



ICAR - NRCB News



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



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FROM THE DIRECTOR'S DESK



In this Newsletter, achievements of banana virology in the past five years have been highlighted. Viruses infecting banana remain a serious production constraint not only in India but, in the world. Complete genome sequences of BBrMV and BSGFV have been deciphered. BBTV has been found infecting *Ensete superbum* in India. Variability of cp and HC-Pro genes among the isolates of BBrMV were studied and new recombinants were detected. On-site detection of viruses is becoming a popular in diagnostics owing to its easy handling and quickness. Using the recombinant antibodies, a Lateral flow immuno-assay (LFIA) or dipstick technique has been developed for the detection of CMV. Rolling circle amplification (RCA) based detection of BBTV and BSMYV has been standardized. Loop mediated isothermal amplification (LAMP) technique targets the genome of the virus and which is highly specific and sensitive than PCR. We have developed LAMP based detection assays of BBrMV and BBTV. The famous hill banana 'Virupaskhi' a choice banana cultivar registered under 'Geographical Indications' (GI) has almost been wiped out due to BBTV disease in

the lower Pulney Hills region of Tamil Nadu and in order to rejuvenate the cultivar, virus free embryogenic cell suspension lines were developed for supplying to the growers and a few transgenic lines developed are being tested for resistance. Application of increased dose of fertilizer (25-50% more than RDF) in cvs Robusta, Nendran and Poovan resulted in compensating the yield loss due to BBrMV. The centre has been accredited for certification of tissue culture banana plants since 2007 and virus testing along with genetic fidelity was done for a large number of samples and certified 40 million TC plants.

MOLECULAR CHARACTERIZATION OF BANANA VIRUSES

The complete genome of the Bract Mosaic Virus infecting cv. Nendran (BBrMV-TRY isolate) was cloned and sequenced and the sequence consists of 9711 nucleotides. BBrMV-TRY isolate shared 95% and 96% sequence identity with BBrMV- Philippines at the nucleotide and amino acid levels respectively. This is the first Indian report on the complete nucleotide sequence of BBrMV. The complete genome of Banana Streak Gold Finger Virus (BSGFV) occurring in cv. Virupakshi comprised of 6591bp nt and sequence analysis revealed 99% sequence similarity with the BSGFV sequence of NCBI genebank. Interestingly, a

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deletion of 672 bp was observed as compared to the published BSGFV. This is also the first report of episomally derived BSGFV in cv. Virupakshi in India.

Natural infection of BBTV in *Ensete superbum* and Banana mild Mosaic Virus (BaMMV) in cv. Udhayam and Karpuravalli was recorded for the first time in India. Diversity analysis based on coat protein (CP) and replicase gene (Rep) sequences of BBTV isolates collected from different banana growing states of India revealed that all Indian BBTV isolates with distinct geographical origin belonged to the South Pacific group, except Shervroy and Kodaikanal hill isolates which neither belonged to the South Pacific nor the Asian group. Genetic diversity and molecular evolution of 49 BBrMV isolates based on the capsid protein gene showed nucleotide (nt) and amino acid (aa) identity of 79–100 and 80–100 %, respectively. Phylogenetic analysis indicated that except two Indian isolates (TN14 and TN16), all isolates clustered together. Eleven recombination events were detected. The helper component proteinase (HC-Pro) gene of 22 isolates from South India showed a sequence identity, which ranged from 92 to 100 % both at the nucleotide (nt) and amino acid (aa) levels. Four potential recombinants with a total of 15 breakpoints, mostly in the N and a few from C terminal regions were detected.

Diagnosics of banana viruses

Coat protein gene of BBTV, BBrMV and viral associated gene of BSMYV were cloned in expression vector system and the expressed fusion viral proteins of BSMYV and BBrMV, were used to produce polyclonal antiserum and ELISA based methodology has been developed. These antisera were supplied for virus indexing to TC laboratories accredited by DBT and to the SAU's.

