



NRCB News

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



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Dr. N. K. KRISHNA KUMAR ASSUMES CHARGE AS DDG(HORT.), ICAR, NEW DELHI



The Director, Scientists and all Staff members of NRC Banana whole heartedly congratulate Dr. N. K. Krishna Kumar on assuming as Deputy Director General (Horticulture), ICAR, New Delhi on 8th August, 2012. He started his carrier as Scientist and elevated to Head,

Department of Agricultural Entomology, IIHR, Bengaluru where he worked for more than two decades and later as Director at NBAII, Bengaluru. Dr. N. K. Krishna Kumar did his Ph.D. and Post-Doctoral Fellow in USA. He is an eminent, renowned entomologist in the country, particularly in the field of entomological research in vegetables. He had 34 years of professional experience and published more than 120 research papers in both National and International journals. He is a recipient of many National and International awards. Dr. N. K. Krishna Kumar had visited several countries. He is also an active member of several professional societies viz. President- Association for Pest Management in Horticultural Ecosystem; Vice-President- Society for Promotion of Horticulture and Founder Member of Entomology Academy of India. Dr. N. K. Krishna Kumar was instrumental in transferring many ICAR technologies to entrepreneurs through commercialization. The Director and Staff of NRCB wish him a great success in his future endeavours.

FROM THE DIRECTOR'S DESK



India is the largest producer of banana in the world, thanks to the several technologies developed by the researchers and adoption of these technologies meticulously by

the banana growers in different banana growing regions of India. However, even after the technology development, occurrence of pests like stem and corm borers are causing severe economical losses in banana due to non-adoption of proper technologies and proper chemicals at right time. Also, aphids though not causing considerable yield loss directly, but act as a vector in transmitting banana bunchy top viruses, which are becoming one of the major causes for yield reduction. Management technologies through insecticides and other measures have been developed for the management of these insect pests, which are not economical, eco-friendly and are also hazardous. To overcome these environmental problems, NRC Banana is actively involved in developing "farmer cum environmental friendly technologies" using entomopathogenic fungi (EPF) and semiochemicals for the management of the above insect pests for the benefit of the farming community. Also, presently research work for the management of other insect pests such as thrips and scarring beetle are underway. The already released technologies for the management of important insects like weevils and aphids have been effectively transferred to the banana farmers through kisan melas, exhibitions, demonstrations in the farmers field which have resulted in the large scale adoption by the farmers in different banana growing areas in the country. Also, the scientist is involved in monitoring the insect pest occurrence with the assistance of co-ordinating centers working on banana leading to development of banana insect pests map of India. One technology developed has been commercialized as liquid formulations, which has helped in the easy and quality product availability to the farmers. The eco-friendly technologies for the management of important insect pests of banana are discussed in this newsletter for the benefit of the farmers.

1. Insect Pest Management

Banana is the most important fruit crop in India and accounts for 32 % of total fruit production. It is widely cultivated in varying agro-climatic regions under different systems of production. In India, banana and plantains are infested with more than 15 insect pests. These insect pests cause 10-30% yield loss in many commercial cultivars of banana. The insect pests are controlled earlier by chemicals but now more emphasis is given for development of eco-friendly management technologies using semiochemicals and entomopathogenic fungi (EPF). Among these EPF, *Beauveria bassiana* and *Lecanicillium lecanii* were identified as potential biocontrol agents for the management of banana weevils and aphids respectively. These fungi were developed into different formulations as rice chaffy grains, liquid (*Beauveria bassiana*) and talcum based (*Lecanicillium lecanii*) formulations. These technologies are available at NRC Banana for use against major insect pests in banana by the farming community. The commercial liquid formulation is available in the market as *Beauvericide*.

1.1. Resistant sources from *Musa* germplasm

The banana accessions (313) were screened against major insect pests such as corm weevil, stem weevil and aphid under both laboratory and field conditions. The screening results indicated that the accessions *Musa acuminata* ssp. *burmanicoides*, Yangambi km 5 and accession number 0598 were identified as resistant to corm weevil. None of the accessions were found to be resistant to banana aphid and stem weevil.

1.2. Semiochemicals for banana weevils

The commercially available semiochemicals were screened under laboratory conditions against corm and stem weevil using electroantennogram. The electrophysiological and behavioural studies of weevils revealed that the semiochemicals Sc. No. 1 (Fig. 1a) and Sc. No. 2 were identified as attractants to corm and stem weevils respectively. Suitable dispensers and traps were also developed (Fig. 1b) and these traps can be used for monitoring and management of banana weevils. Currently, these technologies are being tested in multilocational trials under AICRP on Tropical Fruits.

