ICAR-NRCB Newsletter

Banana Bites

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Contents

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1. MAJOR RESEARCH HIGHLIGHTS

Kaveri Microbial Consortium (KMC) for enhancing growth and yield of banana

KMC is a scientifically developed beneficial microbial consortium comprising Plant Growth Promoting Rhizobacteria (PGPR) such as Bacillus aryabhattai, Priestia megaterium, B. pumilus, B. altitudinis, B. subtilis, and B. flexus, formulated using inert carriers like talc powder and carboxy methyl cellulose. Standardized for field application at 10 g per plant along with FYM or vermicompost at planting and at 3, 5, and 7 months, it is also effectively used during primary and secondary hardening of tissue culture banana plants. The consortium enhances phosphorus and potash availability, improves plant health through induced resistance, and promotes overall growth, resulting in a yield increase of 10–20%, thereby supporting organic and sustainable cultivation. Field evaluations have demonstrated significant improvements in growth and yield parameters; notably, in tissue culture Poovan (elite), KMC-treated plants recorded higher plant height (308 cm), girth (76 cm), number of hands (11.73), total fruits (210), reduced days to maturity (84.8), and increased bunch weight (27.07 kg/plant) compared to untreated controls. Similarly, biopriming of tissue culture plants (cv. Ney Poovan) during hardening stages significantly enhanced plant establishment and growth.

per kg, whereas those produced using conventional planting material fetched only ₹46 per kg. In the Athur area of Salem district, farmers who adopted NRCB planting material realized significantly higher net profits, driven by both increased yield and better market prices. These findings confirm that bioreactor-based planting material offers a clear economic advantage to farmers, reinforcing its potential for large-scale adoption.

Treated Plot

Control Plot

Fig. 2. Performance of KMC under field (cv Elite Poovan)

The technology has been validated across 21 field locations in states such as Uttar Pradesh, Madhya Pradesh, and Maharashtra in cultivars including Grand Nain, Poovan, Nendran, and Red Banana. KMC is produced under a valid biofertilizer license as per FCO 1985 (2024–2029), facilitating its commercial manufacture and sale; over 5 tonnes have been marketed at ₹150/kg. The technology has also been licensed to stakeholders for ₹1,00,000 per license, with successful transfer to institutions such as MIT College of Agriculture and Technology (Tiruchirappalli), the Department of Horticulture (Government of Karnataka), and organizations in Nagaland, and has been recognized by ICAR as a validated technology with wide acceptance among farmers and institutions.

ToT to MIT College of Agriculture and Technology (Tiruchirappalli)

ToT to Department of Horticulture, Government of Karnataka

Fig. 3. ToT of KMC

Banana Weevil Killer: A Bio-formulation for the Management of Banana Weevils

To address the limitations of chemical control, eco-friendly management strategies were developed using entomopathogenic fungi. Seven indigenous fungal strains were isolated from naturally infected insects across India and identified as *Metarhizium anisopliae* (EPF 09, 12, 36, 50), *Beauveria brongniartii* (EPF 27, 28), and *Beauveria bassiana* (EPF 22), with molecular confirmation through GenBank accession numbers. Among these, *B. bassiana* EPF 22 and *M. anisopliae* EPF 50 exhibited superior efficacy, recording high mortality rates (66–78%) in pseudostem weevil under laboratory conditions, while *B. bassiana* EPF 22 showed strong virulence with low LC_{50} values and high attraction in trap-based methods. In corm weevil studies, these strains achieved up to 100% mortality under in vitro conditions, with *B. bassiana* EPF 22 outperforming others under field conditions. Based on these findings, a bio-formulation, Banana Weevil Killer®, was developed using *B. bassiana* EPF 22, which effectively targets all life stages of banana weevils. The formulation demonstrated superior efficacy compared to the commercial product Beauverilin®, achieving 100% mortality under laboratory conditions, while the latter recorded only 24–76% mortality. Further evaluation confirmed its effectiveness against corm weevil with favorable LC_{50} and LC_{90} values and strong statistical reliability. Field observations revealed significantly lower pest incidence and improved root growth in treated plants compared to untreated controls. The technology has shown promising results and is currently undergoing multi-location validation under the ICAR–All India Coordinated Research Project (AICRP) on Fruits (Banana), highlighting its potential as a sustainable and effective biocontrol solution for banana pest management.