Cost effective simple extraction protocol for template NA preparation for detection of banana bunchy top virus by PCR was developed by ICAR-NRCB. Multiplex Reverse Transcriptase PCR has been developed for detection of four banana viruses viz., BBrMV, CMV, BBTV and BSMYV. Multicomponent multiplex PCR based detection of BBTV, Real time PCR techniques for detection of BBTV and BBrMV using TaqMan and SYBR chemistry were standardized. Lateral flow immuno-assay (LFIA) or dipstick technique has been standardized for the detection of CMV. RCA based detection of BBTV and BSMYV, Reverse transcriptase Loop mediated

isothermal amplification (RT-LAMP) technique and lamp for detection of BBrMV and BBTV was developed respectively.

Development of ECS for hill banana

The hill banana cv. Virupaskhi has almost been wiped out due to BBTV disease in the lower Pulney Hills of Tamil Nadu and no resistant sources are available for this virus. Therefore, attempts were made to develop Coat protein, Replicase and RNAi constructs using replicase gene of BBTV and multiple virus genes (BBTV, CMV and BBrMV) and virus genome derived promoter constructs. Embryogenic Cell Suspension (ECS) for hill banana has also been

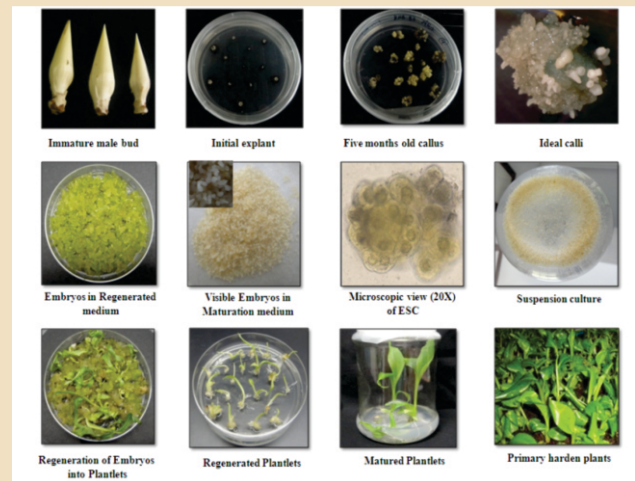


Fig : Establishment of embryogenic cell suspension (ECS) for Hill banana for developing transgenic resistant

developed (Fig.). Few putative transgenic lines were developed for BBTV resistance.

Management of BBrMV disease

To compensate the yield loss caused by BBrMV, a management strategy has been developed by application of increased fertilizer dose (25-50 % more than RDF) in plant crop of Robusta and Nendran bananas. In case of Poovan, application of 125- 150% RDF has reduced the loss due to the dual infection with BBrMV and BSMYV in plant and ratoon crops.

Virus indexing services

ICAR-NRCB molecular virology lab has been accredited by the DBT, Govt. of India, for virus indexing of tissue culture raised plants of banana in 2007. Virus diagnostic techniques developed by ICAR-NRCB during 2003 have been utilized for undertaking virus indexing on contract basis for commercial tissue culture industries, horticultural departments and farmers (free of cost). Around 70000 banana TC mother cultures / TC plants from different DBT certified

TCPUs were tested for four viruses. The virus positive plants identified were asked to be eradicated immediately to avoid the spread. Ca.40 million plants were certified by ICAR-NRCB.

RESEARCH HIGHLIGHTS

Crop Improvement

Exploration undertaken in Arunachal Pradesh has resulted in the collection of nine *Musa* species viz. *M.nagensium* (Kulu), *M.nagensium* (Kurmi), *M.itinerans*, *M.sikkimensis*, *M. velutina*, *M. velutina* hybrid, *M.rosaceae*, *M.aurantica*, *M.saddlensis* and four landraces namely Pakthe, Bhat Manohar, Monthan (Arunachal) and Kechulepa.

Totally 93 transcription factors were identified and C2H2 Zinc finger protein was found to be most abundant in Sigatoka resistant transcripts and 281 miRNA and its targets were predicted from unique up-regulated genes of drought transcriptome using PMRD (plant microRNA database).

