrient Mixture - Banana Shakti" to three different stakeholders from Tamil Nadu, viz. KVK, Namakkal; TNSRLM, Kanyakumari, and KVK, Karur during February 2022. The Centre has licensed and transferred its banana fibre processing technology to Mrs. Anita Roy, a woman entrepreneur and district trainer under PMFME scheme of Kushinagar, Uttar Pradesh.

In this issue of NRCB's newsletter, banana export is the theme in focus and success stories, scope for and strategies to improve banana exports are discussed in detail under the topic, 'Leveraging Banana Exports from India: Scope, Issues and Strategies'. Significant research accomplishments made in banana improvement, production, post-harvest technology and protection during 2021-22 are given in 'Research Highlights' and institute events and important meets are also highlighted.

IN FOCUS

Leveraging Banana Export from India: Scope, Issues and strategies

In India, banana is grown in the states from the humid tropics to humid subtropics and semi-arid tropics like Tamil Nadu, Maharashtra, Gujarat, Andhra Pradesh, Karnataka, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Assam and Odisha. Besides, North-Eastern states contribute heavily on banana germplasm diversity and are one of the hot spots in the world. The Cavendish clones occupies 52% of the total area under banana cultivation and contributes 64% of the total banana production. The factors like production function, purchasing power, distribution system, end point delivery greatly influences the supply chain of banana trade. In terms of world export trade, banana ranks as 5th most important crop after coffee, cereal, sugar and cocoa. With the international banana trade of more than US\$45 billion, banana has a huge impact on the economy of many countries (FAO, 2019). The consumption for bananas, worldwide, is estimated to register a CAGR of 1.21% for the forecast period of 2019-2024. Banana as an enterprise is generating around US \$9 billion and providing livelihood to millions of farmers of India, contributes 20% world banana production with the production of 31.75 million tons in an area of 8.98 lakh hectares (NHB, 2020). Banana exports by different countries totalled US\$14.7 billion with the volume of 23.1 million tonnes in 2019 (exports represent less than 16 per cent of global production) with 11.2% YoY appreciation over 2018. Presently, India shares 0.3% of total export of banana, 21st biggest exporter, with the value of around INR 6.59 billion (US\$ 90 million) and the export volume of 1.81 lakh tonnes (APEDA, 2020).

Technological interventions from ICAR-NRCB

Post-harvest handling, packing, storage and ripening techniques were developed at ICAR-NRCB for commercial and traditional cultivars of banana for domestic and export markets. Post-harvest management technologies were developed for banana cvs. Grand Nain, Udhayam, Ney Poovan, Nendran, Red Banana and Mortaman. Improved post-harvest handling practices, packing in polybags, and cold storage at 13.5°C enhanced the shelf of fruits of banana cv. Grand Nain for 108 days when harvested at 80-85% maturity. Fruits treated with ethylene @ 100 ppm for 24 hrs gave uniform colour development with a yellow life of 12 days at 22°C storage temperature.

In pre harvest nutrient spray experiment, Ney Poovan fruits treated with Salicylic acid (100mg/litre) + bunch cover showed the highest fruit weight of 75-78 g with PPR 3.4-3.8 and calliper of 36-38. Nutrient spray of K₂SO₄ + micronutrients, Hexanal with micronutrient treatment enhanced shelf life of about 8 days which was significantly different from other treatments including control.

Treating Ney Poovan fruits with NF-2 and Carbendazim along with the O₂, CO₂ and ethylene scrubbers was most effective in minimizing physiological loss in weight, and maintained higher firmness with the green life of 32 days. Hexanal dipping recorded a green life of 70 days for the var. Ney Poovan over control (15 days) at 13.5°C. Similarly, fruit coated with wax recorded the green life of 75 days at 13.5°C over the control. The physiological, biochemical and quality characteristics of hexanal and wax treated ripe banana were similar to untreated control bananas. Var. Grand Nain coated with wax after infusing ethylene for ripening showed good effect on the extension of yellow life and prevention of crown rot and black spot with 8 days of shelf life after ripening, when compared to control. For red banana, following specifications are standardized; Fruit weight 171.59±4.51 g, fruit length 18.73±2.46 cm, fruit circumference 15.03±0.04 mm, calliper grade 43-48 mm and PPR 1.31 for the distance market like Europe without compromising on the price realization with better shelf life (50-60 days) when stored under low temperature of 14±1°C with the RH of 85-90%.