Fig. 4. Banana Weevil Killer (*Beauveria bassiana* ICAR-NRCB Bb EPF 22)

Fig. 5. Mortality of O. longicollis due to banana weevil killer

Extrusion Process-dependent starch structure-function relationships in the development of instant banana powders across ripening stages

This study evaluated the influence of banana ripening stage and extrusion processing on the quality of banana powders for instant food applications. Banana extruded powders (BEP) prepared from moderately ripe fruits (15–20 °Brix), specifically BEP15 and BEP20, demonstrated superior performance in terms of functional, structural, and nutritional properties. Extrusion processing facilitated partial pre-cooking of starch, resulting in enhanced water absorption, solubility, and rapid reconstitution, which are critical for instant formulations. These samples also maintained better thermal stability and structural integrity compared to powders derived from highly ripe bananas (BEP25), which exhibited excessive degradation and reduced stability. Additionally, extrusion-induced particle size reduction improved hydration, dispersion, and flowability, ensuring ease of handling and dissolution. Notably, BEP15 and BEP20 showed balanced starch digestibility with moderate glycaemic index values, indicating improved nutritional quality. Overall, banana extruded powders produced from 15–20 °Brix fruits under optimized extrusion conditions were identified as ideal ingredients for instant food applications.

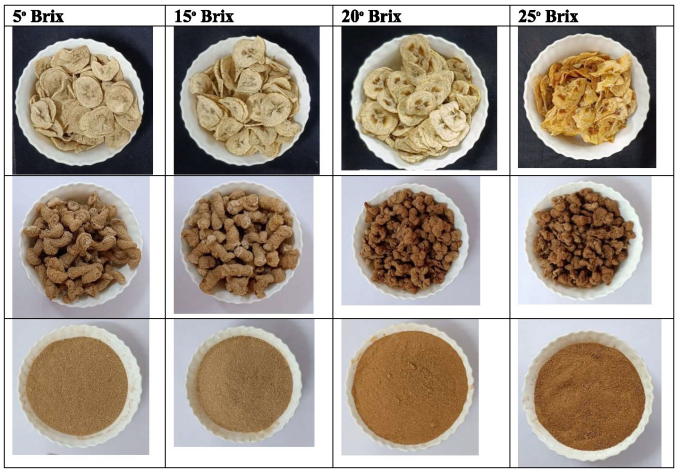

Fig. 6. Banana extruded powders produced from bananas at different ripening stages

2. TRANSFER OF TECHNOLOGY (TOT)

During the third quarter of 2025, the institute licensed multiple banana-based production and value-addition technologies, generating revenue through diverse stakeholders across India. Key technologies transferred included variety-specific tissue culture protocols, Kaveri Microbial Consortium, banana wine and vinegar, banana flour-based weaning foods, fortified central core stem juice, low-fat flavoured chips, dehydrated banana fig, and low-sodium banana-based pickles. These technologies were disseminated to individual entrepreneurs, state departments, and institutions across Tamil Nadu, Karnataka, Maharashtra, Nagaland, and other regions, contributing to a total revenue of ₹4.70 lakh during the quarter.

3. OUTREACH AND EXTENSION

Capacity Development Programmes

Particulars	No. of Programme	No. of Beneficiaries
Training		
One day training for farmers	01	25
Exposure Visit		
Farmer's exposure visit	11	434
Student's exposure visit	12	552
Total	**24**	**1011**