Macropropagation of Udhayam using steam sterilized corms resulted in the production of 3.5 plants per corm as against 0.8 plants per corm in control corms without steam sterilization. A high yielding elite clone of Ash Monthan collected from Bhavani district of Tamil Nadu produced bunch weighing 15.5 kgs in a crop duration of 370 days.



Ash Monthan

Expression profiling for five *Musa*WRKY genes indicated that *Musa* WRKY 95 is expressed only in resistant cultivar at 6 days after inoculation.

Crop Production

Alleviation of soil moisture and salt stresses

Soil moisture deficit stress (-0.6 to -0.7 MPa) imposed in the field grown banana cv. Grand Naine at flowering stage reduced fruit girth by 24 % and 33 % reduction in bunch weight than irrigated control. Foliar priming of field grown cv. Grand Naine plants with 20mM glycine betaine a day before imposition of soil moisture deficit stress at one month prior to flowering increased the finger length (11.24%) and bunch weight (7.39%) over non-primed plants.

The Grand Naine plants primed with 200 μ M beta amino butyric acid (BABA) and subsequent

imposition of salt stress with 50 mM NaCl recorded two fold more photosynthesis than salicylic acid (100 μ M) primed plants. However, gas exchange parameter was 10-12 fold less in primed plants than control plants.

Development of Iron-rich transgenic banana

A total of seventy transgenic Rasthali and Grand Naine plants were raised through *Agrobacterium*-mediated transformation of iron gene constructs, pBMGF-DC-52, 53, 57 and 58 with *Fea*, *OsNas1*, *OsYSL2* and SoyFerritin genes. Presence of selectable marker gene *nptII* and gene of interest *NAS1* and *YSL2* were confirmed by the PCR using the gene specific primers in some of the Rasthali transgenic plants developed from the construct of pBMGF-DC-57.

Crop Protection

Increasing yellow life of Grand Naine banana fruits

Treatment of banana fruits cv. Grand Naine with *Trichoderma asperellum* (Prr2) at 10^6 spores/ml and storing at 23°C significantly increased the yellow life compared to untreated control fruits.



Effect of *T. asperellum* (prr2) on the yellow life of banana cv. Grand Naine at 23°C (9th day of yellow life)

Management of root lesion nematode

Soil application of *Trichoderma asperellum* and *T. viride* @ 30 g/ plant at the time of planting recorded 90-93% reduction of *P. coffeae* population in roots of cv. Grand Naine under green house condition.

Reducing *Foc* inoculum in the soil

Planting of Zimmu in the *Foc* pathogen inoculated soil reduced *Foc* by 28 fold at 20 days of planting and 300 fold at 40 days of planting.

Survey for viruses in Poovan banana grown for leaf purpose in Thirukattupalli, Tamil Nadu revealed severe incidence of BBTv ranging from 12 to 30.5% and BBrMV incidence in the range of 2.5 % to 40%.

Complete genome (ca.7.6 Kbp) of a BSV species infecting cvs. Rasthali and Poovan were amplified by Rolling Circle Amplifications (RCA), cloned and the partially sequenced which revealed the presence of both BSMYV and BSGFV in Poovan banana. Sequence

analysis of the complete genome of BSV species infecting Hill Banana comprised of 6591bp nt. The sequence analysis revealed that 99% sequence similarity with the Banana Streak GF Virus sequence obtained from NCBI gene bank. Interestingly a deletion of 672 bp was observed compared to the published BSGFV

Real time PCR assay has showed that the BBrMV titre was more in root tissues followed by bract, leaf sheath, meristem, cigar leaf and unopened leaf of infected Poovan banana samples collected in the month of June.

Rolling circle amplification (RCA) and southern analysis revealed that BSOLV is integrated whereas BSMYV is found to be in episomal form in cv. Poovan.

Real time PCR quantification of BBTV in banana and cotton aphids revealed that the virus titre was higher in banana aphid compared to cotton aphid which might be the reason for poor transmission of BBTV after acquisition by feeding in the infected plants.

Phloem proteins in healthy and BBTV infected plants

BBTV infected cv. Virupakshi banana plants showed induction of catalases, peroxidases, PPO,

APX, GPX, total phenol and total protein, whereas SOD showed reverse trend. GA was found to be higher in healthy plants (9.07µg/g) whereas auxin showed reverse trend.