ICAR - NRCB success stories to boost banana trade

Considering the business potential and the presence of Indian population, three project initiatives were undertaken for developing sea protocol for traditional banana cultivars like Nendran to West Asia and Europe and to establish the harvesting and post-harvest handling procedures for Grand Nain for its sea transport to farthest markets like Europe which requires more than 25 days of travel.

- APEDA, New Delhi and Fair Exports (India) Pvt. Ltd., Kochi under the Public Private Partnership (PPP) for Nendran to West Asia
- TNAU, Coimbatore & University of Udine, Port of Trieste, Italy for Grand Nain to Italy
- VFPC, Kerala for exporting Nendran to United Kingdom

The projects culminated with significant outcomes. Fair exports Pvt Ltd., Kochin, Kerala, started sailing

40 tons of Nendran bananas through sea every week to Dubai with the volume of 2,000 tons per year. With the saving of Rs. 40,000 to 50,000 per ton compared to airlifted bananas, the company realized savings of Rs. 4-5 crores per year. A cable way conveyor-based harvesting cum export protocol resulted successful export of fruits of cv. Grand Nain to Italy with more than 86% sound fingers. During March 2021, export of fruits of cv. Nendran to London through sea yielded the cluster of fingers with more than 95% of fruits being sold with premium rate. This opens up new vista of opportunity to place Indian bananas in the farthest markets. ICAR initiatives enhanced the export volume (50%) and reduced the freight charges (saving more than 80%) significantly, made the Indian traditional bananas available at cheaper cost in the off shore market, given the better price realization for the farmers at the farm gate and also made the jump in export trade via sea route contribution of more than 90% handling in Rs. 1000 crores of export value. There is a possibility to enhance nearly 1,90,000 containers in the coming years with the handling volume of minimum of 10 million tons which in value term is around Rs. 22,000 crores equivalent to US\$ 3.5 billion.

Strategies for boosting banana export in India

Considering the price volatility in the international market, following measures could provide the road map for keeping Indian banana off-shore in newer markets besides the traditional markets.

Identifying push and pull factors

Forward and backward improvements in banana is essential for getting higher quality banana and improvement in trade. There is a need to promote the adoption of quality planting material production (Tissue culture plants, identification of good mother block, selecting disease free orchards for the suckers, uniform suckers) for all the varieties for cultivation. Productivity map for the zones may be done to provide specific production strategies for different regions.

Enabling IoT/ AI based data driven ecosystems

Developing methodologies based on input-output models which provide information about the cluster wise production of banana and could identify the major catchments for supplying the fresh produces. This will allow in calculating the impact of any change in the supply chain. Enabling start-ups,

skill development, identifying innovations through value chain approach and developing IoT/ AI based ecosystems, sensor based production linked with the demand of present and future markets.

Change in banana production and market driven high throughput cultivation

Production technology of modern lines needs to be demonstrated to the growers on a massive scale. The production processes depend on less external inputs – manures, plant protection measures which would lead to better net incomes by reducing the input cost. Cluster formation or co-operative farming for procurement of all the inputs on collective basis, better implementation of the technologies, credit approval, better price realization are needs to be strengthened and encouraged. Traceability of the farm should be given importance with the stricter adherence to good agricultural and handling practices and complying to certification procedures. Farmers need to be educated about export requirements and international quality standards. Unlike other countries where the banana is grown in larger area and monitored by big firms, Indian banana industry is highly fragmented. Time has ripened that the farmers have to work together and should “widen the circle of banana growing regions” by coming together. This will reduce the input cost and enhance uniform maintenance of plantations and thus able to get uniform quality, exportable bunches and also reduce the cost for acquiring GAP certification for the orchards.