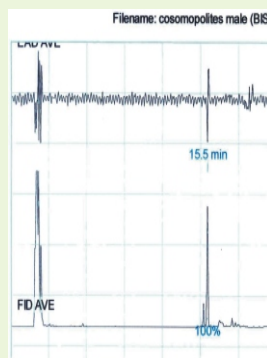


Fig.1a. GC-EAD of corm weevil to semiochemical Sc. No.1



Fig.1b. Funnel trap with dispenser

1.3. Entomopathogenic microbials for the management of insect pests of banana

Entomopathogenic microbials such as *Beauveria bassiana*, *Metarhizium anisopliae* and *Lecanicillium lecanii* were isolated from rhizosphere soil and also from different parts of banana plants. The isolated fungi were evaluated against corm weevil, stem weevil and aphid under *in vitro* and field conditions. The results indicated that *B. bassiana* (B. b - NRCB 7) isolated from rhizosphere soil recorded more than 90% mortality of stem weevil both under lab and field conditions.

Endophytic fungal isolates of *Beauveria bassiana*, *Metarhizium anisopliae* and *Lecanicillium lecanii* isolated from different banana accessions were evaluated against stem weevil, corm weevil and aphids. The results indicated that an isolate of *Metarhizium anisopliae* (M. a Endo 66) recorded 76% mortality of stem weevil and 100% mortality of aphids while, *B. bassiana* isolate (B. b Endo 32) recorded 54% mortality of corm weevil. The isolate *Lecanicillium lecanii* (L. 1 Endo 158) recorded 93% mortality of aphids under *in vitro* conditions.

1.4. Evaluation of petroleum oil

The combined effect of petroleum oil (Agrospray S) (0.5ml/l) and entomopathogen *Lecanicillium lecanii* (0.5ml/l containing 1×10^9 CFU/ml) was evaluated in banana cv. Poovan at Thirukattupalli in Thanjavur district. The results of the field study indicated that spraying of banana plants for two times at shooting and after opening of all hands recorded complete arrest of rust thrips infestation.

1.5. Release of entomopathogenic fungi for the management of banana weevils and aphid

The rice chaffy grain formulation of entomopathogenic fungi of *Beauveria bassiana* was released at the Field day conducted at HRS,



Fig. 2a. Rice chaffy grains formulation of *Beauveria bassiana*



Fig. 2b. Dr. M. M. Mustafa, Director, NRCB releases the talcum formulation of *Lecanicillium lecanii*



Fig. 2c. Mr. Bijay Kumar, M.D, NHB releases the liquid formulation of *Beauveria bassiana*

Thadiyankudisai, TNAU on 2.6.2007 (Fig. 2a) and talcum formulation of *Lecanicillium lecanii* at NRCB Foundation Day held on 21.8.2008 (Fig. 2b). For easy availability of the biopesticide, the technology was transferred to a private company TARI, Thanjavur to produce liquid formulation of *Beauveria bassiana*. The liquid formulation of *Beauveria bassiana* was released during the International Conference on Banana held at Tiruchirapalli on 24th October, 2008 (Fig. 2c).

During the last five years, new eco-friendly technologies such as semio chemical traps & bio-pesticides have been developed for the management of insect pests of banana.

PUBLICATIONS

Research Journal

Sangeetha, G., Thangavelu, R., Usha Rani, S. and Muthukumar, A. 2012. Antimicrobial activity of medicinal plants and induction of defense related compounds in banana fruits cv. Robusta against crown rot pathogens. *Biological Control*, 64: 16-25.

Selvarajan, R., Balasubramanian, V., Jeyabaskaran, K. J., Pandey, S. D. and Mustafa, M. M. 2012. Mitigating the effect of banana bract mosaic disease through application of increased doses of fertilizer in banana cultivar Robusta (AAA). *Journal of Plant Disease Sciences*, 7: 158 161.

Uma, S., Lakshmi, S., Saraswathi, M. S., Akbar, A. and Mustafa, M. M. 2012. Plant regeneration through somatic embryogenesis from immature and mature zygotic embryos of *Musa acuminata* ssp. *burmannica*. *In vitro Cell and Developmental Biology - Plant* : DOI 10.1007/s11627-012-9462-z.