Post harvest Technology

Development of banana central core stem slicer and juice extractor

In collaboration with CIAE, Regional center, Coimbatore, banana central core slicing cum dicing unit, diced banana central core fiber removing equipment, diced banana central core surface water removing unit and banana central core juice extraction unit were developed.

TRANSFER OF TECHNOLOGY

Training

More than 5800 visitors comprising banana farmers / entrepreneurs / horticultural / agricultural officers / college students visited ICAR-NRCB and they were briefed about improved production, protection technology, post harvest management and value addition of banana.

Radio talks through All India Radio, Tiruchirapalli

Name of the Scientist	Topic	Date of broadcast
K.J. Jeyabaskaran	Soil and fertilizer management in banana (Tamil)	12 April, 2014
K.N. Shiva	Importance of dehydrated banana and its marketing strategies (Tamil)	18 June, 2014

Television talks

Name of the Scientist	Topic	Date of telecast & TV
K.N. Shiva	Value added products from Banana	24 - 25 Dec., 2014, DD-Pothigai
K.N. Shiva	Production of Handicrafts from Banana Fiber	12 - 14 Jan., 2015, Puthiyathalaimurai

Exhibitions conducted / participated

Name of the Events	Organiser/ venue	Date(s)
Kissan Mela - 2014	ICAR-NRCB, Tiruchirapalli, Tamil Nadu	21 Aug., 2014
Workshop on village farmers	ICAR-NRCB and NAARM, Koppu, Tamil Nadu	3 Sep., 2014
International HORTI INTEX - 2014	TNAU and CODISSIA, Coimbatore	7 - 9 Sep., 2014
Agri Expo - 2014	Dinamalar (Tamil Daily), Thanjavur, Tamil Nadu	19-22 Dec., 2014
3 rd CII Banana Festival	CII, ICAR-NRCB & TABAGRFD, Tiruchirapalli, T.N.	20 - 21 Dec., 2014
Southern Regional Agricultural Fair - 2015	TNAU, Coimbatore, Tamil Nadu	7- 9 Jan., 2015

Exhibitions conducted / participated

Name of the Events	Organiser/ venue	Date(s)
National Agri Fest -2015	KAU and Govt. of Kerala, Kerala	20 Jan., 2015 to 3 Feb., 2015
12 th Agricultural Science Congress Expo - 2015	NDRI and NAAS, NDRI, Karnal, Haryana	3 - 6 Feb., 2015
Eastern Zone Regional Agriculture Fair - 2015	CPRI - RS, Patna, Bihar	19 - 21 Feb., 2015
National Agri Fest - 2015	Ministry of Agriculture, Govt. of Kerala, Kerala	10 - 17 Feb., 2015
National Science Day-2015	ICAR-NRCB, Tiruchirapalli, Tamil Nadu	11 Mar., 2015
National Farmer's Meet	TNAU, Regional Station, Paiyur, T.N.	14 Mar., 2015
Workshop on Banana technology	IIVR, Kushinagar, U.P.	26 Mar., 2015
TSP Programme	Manathavadi and Agali, Kerala	18-20 Mar., 2015
5 th SICCI Agri Summit- 2015	SICCI, St. John's Vestry School, Tiruchirapalli, T.N. Tamil Nadu	13-15 Mar., 2015

LIST OF TRAININGS OFFERED

On - Campus Training

Title of the training	Date	Co-ordinator
Advances in Banana Cultivation	14-17 May, 2014	V. Kumar & all scientists
Production of banana through Macropropagation	26 June, 2014	M.S. Saraswathi
Improved Production and Post harvest Management Technologies in banana, Kerala	15 July, 2014	V. Kumar & B. Padmanaban
Production of banana flour and biscuits	8-10 Sept., 2014	K.N. Shiva
Improved Production and Post Harvest Management of Banana	5 Nov., 2014	V. Kumar & B. Padmanaban
<i>MusaNet</i> Training cum Workshop on <i>Musa</i> Germplasm:	6-14 Dec., 2014	S. Uma
Production of Banana flour and flour based baby food, health drink and central core stem juice	29-31 Dec., 2014	K.N. Shiva
Production of Banana Fig	10-11 Mar., 2015	K.N. Shiva
Improved Production and Post Harvest Management of Banana	19 Feb., 2015	V. Kumar & B. Padmanaban