Development of robust supply chain infrastructure and logistics system

The supply chain in banana has to be shortened to reduce the travel cost, starting from production site to port. The days taken and the cost incurred for inland transport cost make the banana export less competitive. Efforts should be made to waive off the inland transit cost across the states. The concept of creation of linking farms with the collection centres and then to the primary processing centres needs to be promoted. Farmers’ producer organizations could be equipped with the better farming infrastructure including cable way conveyor system and the creation of APEDA certified pack houses to ease the export of banana from different regions. Banana specific export zones could be created with the provision of tax holidays to the entrepreneurs to sustain the banana industry. Development of exclusive railway transport system connecting different banana growing regions may also be mooted.

Branding, stop in, plug-in and plug-out of banana trade

Indian bananas are cheaper than that of Philippines and Ecuador. This is mainly due to irregular bunches, finger size, and poor postharvest handling practices. Quality control, packing and marketing are other problems faced by the exporters. Identification of banana growing clusters specifically for the export of banana and creation of clusters of cottage or small scale industries under a central unit need to be promoted for processing the fruit under standard specified conditions and practices. Packing, branding and marketing have to be done by the central unit. Efforts have also to be made for developing cost effective suitable packing material for banana export and to standardize the packaging techniques to have consistent quality for traditional varieties.

Regulation of market and ease of doing business

Government may take steps to reduce the GST cost for packages. It will be advisable to have some working arrangements for ripening of banana arrival in importing countries on a regular basis. New markets have to be tapped other than vertical penetration in the traditional market. Government agencies must come out with a strategy for demand forecasting and accessing more data points to provide real time movement of commodities through APP based services and tapping IoT/ AI platforms.

Inclusion of banana as the commodity in bilateral agreements and providing tax holidays

Banana could also be suggested as a tradable commodity when the bilateral agreements are signed between the countries and to reduce the customs duty upon arrival. The entrepreneurs have to be encouraged with tax holidays, reduction in GST, providing special Green channel at port, reduction in handling time from 8-10 hrs to within two hrs. and fast clearance in port by single point inspection for phytosanitary, quarantine and customs procedures.

Development of processing unit for downstream processes

Export units pushes to generate enormous rejects, it has to be absorbed with sophisticated, robust internal market or through development of processing clusters. Unlike developed countries, the food processing sector in India is dominated

by the unorganized sector, contributing more than 80% share. Building infrastructure especially for converting banana into healthy powder and puree which have greater nutritional potential and could be used in functional food markets with its pre-biotic characters. Using the banana wastes for the production of innovative / novel products like nutraceuticals, bio colourant, through encapsulation methods and developing synbiotic foods need to be promoted.



Flagging off ceremony at Fair Exports - Angamally, Kerala for export of var. Nendran to Dubai



Flagging off ceremony at TNAU, Coimbatore for export of var. Grand Nain to Italy

RESEARCH HIGHLIGHTS

Crop Improvement

- Three promising ITC accessions, viz. ITC 1307, ITC 1437 and IITA 75 were identified as resistant to *Fusarium* wilt race 1 under sick plot conditions.
- Three promising selections, viz. Selection 15 (High yielding, *Fusarium* wilt race 1 resistant); Selection 16 (High beta carotenoid fruits) and Selection 17 (*Fusarium*