Chapters in books/ Technical bulletins

Selvarajan, R., Balasubramanian, V. and Mary Sheeba, M. 2012. Banana bunchy top virus: Symptomatology, molecular characterization, genetic diversity, diagnosis and management strategies, *In: Recent trends in plant virology*. (Eds. Govind P. Rao, VK Baranwal, Bikash Mandal and Narayan Rishi). Studium press LLC, Texas, U.S.A. pp. 367-387.

Mustafa, M. M. and Shiva, K. N. 2012. Banana and processed products as food, nutrient and livelihood. *In: Shodh Chintan* (Eds. Babita Singh, Manoj Kumar and Malhotra, S.K.). Published by Plain & Valley, New Delhi. pp. 78-82.

Uma, S., Saraswathi, M. S. and Durai, P. 2012. Kela Vridhi Vazhai urpathyil oru puthiya thozil nutpam (Tamil). Technical bulletin no. 19, NRCB, Trichy. pp. 1-20.

Uma, S., Saraswathi, M. S., Durai, P. and Mustafa, M. M. 2012. Valamtharum vazhai ragangal (Tamil). Technical bulletin no. 20, NRCB, Trichy. pp. 1-16.

TRANSFER OF TECHNOLOGY

- Mother culture of cv. Neypoovan has been commercialized to a T.C. lab M/s. Dhanam Agro Biotech, Kaveripattinam, Krishnagiri district on 8.11.2012.
- 250 Udhayam banana plants have been distributed to interested banana growers.
- Demonstrated bunch cover technology using polypropylene non woven bunch sleeves in the summer crop of banana cv. Grand Naine at Chinnamanur, Theni and in cvs. Ney Poovan and Rasthali in Thottiam, Tiruchirapalli.



Radio talk

Padmanaban, B. gave a radio talk on question and answer programme about “Integrated Pest Management” and was broadcasted on 7.9.2012 by the All India Radio, Tiruchirapalli.

Exhibitions

1. NRCB showcased its technologies during the National Conference on Adaption to climate change for sustained production of banana (NCB-2012) at Jain Hills, Jalgaon, Maharashtra from 7th - 10th April, 2012.
2. NRCB has disseminated its technologies during the 19th Foundation Day of NRCB (Kissan Mela- 2012) on 27th August, 2012. More than 400 progressive farmers from different districts of Tamil Nadu participated.

AWARDS

Dr. B. Padmanaban received “Dr. S. Sithanatham Award” for the year 2008 - 09 for the contribution towards



"Dr. S. Sithanatham Award" to Dr. B. Padmanaban, NRCB



The "Fellow of AIPUB Award" to Dr. R. Thangavelu, NRCB



The "Fellow of AIPUB Award" to Dr. V. Kumar, NRCB

RECOGNITIONS

Name of the Scientist	Particulars
Padmanaban, B.	Nominated as Secretary, QRT for the period (2007-2012) of NRCB) by ICAR. Nominated as Member Secretary- RAC of NRCB for the period up to 2014 by ICAR. External examiner for the Ph.D degree thesis of University of Kerala.
Selvarajan, R.	Recognized as member in Board of Studies in Plant Pathology, Faculty of Agriculture, Annamalai University, Chidambaram. Nominated to act as external examiner for Mr. R. Karuppiah, Ph.D scholar, Sugarcane Breeding Institute registered with Bharathiar University, Coimbatore. Selection committee member for the UGC-BSR Research fellowships in Department of Plant Science, Centre of Excellence in Life Sciences, Bharathidasan University, Tiruchirapalli.
Saraswathi, M. S.	Nominated as a member of the doctoral committee for K. Udhayaanjali and G. Valarmathi registered with Bharathidasan University, Tiruchirapalli.

the biological control of insect pests of Horticultural crops by the Association for Advancement of Pest Management in Horticultural Ecosystem (AAPMHE) during the IV National Symposium on Plant Protection held at IIHR, Hessaraghatta, Bengaluru on 25th April, 2012. Also, Dr. B. Padmanaban conferred with the “Distinguished Alumnus Award” for the year 2012 for his contribution towards the Research & Development. This award was presented by Dr. K. Meena, Vice-Chancellor, Bharathidasan University, Tiruchirapalli during the Annual Alumni Meet of Jamal Mohamed College, Tiruchirapalli held on 26th August, 2012.

Dr. B. Padmanaban, Dr. R. Thangavelu and Dr. V. Kumar, Scientists, NRC for Banana received the “Fellow of AIPUB” award for their outstanding contribution to banana research & development in India by Association for the Improvement in Production and Utilization of Banana (AIPUB) during the National Conference on Adoption to climate change for sustained production of banana held at Jalgaon, Maharashtra on 7th April, 2012.