Off - Campus Training

Title	Period	Co-ordinator(s)
Improved production and integrated pest and disease management of Grand Naine banana	15 - 17 April, 2014	V. Kumar et. al.
Production and protection of banana landraces	19 June, 2014	S. Uma et. al.
Value addition for entrepreneurship development	22 Aug., 2014	K.N. Shiva
Production and post-harvest management, value addition and waste utilization of banana	3-6 Sept., 2014	V. Kumar & K.N. Shiva
Farmers' training programme on Macropropagation	24&25 Sept., 2014	S. Uma

Title	Period	Co-ordinator(s)
Training cum demonstration of banana fibre extraction machine and distribution of farm inputs to the tribal banana farmers	19-20 Mar., 2015 30 Mar., 2015	M.M. Mustaffa V. Kumar
Improved banana cultivation practices	31 Mar., 2015	M.M. Mustaffa & V. Kumar

LINKAGES AND COLLABORATIONS IN INDIA AND ABROAD

- ❖ Development of mechanization package for rope making from outer sheath of banana pseudostem between ICAR-CIAE & ICAR-NRCB, Tamil Nadu.
- ❖ Development of post-harvest mechanization package for banana central core between ICAR-CIAE & ICAR-NRCB.

CONSULTANCY SERVICES AND COMMERCIALIZATION OF TECHNOLOGIES

- ❖ 602 batches of tissue cultured bananas of SVS Grand Naine, Robusta and Nendran were tested for their genetic fidelity using SSR and ISSR markers under DBT – ATL project.
- ❖ Transforming Eastern India's Economies through Innovative Rural Business Hubs (RBH) in West Bengal.
- ❖ Evaluation of high yielding technology system formulations for higher productivity of banana by M/s South Asia AGRINOS India Pvt. Ltd., New Delhi.
- ❖ A total of 15373 samples were tested for the presence of virus.
- ❖ Polyclonal antiserum produced for CMV, BBrMV and BBTv was sold to tissue culture companies and also to the State agricultural universities.
- ❖ *In vitro* evaluation of bio-nematicide to root-knot nematode, *Meloidogyne incognita* with M/s. Subramanian & Co, Salem.
- ❖ Licensing of Technical know-how was transferred to three entrepreneurs A.P., T.N., and Kerala.

PUBLICATIONS

Research Papers

International

Backiyarani, S., Uma, S., Nithya, S.,

Chandrasekar, A., Saraswathi, M.S., Thangavelu, R., Mayil Vaganan, M., Sundararaju, P. and Singh, N.K. 2015. Genome-wide analysis and differential expression of chitinases in banana against root lesion nematode (*Pratylenchus coffeae*) and eumusae leaf spot (*Mycosphaerella eumusae*) pathogens. *App. Biochem. and Biotech.* DOI 10.1007/s/2010-015-1528-Z.

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Septoria leaf spot disease of banana in India. *Indian Phytopath.* **67**(4): 388-395.

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Mayil Vaganan, M., Sarumathi, S., Nandakumar, A., Ravi, I. and Mustafa, M. M. 2015. Evaluation of different protein extraction methods for banana (*Musa* spp.) root proteome analysis by two-dimensional electrophoresis. *Ind. J. Biochem. Biophys.* **52**: 101-106.

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Ravi, I., Mayil Vaganan, M. and Mustafa, M.M. 2014. Bananas grown in salt affected soil impairs fruit development in susceptible cultivars. *The Andhra Agricultural J.* **61**(3): 638 - 642.

Sajith, K.P., Uma, S., Saraswathi, M.S., Backiyarani, S. and Durai, P. 2014. Macropropagation of banana-Effect of bio-fertilizers and plant hormones *Indian J. Hort.* **71**(3): 299 - 305.