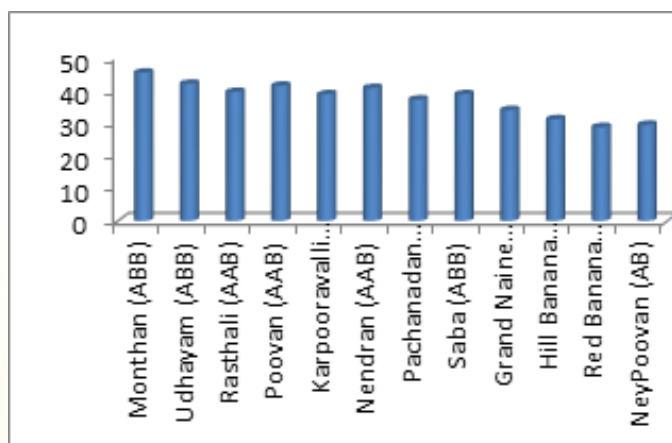


IITA 75

- wilt race 1 resistant) were identified and evaluated.
- *In vitro* regeneration protocol has been standardized for recalcitrant varieties like Poovan, Rasthali, Red Banana, Ney Poovan, cv. Rose, Williams, etc.
 - About 121 commercially cultivated Indian cultivars were analyzed for nine minerals using ICP-OES. The results indicated that consumption of 100 g of banana pulp can contribute fairly to the daily requirement of Mn > Ca > Mg > Fe > Zn > K > Na and > P in the ascending order in Indian adults according to the values notified by the ICMR.
 - The performance of NRCB selection 18 (Progeny No. 959) was stable with an average yield of 23.5kg/bunch for three consecutive years and it has better cooking quality than Kaveri Saba and Monthan.
 - NRCBGNMG 1, a Grand Nain mutant derived from Gamma irradiated ECS (35 Gy), which was resistant to *Fusarium* wilt race-1 in pot and sick plot conditions, was further multiplied and evaluated in the hotspots of Theni, Tamil Nadu and the results indicated that their yield is better than cv. Grand Nain.
 - Two diploid progenies (Pro. 429 - cv. Rose x Pisang Lilin; Pro. 820 - Udhayam x Pisang Lilin), two triploids (Pro. 0009 - Matti x Anaikomban; Pro. 819 - Udhayam x Calcutta 4) and one tetraploid (Pro. 814 - Bankela x Calcutta 4-1) exhibited resistance to pseudostem weevil and *Fusarium* wilt, race 1. One open pollinated (OP) progeny of Namwakhom was found to be dwarf with a smaller bunch which could be exploited commercially for its aesthetic value.
 - Expression studies of MaPR-1 genes in banana revealed their role in biotic and abiotic stresses in general and *Fusarium* wilt in particular. Genic SSR markers for *Fusarium* wilt race 1 and TR4 have been developed and validated.
 - Identified twelve unique inter-specific ornamental hybrids after the field evaluation of 362 different ornamental banana hybrids belonging to *Musa rubra* × *M. acuminata* ssp. *zebrina*, *M. ornata* × *M. rubra*, *M. ornata* × *M. acuminata* ssp. *zebrina*, and *M. ornata* × *M. velutina* ssp. *markkuana*. These elite 12 inter-specific ornamental hybrids were supplied to different ICAR Institutes, SAUs and NDMC during 2021 with MTA for multi-location evaluation.
- ## Crop Production and Post-Harvest Technology
- The nutrient uptake (kg/ha) in Nendran and Grand Nain followed different paths depending on the nutrient. Uptake of N increased from 22.5 to 233.57 gradually with increasing rate in Nendran and in Grand Nain, the N uptake increased steadily from 21.59 to 119.85.
 - The nutrient uptake in 5-leaf and 10-leaf stages in organically grown banana was quantified. In 5-leaf stage, the highest uptake was observed with 100% inorganic fertilizer and in 10-leaf stage, the highest was with poultry manure @ 5kg/pl + groundnut cake @ 1kg/pl + rural compost @ 3kg/pl + wood ash @ 3kg/pl.
 - In clump management of Ney Poovan, mother plant with four suckers (S4) recorded the longest total clump duration (595.6 days) with the highest bunch weight (42.1 kg) and a total yield of 73.2 t/ha. In Poovan also, S4 recorded the longest clump duration (643.6 days) with the highest bunch weight (69.2 kg) per clump with a total fruit yield of 96.2 t/ha.
 - Poovan, Karpooravalli, Sakkai, Phirima wild and Progeny 183 were evaluated for leaf production and Karpooravalli produced the maximum number of leaves (5.00) while Phirima wild (3.88) produced the minimum number of leaves. Total chlorophyll content in leaves varied from 5.40 mg/g in Karpooravalli to 12.43 mg/g in Progeny 183. Maximum side suckers were produced by Karpooravalli (3.48), followed by Poovan (3.13).
 - Acid thinning and oxidation modification of starch powders significantly increased the lightness when compared with native banana starch and light transmittance was found to increase initially, but decreased for all the modified starches as the storage days increased. Swelling power increased with increase in temperature for all types of modification.
 - Biofilms were prepared from biological materials for protecting food products and extending their shelf life. Edible films were also developed using starch and additives such as carrageenan gum, CMC, gum arabica and gum tragacanth.
 - Field evaluation of 53 banana genotypes belonging to different genomes to soil moisture deficit stress at floral primordial initiation stage showed Nendran, Rasthali, Leyan and Lacatan were susceptible with maximum yield reduction by 35%. *Musa balbisiana*, Bhimkol, Manohar, and Paglapahad Wild-2 recorded better drought tolerance. Foliar application 50 mM sodium silicate before imposition of drought recorded higher RWC, leaf pigments and osmolytes.
 - Profiling and quantification of anthocyanins from flower bracts of 10 north eastern banana cultivars showed 5-6 anthocyanin compounds. In Suti Jahaji, Gobin Tulci and Vennutmannan,