CONSULTANCY SERVICES AND COMMERCIALIZATION OF TECHNOLOGIES

- M. S. Saraswathi, Senior Scientist has analyzed eleven batches of tissue cultured varieties namely Grand Naine, and Ambamore under DBT-ATL for their fidelity using SSR and ISSR markers.
- Totally 6537 samples had been tested for the virus during the period under report under contract service for virus indexing of banana TC plants.

NATIONAL/ INTERNATIONAL TRAININGS ATTENDED BY THE SCIENTISTS

- Mayil Vaganan, M. underwent an advanced training in biomolecules metabolomics under National Agriculture Innovation Project (ICAR) at Metabolomics Research and Core Facility, Department of Molecular and Cellular Biology & Genome Centre, University of California, Davis, USA under the guidance of Dr. (Prof.) Oliver Fiehn for 90 Days from 21st March to 18th June, 2012.
- Selvarajan, R. attended a training programme on 'IPR and Biotechnology' at NAARM from 21 to 25th September, 2012.

WORKSHOPS, SEMINARS, SUMMER INSTITUTES, FARMERS DAY, TRAINING PROGRAMME ETC. ORGANIZED AT THE CENTRE

National Conference

A National Conference on “Adaption to Climate Change for Sustained Production of Banana” was organized by the Association for the Improvement in Production and Utilization of Banana (AIPUB) and National Research Centre for Banana (NRCB), Tiruchirapalli in collaboration with Jain Irrigation Systems Ltd. (JISL), Jalgaon and Confederation of Horticulture Association of India (CHAI) during 7-10 April, 2012 at Jalgaon, Maharashtra. The conference was organized with a theme on “To alleviate climate change

for sustained production of banana”. During this conference, many emerging issues were discussed to mitigate the climate change. The conference was attended by more than 500 delegates consisting of scientists,



technocrats, developmental officials, progressive growers from nine different banana growing states and representatives from industries involved in banana production.

The chief guest of the conference Shri. Radhakrishna Vikhe Patil, Hon'ble Minister of Agriculture and Marketing, Govt. of Maharashtra released the “Souvenir-cum-Abstract” of the conference brought out by the AIPUB. He also released a book in Marathi on “Improved Production Technologies of Banana”. The chief guest also gave away the “Jain Awards” to 10 farmers hailing from different banana growing areas like Gujarat, Maharashtra, Andhra Pradesh, Madhya Pradesh, Karnataka and Tamil Nadu.

Banana Show/ Exhibition

To show the strength in banana production and quality fruits, a banana show was organized at 10.30 AM on 7th April, 2012. Farmers from Jalgaon, Yawal, Raver and Chinawal districts in Maharashtra and Burhanpur district in Madhya Pradesh have participated in this banana show. Prizes were awarded to the best three banana bunches by Shri Gulab Rao Devkar, Hon'ble Minister of State for Agriculture and Transport, Govt. of Maharashtra.

An exhibition was also organized to showcase the technologies and inputs available for the better production of banana. In the exhibition, apart from NRCB and JISL, four service-providers have also participated.



Kissan Mela

The National Research Centre for Banana, Tiruchirapalli, has celebrated its 19th Foundation Day on 27. 08. 2012 by organizing a 'Banana Field Day' with a theme on "Generation of Wealth from Banana Waste".

The Field Day was organized mainly to highlight and disseminate the use of various technologies developed by the Centre including banana waste recycling- vermicomposting technology and banana waste utilization processes. In the technical sessions, scientists of NRCB delivered lectures on postharvest technology, soil management, high density planting, pest and diseases management etc. In addition, there was a Scientist - Farmers interactive session in which many aspects of improved production, protection and postharvest technologies were discussed. In the field day, banana researchers, agriculture & horticulture officers, progressive farmers and entrepreneurs from different banana cultivating areas of Tamil Nadu have participated and discussed about various production and protection constraints to maximise the production and productivity of banana in India.



Training

A six-day training programme on 'Production of value added products from banana' was conducted at NRCB from 10th to 15th September 2012, in which 12 persons have participated.