Saraswathi, M.S., Praveena, S., Uma, S., Thangavelu, R., Kannan, G., Backiyarani, S. and Arivazhagan, T. 2014. Development of an efficient micropropagation technique for *Musa* cv. Udhayam. *Indian J. Hort.* **71**(4): 452 -457.

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Books/Book Chapters

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Nandwani, D.). *Sustainable horticultural system issues technology and innovation series: Sustainable development and biodiversity*, Vol. 2 Springer International Publishing pp. 275 - 299. ISBN 978-3-319-06904-3.

Hazarika, B.N., Sankaran, M., Rema Menon, Sudha, R., Jai Prakash, Suresh Kumar, P., Shiva, K.N., Romen Singh, S. and Rabha, A. 2014. Banana. In: *Tropical and Sub tropical fruit crops: Crop improvement and varietal wealth* (Part-1) (Ed. S.N. Ghosh). Jaya Publishing House, Delhi, pp. 71 - 136.

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Extension / technical folders / reports / scientific reviews

Anuradha, C. and Mustafa, M.M. (Eds.). 2013. *e-Newsletter of ITMU*, Vol. II, Issue No. 2. ICAR-NRCB, Tiruchirapalli. p. 4.

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Padmanaban, B., Mayil Vaganan, M., Ravichamy, P., Anuradha, C. and Saraswathi, M.S. 2014. *Annual Report 2013 - 14*. ICAR-NRCB, Tiruchirapalli. p.104.

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OTHER INFORMATIONS

RAC Meeting

The 16th Research Advisory Committee meeting of

the Centre was conducted on 12 and 13 November, 2014, wherein all the members of RAC including the Chairman Dr. G. L. Kaul, Former VC, AAU, A som attended the meeting. Recommendations generated from the meeting were approved by the Council.



IRC Meeting

The 18th Institute Research Council meeting was held on 9, 13, 19 May, 2014 and 1 & 3 November, 2015 under the Chairmanship of Dr. M.M. Mustafa, Director, ICAR-NRCB. After introductory remarks by the Chairman, salient achievements for the year 2013-14 and technical programme for the year 2014-15 were presented by the scientists.



Human Resource Development

Name	Name of the programme /Venue	Period
B. Padmanaban	International training programme on pest risk analysis organized by NIPHM &US-AID, Hyderabad	1-5 Sept., 2014
	HRM, NAARM, Hyderabad	26 Feb., 2015
R. Selvarajan	Management development programme on PME of agricultural research project, NAARM, Hyderabad	4-8 Aug., 2014
I. Ravi	Management development programme on leadership development NAARM, Hyderabad	15-6 June, 2014
S. Backiyarani	Second stewardship training, QUT, Brisbane, Australia	24-27 Aug., 2014
P. Ravichamy	Capacity building programme for technical personal, IIPA, New Delhi	24-27Aug., 2014
P. Durai, N. Marimuthu & D. Ramachandramurthi	Capacity Building Programme for Technical Assistants, IIPA, New Delhi	2-13 Feb., 2015

Name	Name of the programme /Venue	Period
P. Murugan	Organization Special Programme for ICAR employees, ISTM, New Delhi	25 Aug., to 5 Sept., 2014
A.V. Suja	Organization Special Programme for ICAR employees, ISTM, New Delhi	10-11Nov.,2014
Mr. Kishor Kumar Mahanti	HRS,Dr.YSR Hort. University, Kovvur, Andhra Pradesh	1-31 March, 2015

Banana Kissan Mela- 2014

ICAR - NRCB celebrated its 21st Foundation day as “Banana Kissan Mela” with the theme on “Drought management in banana” on 21st August 2014. Thiru K. Tharpagaraj, District Collector in-charge, Tiruchirapalli was the chief guest. Around 450 banana growers, agricultural, horticultural officers, entrepreneurs participated in the Mela.