cyanidin was the predominant compound whereas in Borkal Baista, Bharatmoni and Kaithkullung, pelargonidin was the major compound.

- Nutraceutical potential of anthocyanins of flower bracts of 15 commercial banana varieties was assessed using TEAC and ORAC assays. Monthan (ABB), Saba (ABB), Udhayam (ABB) and Popoulu (AAB) exhibited higher antioxidant activity commensurate with cyanidin contents.
- Gallicocatechin was the predominant flavonoid compound in banana fruit pulp. Among commercial bananas, Monthan (ABB), Karpooravalli (ABB), Udhayam (ABB) and Saba (ABB) contained high amounts of gallicocatechin. Nutraceutical potential of flavonoids from fruit pulp was assessed and the high gallicocatechin containing banana cultivars, Monthan (ABB), Karpooravalli (ABB), Udhayam (ABB) and Saba (ABB) showed higher levels of antioxidant activities of around 95.0 $\mu\text{mol TE} / 100 \text{ g}$. Monthan, Nendran and Udhayam possessed higher levels of fructans in both pulp and peel.



Gallicocatechin flavonoid contents (mg as QE/100 g) in pulp of ripe fruits of commercial banana

- Five elite iron Grand Nain events with OsNAS1 and 2 genes with >6-fold higher iron mineral content in fruit were multiplied through shoot tip culture using sword suckers and a total of 150 plants of the five elite events were generated.

Crop Protection

- Bondar's nesting whitefly, *Paraleyrodes bondari* Peracchi, a recently reported exotic invasive pest in India, was recorded on banana from Karur and Trichy districts of Tamil



Bondar's nesting whitefly

Nadu. *Spodoptera exigua*, *Simplicia cornicalis*, *Gesonula punctifrons*, *Atractomorpha crenulata*, *Zeugodacus cucurbitae*, and *Rastrococcus invadens* were recorded as pests of banana.