Fig. 7. Capacity Development Programme

Off campus Training programme

During the third quarter, the institute focused on the *Viksit Krishi Sankalp Abhiyan (Pre-Kharif farmer campaign)* as a major outreach initiative. As a Nodal officer of VKSA, Dr. C. Karpagam has coordinated the overall activities of the programme. The campaign was successfully conducted at Perambalur district, Tamil Nadu, during 02–12 July, involving I. Ravi, P. Giribabu, and A. Mohanasundaram, and reaching 4,200 farmers. Similarly, the *Viksit Krishi Sankalpa Abhyaan (VKSA)* Pre-Kharif farmer campaign was organized in association with ICAR-KVK, Pudukkottai, Tamil Nadu, under the coordination of K. J. Jeyabaskaran, benefiting 4,500 farmers during 04–12 July. In addition, demonstrations on Fusarium wilt management in banana were carried out at Burhanpur, Madhya Pradesh, on 11 and 12 August by M. Loganathan and G. Prabhu, covering 30 farmers. A similar demonstration was conducted at Dasnur, Maharashtra, on 20 and 21 September by the same team, benefiting 12 farmers.

Transfer of Technology through frontline exhibition activities

During the reporting period, the institute actively participated in several major exhibitions and events to promote banana technologies and strengthen stakeholder engagement. The *AGRI INTEX–2025*, organized by CODISSIA at Coimbatore, Tamil Nadu, from 10–14 July 2025, witnessed a large outreach of about 50,000 beneficiaries. The 32nd NRCB Foundation Day cum Farmers' Day–2025 on the theme "Smart Banana Farming for Wealth and Health" was held at ICAR-NRCB, Trichy, on 21 August 2025, benefiting around 1,000 farmers.

Further, the institute participated in DELMIN EXPO–2025 organized by the Tiruchirappalli District Tiny & Small-Scale Industries Association (TIDITSSIA) at Kalaiyarangam Hall, Trichy, during 19–21 September 2025, reaching about 5,000 beneficiaries. The Tamil Nadu Government State Exhibition AGRI Business Expo–2025 held at Chennai Trade Centre, Nandambakkam, Chennai, on 27 and 28 September 2025 attracted nearly 25,000 beneficiaries. In addition, a stakeholders' meeting on "Strengthening Banana Value Chain and Export Promotion" was organized at ICAR-NRCB, Trichy, in collaboration with TNAPEx, Government of Tamil Nadu, on 29 September 2025, benefiting 150 participants.

Fig. 8. Frontline exhibitions

Transfer of technologies through print and electronic media

During the reporting period, a total of 44 media outreach activities were carried out. This included 18 news items published in print media, 4 news items broadcast through electronic media (TV and All India Radio), and 11 news updates shared via social media platforms. Additionally, 3 news stories were reported in ICAR News (online). These efforts collectively enhanced the visibility and dissemination of the institute's activities and technologies.

4. OTHER INFORMATIONS

Institute Research Council (XXVIII-IRC) meeting

The Twenty Eighth Institute Research Council (XXVIII-IRC) meeting was held under the Chairmanship of the Director with all Scientists from 4.8.2025 to 7.8.2025 to review the research work done in each project and to approve the new projects proposed.

Fig.9. Institute Research Council (XXVIII-IRC) meeting

Institute Management Committee (IMC)

The Twenty-Ninth Institute Management Committee (XXIX IMC) meeting of the Centre was held on 20th August 2025 at the Centre. The key research achievements of the Centre were highlighted during the meeting. The Director of ICAR-NRCB provided updates on infrastructural developments and discussed matters related to the IMC.

Training and Transfer of Technology to Nagaland Farmers

The ICAR - National Research Centre for Banana (ICAR–NRCB), Tiruchirappalli, organized a four-day (20-23 August, 2025) capacity building programme, training and transfer of technology for the government officials and farmers of Wokha District (under One District – One Product, MoFPI, GoI), Nagaland with the objective of strengthening knowledge and skills in hi-tech banana cultivation and banana-based value addition consequent upon the National Stakeholders Workshop and Panel discussion on 'Strengthening Banana Ecosystem for Sustainable Development" held at Wokha Dt., Nagaland on 11th March 2025. A total of 19 including Project Manager & Skill Development Officer, ICAR-KVK SMS, Farmers, FPO other stakeholders participated in the programme.