QRT/ IMC/ IRC MEETINGS

QRT Visit

The QRT of NRC for Banana under the Chairmanship of Dr. S. D. Shikhamany, former Vice-Chancellor, APHU, Hyderabad along with members of QRT viz., Dr. S. Sambandamurthy, former Dean, TNAU, Coimbatore; Dr. P. K. Ray, Head Dept. of Horticulture,

Rajendra Agricultural University, Pusa, Bihar; Dr. E. I. Jonathan, Director, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore and Dr. Sosamma Jacob, Professor & Head, Dept. of Entomology, College of Horticulture, Kerala Agricultural University, Thrissur and Dr. B. Padmanaban, Principal Scientist, NRCB as Secretary, QRT reviewed the ongoing and other research programmes of the Centre on 18th - 19th June, 2012 (first time) and 16th - 17th July, 2012 (second time). Dr. M. M. Mustafa, Director, NRCB along with all the scientists of the Centre participated in the deliberations and discussions during the team meeting. The final QRT report was submitted to ICAR on 16.10.2012 along with the recommendations.



QRT members visit to NRCB research farm

IMC Meeting

The Sixteenth meeting of the Institute Management Committee (IMC) was held on 16.7.2012 under the chairmanship of Dr. M. M. Mustafa, Director, NRC for banana along with members of IMC. During this meeting, various policy decisions were discussed and recommended for approval by the Council.



Dr. M. M. Mustafa, Director NRCB, chairing the meeting

IRC Meeting

The Sixteenth Institute Research Council Meeting was held on 14.4.2012, 15.5.2012 and 22.5.2012 under the Chairmanship of Dr. M. M. Mustaffa, Director, NRCB. The salient research achievements of previous year and technical programmes for the next year were presented by the respective project leaders of the institute. The Chairman has reviewed the research achievements made under each project and gave critical inputs for refinement of the research programmes.



Dr. M. M. Mustaffa, Director, NRCB
chairing the meeting

VISITORS

Sl. No.	Name & Address of visitors	Date of visit
1.	Dr. S. D. Shikhamany, former Vice-Chancellor, APHU, Hyderabad.	18.6.2012
2.	Dr. S. Sambandamurthy, former Dean, TNAU, Coimbatore.	18.6.2012
3.	Dr. P. K. Ray, Head Dept. of Horticulture, Rajendra Agricultural University, Pusa, Bihar.	18.6.2012
4.	Dr. E. I. Jonathan, Director, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore.	18.6.2012
5.	Dr. (Mrs.) Sosamma Jacob, Professor & Head, Dept. of Entomology, College of Horticulture, Kerala Agricultural University, Thrissur.	18.6.2012
6.	Dr. N. Kumar, Dean (Horticulture) Tamil Nadu Agricultural University, Coimbatore.	16.7.2012
7.	Shri T. Chandra Sekaran, Deputy Director of Horticulture, Govt. of Tamil Nadu, Chepauk, Chennai.	16.7.2012
8.	Dr. C. K. Narayana, Principal Scientist, IIHR, Hesseraghatta Lake post, Bengaluru.	16.7.2012
9.	Dr. Sukhada Mohandoss, Principal Scientist, IIHR, Hesseraghatta Lake post, Bengaluru.	16.7.2012

More than 3500 farmers including agricultural & horticultural officers, self help groups, students and VIPs visited the Centre



QRT members visit to NRCB on 18.6.2012



Kerala farmers visiting the NRCB research farm
on 29.5.2012

Appointment

Mr. P. Murugan was appointed as Assistant w. e. f. 27.08.2012.

Promotion

Dr. P. Durai was promoted from T5 - Technical Officer (Field) to T6 - Technical Officer w. e. f. 03.04.2011.

Dr. M. S. Saraswathi was promoted from Scientist (SS) to Senior Scientist w. e. f. 02.03.2008.

Upgradation

Smt. K. Mariammal, Skilled Supporting Staff was granted first financial upgradation under MACP on completion of 10 years regular service w. e. f. 17.10.2011.

Institute Joint Staff Council

The newly elected Institute Joint Staff Council (IJSC) of NRC for Banana for the period of 13.09.2012 to 12.09.2015 is as follows:

Dr. I. Ravi, Senior Scientist

Dr. S. Backiyarani, Senior Scientist

Mr. M. Krishnan, Administrative Officer

Mrs. C. Gomathi, Asst. Finance & Accounts Officer

Mr. M. Devarajan, Lower Division Clerk

Mr. A. Subramanian, T-2, Driver

Mr. P. Kamaraj, Mali, SSG-II

Mr. V. Ganesan, Mali, SSG-I

Mr. R. Pitchaimuthu, T-3, Field Technician has been elected as Secretary Staff Side and

Mr. R. Sridhar, Personal Assistant has been selected as CJSC member.

Published by : **Dr. M.M. Mustafa**, Director

Edited by **Dr. R. Thangavelu**

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