- *Fusarium* wilt infected samples from five districts of Tamil Nadu (Kanyakumari, Tirunelveli, Tuticorin, Tiruchirappalli and Namakkal) were studied and VCG groups identified. Novel markers were developed for early detection and monitoring of virulent strains of FocSTR4.
- Two potential phosphate solubilizing bacteria, *Enterobacter hormaechei* ssp. *sakuensis* (PSB52) and *Leclercia decarboxylata* (PSB54), were field evaluated in cv. Ney Poovan. Combined application of two nutrient solubilizing bacteria along with rock phosphate enhanced the activity of alkaline phosphatase enzyme by 300–500% over control.
- An economical, rapid method of mass production of *Trichoderma* spp. in rice gruel medium was developed and 50 kg of formulation sufficient to apply on one acre of banana could be produced within 3-5 days at a low cost of Rs.10.
- Field trials using three consortia of bioagents were carried out for the management of *Fusarium* wilt (TR4) on cv. Grand Nain in Siswabazar of Maharajganj district in Uttar Pradesh. *Bacillus flexus* (TVPr1) + rhi. *Trichoderma* spp. (NRCB3) was found to be the best.
- *In vitro* evaluation of fungal and bacterial biocontrol agents of endophytic and rhizospheric origin and principal compounds extracted from *Trichoderma* and Zimmu against postharvest diseases (*Lasiodiplodia theobromae* and *Colletotrichum musae*) indicated that rhiz. *Trichoderma* spp. (NRCB3) and *T. harzianum* were effective against *C. musae*, the principal compound 3 from Zimmu was most effective against both, but none was effective against *L. theobromae*.
- *In vitro* testing of PGPR, Actinobacteria and fungicides recommended for *Fusarium* wilt and leaf spot against *L. theobromae* and *C. musae* showed significant levels of inhibition of both, with two actinobacteria (Act 16 and Act 10) against *C. musae* and PGPR (H8BC1, H7BC2 and H6BC2) against *L. theobromae* causing the maximum inhibition. All the fungicides inhibited *L. theobromae* at significant levels.
- Molecular characterization of three rhizome rot isolates (NPK-3-48, GTC-5 and 1-1B-3) obtained from Ney Poovan, Grand Nain and Thellachakkarakeli was done by PCR amplification of the beta-subunit of RNA polymerase gene (*rpoB*) and their identity was confirmed as *K. variicola*.

- Microencapsulated formulations of four PGPR isolates (H4BC1, H6BC2, H6BC3 and H7BC2) were found to have the desired CFU but enhanced growth of the seedlings was achieved only with H6BC3 and H7 BC. Among eight PGPR isolates evaluated on cv. Grand Nain during primary hardening stage using soilless medium, all isolates except BCB 2-4 enhanced the growth of the seedlings within a month, with H7BC2 and H8BC2 proving to be better than the rest.
- A triple antibody sandwich ELISA (TAS-ELISA) was standardized and validated using field samples against BBrMV and CMV and a TAS-ELISA kit was developed using two antisera.
- An automatic disease identification system was developed for banana bunchy top disease (BBTD) and banana mosaic (CMV). An app has been created for acquiring the images of banana diseases and pests from the farmers.
- Sequencing and analysis of the corm and rhizosphere microbiome of banana cultivars classified as resistant (9) and susceptible (4) using Nanopore platform indicated that fungal community abundance and diversity were higher in resistant varieties than in susceptible varieties in both corm and rhizosphere soil and the abundance of *Fusarium* species complex and *Aspergillus flavus* increased in the rhizosphere soil of resistant and susceptible varieties.
- In pot culture, foliar application of salicylic acid @ 200 and 500 μ M concentration at 24hrs prior to inoculation of root-lesion nematode on tissue cultured cv. Grand Nain reduced the root nematode population by 72 and 60%, respectively, over control after 3 months.
- Zimmu leaf extract caused >90% mortality of root-lesion and root-knot nematodes in vitro at or above 50% concentration at 48hrs and 72hrs of exposure.

OTHER INFORMATION

ICAR-NRCB Foundation Day & Kisan Mela

The ICAR-NRCB celebrated its 28th Foundation Day on virtual platform on 21 August, 2021. Dr. A. K. Singh, Deputy Director General (Hort. Science), ICAR and Dr. S. K. Malhotra, Agriculture Commissioner, Ministry of Agriculture and Farmers' Welfare, Govt. of India graced the event as Chief Guests. Padma Shri Dr. Mylswamy Annadurai, Former Director, ISRO; Dr. Pawan Kumar Singh, Director, IIM, Tiruchirappalli; Dr. M. Selvam, Vice Chancellor, Bharathidasan University,