Fig.10. Training and ToT to Nagaland Farmers

32nd Foundation Day and Kisan Mela

ICAR–National Research Centre for Banana celebrated its 32nd Foundation Day and Kisan Mela on 21 August 2025 under the theme "Smart Banana Farming for Wealth and Health," attracting around 1,000 farmers and stakeholders The event was graced by Tusar Kanti Behera, Director, ICAR–Indian Institute of Horticultural Research, as Chief Guest; S. Annadurai, Director, Tribal Development Board, Chennai; R. Thangavelu, Director, ICAR–National Research Institute for Integrated Pest Management, New Delhi; and P. Govindaraj, Director, ICAR–Sugarcane Breeding Institute, Coimbatore, as dignitaries, who emphasized quality planting materials, sustainability, entrepreneurship, and integrated pest management. During the event, three MoUs were signed with key stakeholders, extension materials and products were released, and 4,000 tissue-cultured plants were distributed to SC farmers. The programme also featured panel discussions on "AI Interventions in Banana Farming and Value Chain" and "Quality Planting Material to Boost Banana Productivity". The event featured more than 20 exhibition stalls, highlighting innovations in banana cultivation and value addition.

Fig.11. 32nd Foundation Day and Kisan Mela

Stakeholder's meeting on Strengthening Banana Value Chain and Export Promotion

A stakeholders' meeting on "Strengthening Banana Value Chain and Export Promotion" was held at the ICAR–NRCB 0n 29-09-2025. Nearly 150 participants, including farmers, traders, exporters, entrepreneurs, members of various Krishi Vigyan Kendras (KVKs), Farmer Producer Organizations (FPOs), and aspiring banana growers, took part in the event. The Chief Guest, Prof. Pawan Kumar Singh, Director of IIM Tiruchirappalli, appreciated NRCB's global achievements and highlighted the cultural and spiritual significance of banana.

Fig.12. Stakeholder's meeting on Strengthening Banana Value Chain

Publications

Sassikumar, D., Theertha, P., Pushpa, R., Suresh, R., Shanmugam, A., Manimaran, R., & Paramasivam, S. K. 2025. Comparative techno-functional, physio-chemical and pasting properties of pigmented (Kavuni) rice landraces of India. *Scientific Reports, 15*(1), 1–18. https://doi.org/10.1038/s41598-025-95747-8

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Paramasivam, S. K., Birundha, M. K., Pushpavalli, S., Arthee, R., Shuprajhaa, T., & Wakchaure, G. C. 2025. Enhancing the dietary fibre in muffins with banana peel powder and evaluating its effect on physicochemical characteristics, textural quality and storage life. *Discover Food, 5*, Article 231. https://doi.org/10.1007/s44187-025-00544-x

Shuprajhaa, T., Paramasivam, S. K., Pushpavalli, S., Anandakumar, S. U., & Naik, R. 2025. Influence of additives on the development, mechanical, functional characteristics and biodegradability of banana starch-based bioplastic films. *International Journal of Biological Macromolecules, 295*, Article 139544. https://doi.org/10.1016/j.ijbiomac.2025.139544

Personalia

Posting/ Joining

1. Dr. J. Berliner, Senior Scientist joined ICAR-NRCB on transfer from ICAR-IARI Regional Station, Wellington on 19.09.2025
2. Dr. S. Prabhu Karthikeyan, Senior Scientist joined ICAR-NRCB on transfer from ICAR-CRRI, Cuttack on 19.09.2025
3. Dr. R. Panjavarnam, Senior Scientist joined ICAR-NRCB on transfer from ICAR-CPCRI, Kasaragod on 25.09.2025

Promotion

Dr. R. Sudha, Senior Scientist, was promoted as Principal Scientist with effect from 14.09.2023

Other Informations

79th Independence Day celebrations at ICAR - NRCB

79th Independence Day Flag hoisted by Director I/c Dr. J. Poorani at ICAR-National Research Centre for Banana, Trichy on 15th August 2025, and delivered an inspiring address to the staff.

Fig.13. 79th Independence Day celebrations at ICAR - NRCB

Extension & Farmers Services Corner

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For Location