The Musa Net Workshop

The second workshop on “Musa germplasm: Identification towards optimising use” was held at the ICAR - NRCB, during 6 -12 December, 2014. The workshop was inaugurated by Dr.N.K.Krishna Kumar, DDG (Hortl. Sci.), ICAR. Participants from Burundi, Cameroon, Costa Rica, Indonesia, Nigeria, Philippines, Tahiti, Uganda, USA, Vietnam India Australia, Malaysia, Guadeloupe and Papua New Guinea attended.



National Science Day Celebration at ICAR-NRCB

National Science Day was celebrated on 11th March, 2015. This function was to create an awareness and motivation to students. Over 450 students from different schools and colleges visited.



Hindi Week Celebrations at ICAR-NRCB

‘Hindi Week’ from 24th to 29th September 2014 was celebrated at the Centre. Dr. K. Krishna Kumar, DDG (HS), ICAR graced the occasion as Chief Guest and distributed prizes to the winners of various Hindi competitions.



Swachh Bharat

As per the directions of Prime Minister, cleanliness week was observed at the ICAR- National Research Centre for Banana, Tiruchirapalli, Tamil Nadu during first week of October, 2014. On this occasion, oath was taken by the staff members of the centre to maintain cleanliness in the campus. To mark the occasion and to continue to have the cleanliness habit, staff members participated in the cleaning of office campus. The cleanliness drive was extended to farm and office quarters.



Sports Meet

A Sports Contingent of six members *viz.*, K.N. Shiva, V. Kumar, D. Ramachandramurthi, R. Pitchaimuthu,

T. Sekar and V. Selvaraj participated in six sports and games events in the ICAR Zonal Sports (South Zone) 2014 organized by IIHR during October 13-17, 2014 at Bengaluru.



Inauguration of ICAR-NRCB transgenic nethouse



Inauguration of ICAR-NRCB exhibition hall

Distinguished visitors

Name and Address	Date
Dr. S. K. Sharma, Director, ICAR-CIAH, Bikaner, Rajasthan	6 Apr., 2014
Dr. G. L. Kaul, Former VC, AAU, Asom	12 Nov., 2014
Dr. T. Janakiram, ADG (Hort.Sci.), ICAR, New Delhi	12 Nov., 2014
Dr. R. T. Patil, Former Director, CIPHET, Ludhiana, Punjab	12 Nov., 2014
Dr. S. K. Apte, Director, Bio-Science Group, BARC, Mumbai	12 Nov., 2014
Dr. R. K. Tyagi, Head, Division of Germplasm, NBPGR, New Delhi	12 Nov., 2014
Dr. N. K. Krishna Kumar, DDG (Hort. Sci.), ICAR, New Delhi	6 Dec., 2014
Dr. R. Vijayakumar, IAS, Secretary, Min. Develop. NE Regions, New Delhi	27 Feb., 2015
Dr. S. A. Patil, Former Director, IARI, New Delhi	27 Feb., 2015

STAFF NEWS

Promotion

Name	Promoted	w.e.f.
Dr. M. Mayil Vaganan, Senior Scientist	Principal Scientist	20.02.2010
Dr. K. N. Shiva, Senior Scientist	Principal Scientist	28.07.2013
Dr. S. Backiyarani, Senior Scientist	Principal Scientist	29.08.2013
Dr. M.S. Saraswathi, Senior Scientist	Principal Scientist	02.03.2014
Mrs. C. Sagayam Jacqueline, Senior Technical Assistant	Technical Officer	01.01.2013
Mr. R. Pitchaimuthu, Technical Assistant	Senior Technical Assistant	01.01.2013
Mr. N. Marimuthu, Technical Assistant	Senior Technical Assistant	01.01.2013
Mr. K. Kamaraju, Technical Assistant	Senior Technical Assistant	10.03.2013

Mr. Kishor Kumar Mahanti (Scientist -Fruit Science) joined on 13.10.2014 and Dr. P. Giribabu (Scientist-Nematology) transferred from ICAR - IIOR, Hyderabad joined on 01.12.2014

Mr. M. Krishnan (Administrative Officer) superannuated on 30.04.2014 and Mr. A. Subramanian (Technical Assistant-Driver) superannuated on 31.12.2014



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