Tiruchirappalli and Dr. B. K. Pandey, Assistant Director General (Hort. Science –II), ICAR were Guests of Honor. The event was felicitated by Shri Ajith Jain, Joint Managing Director, Jain Irrigation Systems Ltd.; Dr. V. Venkatasubramanian, Director, ICAR–ATARI, Bangalore; Dr. T. Janakiram, Vice Chancellor, Dr. YSR Horticultural University; Shri A. P. Karuppaiah, Chairman, TNBPCL and Shri G. Ajeethan, Managing Director, TNBPCL. Dr. Mylswamy Annadurai lauded ICAR–NRCB for its contribution to banana cultivation and export and mentioned the potential of banana fiber for value added products and their export. Dr. A. K. Singh delivered the chief guest address. Dr. S. K. Malhotra released ICAR–NRCB's publications and gave the foundation day awards. A webinar titled 'Banana Value Chain and Marketing – New Business Horizons' was organized.

'Target Farmers & Target Media' Approach - A technology delivery system by scientists-farmers linkage through mass media during covid lockdown

During the lockdown, a comprehensive program comprising eleven episodes on banana technologies for technological backstopping for banana farmers and other stakeholders was telecast through "Malarum Boomi", a popular agriculture-based program of Makkal TV, a regional TV channel. The program covered improvement, production, post-harvest and protection aspects of banana cultivation.



The Director and Scientists of NRCB delivering lectures and demonstrating technologies on Makkal TV

Farmer's Awareness Campaign on 'Balanced Use of Fertilizer in Banana Cultivation'

ICAR–NRCB in collaboration with ICAR-KVK, Pulutheri, Karur organized a 'Farmers' Awareness Campaign' on 18 June, 2021. Dr. K.J. Jeyabaskaran, Principal Scientist, ICAR-NRCB delivered a lecture on 'Balanced Use of Fertilizer in

Banana Cultivation’. The campaign was organized online. Around 500 participants participated in the campaign.

National webinar on ‘Integrated Farming System’

A national webinar on ‘Integrated Farming System’ was organized by ICAR-NRCB on 7 July, 2021. Dr. N. Ravisankar, Principal Scientist & Project Coordinator (In-charge), AICRP–IFS, Coordination Unit, ICAR-IIFSR, Modipuram, delivered a talk on “Sustainable Integrated Cropping and Farming System Models with Special Reference to Banana for Enhanced Income of Farmers”. Around 700 participants including researchers and students from different SAUs across India, SMS from KVKs of ATARI, Zone XI, Bengaluru and other KVKs also participated the webinar.

ICAR-NRCB joins hands with Government of Tripura for promoting new varieties and production and post-harvest technologies

ICAR-NRCB initiated collaboration with Government of Tripura during “Progressive Farmers’ Meet on Horticulture Development with Special Reference to Banana” which was held during 17-18 August, 2021. The meet was inaugurated and graced by Shri Biplab Kumar Deb, Hon’ble Chief Minister, Tripura. Around 600 farmers participated.



Shri. Biplab Kumar Deb, Hon’ble Chief Minister,
Tripura Visiting ICAR-NRCB Stall

‘Poshan Vatika Maha Abhiyan’ and Tree Plantation Campaign

The NRCB organised a farmers’ meet to celebrate ‘Poshan Vatika Maha Abhiyan’ and Tree Plantation as part of the celebration of ‘International Year of Millets-2023’ on 17 September, 2021. Dr. S. Uma, Director, ICAR-NRCB delivered a talk on the importance of banana and nutri-cereals and their role in human health. All the participants were provided with banana suckers and a tree plantation campaign was held. Women farmers planted different

tree saplings in the institute premises. To create awareness about the health benefits of millets, pearl millet porridge was provided to all the participants.

Awareness programme on “Climate Resilient Agriculture”

The Centre organized a farmers’ meet on 28 September, 2021 under a “Mass awareness campaign for large scale dissemination of climate resilient technologies and methods”. In the online campaign, Honorable Prime Minister dedicated 35 crop varieties to the nation and bestowed the Clean Green Campus Awards on different institutes and addressed the farmers. The program was attended by around 240 participants.

World Food Day Celebrations

The Centre celebrated the World Food Day on 16 October, 2021 with the tagline “Safe food now for a healthy tomorrow”. Dr. S. Uma, Director, ICAR-NRCB highlighted the importance of banana in our diet. Around 120 B.Sc. (Agri.) students attended the program. Off-campus & outreach training programs were also organized for farmers of Karur and Namakkal Districts and banana planting materials and Banana Sakthi were distributed free of cost to the farmers.

Celebration of “Agriculture and Environment: the Citizen Face”

ICAR–NRCB organized a training program for school children on the occasion of ‘Agriculture and Environment: the Citizen Face’ on 26 November, 2021. They were trained for “Edible packaging of fresh fruits using natural products from banana”. The students were also exposed to other eco-friendly technologies like banana fiber and napkin production.



School children at the Centre during the training program

Meet on 'Natural Farming'

ICAR–NRCB organized a farmers' meet on 16 December, 2021. Honorable Prime Minister addressed the farmers, students, scientists and other stakeholders on the topic 'Natural Farming' in virtual mode. Around 100 farmers from Viluppuram and Kanyakumari Districts of Tamil Nadu, 50 students and other stakeholders participated in the program.

"Banana Farmers to Banana Experts (BF-BE)": A Novel Initiative by ICAR-NRCB

With an objective of providing the necessary information on new technologies in banana cultivation to the farmers, the Centre initiated an endeavor titled "Banana Farmers to Banana Experts (BF-BE)". The initiative has been undertaken in collaboration with the Agricultural Technology Management Agency-Support to State Extension Programs for Extension Reforms Scheme (ATMA-SSEPERs). Under this program, totally 440 farmers from 11 districts of Tamil Nadu were trained during December, 2021–January, 2022.

Kela Mela celebration – An Outreach initiative by ICAR-NRCB

In collaboration with different KVKs of Tamil Nadu, the NRCB organized *Kela Melas* during February – March, 2022 to promote banana cultivation and to train SC banana stakeholders under SC & SP scheme. As part of the program, inputs were supplied and scientific lectures on banana cultivation were delivered by Drs. K.J. Jeyabaskaran, K.N. Shiva, M. Loganathan and C. Karpagam.

Hindi Pakhwada

The ICAR-NRCB celebrated 'Hindi Pakhwada' during 14-29 September, 2021. As part of the celebration, 'Rajbhasha Pledge' was taken by the staff on 14 September, 2021. Competitions on essay writing, elocution, poem recitation and picture based hindi word competition and a quiz were held during 22–28 September, 2021. The closing ceremony was held on 29 September, 2021. Mr. D. Anil, Commissioner, Customs, Tiruchirappalli was the Chief Guest of the event and gave away the prizes to the winners of various competitions and addressed the staff.



Prize distribution to winners of Hindi Pakhwada competitions held at the centre

Vigilance Awareness Week celebrations

The ICAR-NRCB observed the Vigilance Awareness Week during 26 October–1 November, 2021 under the theme "Independent India @ 75: Self Reliance with Integrity". The Director and the staff of the centre took the integrity pledge on 26 October, 2021.

Published by

Dr. S. Uma, Director

Editors : Dr. P. Giribabu, Dr. J. Poorani, Dr. M.S. Saraswathi,
Dr. M. Mayil Vaganan, Dr. R. Selvarajan and Dr. P. Ravichamy

ICAR - NATIONAL RESEARCH CENTRE FOR BANANA

Thogamalai Road, Thayanur Post, Tiruchirappalli - 620 102, Tamil Nadu, India. Phone: 0431 - 2618125,

E-mail: director.nrcb@icar.gov.in, Web: nrcb.res.in

Facebook: <https://www.facebook.com/nrcb.icar>, Twitter: https://twitter.com/ICAR_NRCB