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International Conference on 'Low Temperature Science and Biotechnological Advances'



Release of Book of Abstracts during the inaugural session by Drs K.C. Bansal, J.S. Sandhu, R.B. Singh, S. Ayyappan, M. Lambardi, H. Pritchard and R. Chaudhury (left to right)

An International Conference on 'Low Temperature Science and Biotechnological Advances' was organized by ICAR-NBPGR, New Delhi, from April 27-30, 2015 at the National Agricultural Science Centre (NASC), New Delhi. This was held in collaboration with National Academy of Agricultural Sciences (NAAS), India, Society for Low Temperature Biology (SLTB), United Kingdom (UK) and Royal Botanic Gardens (RBG), Kew, UK. The event focused on low and ultra-low temperature biobanking of genetic resources, especially using cryopreservation. In his inaugural address, Dr Ayyappan, Secretary, DARE & DG, ICAR said that the conference was an unique opportunity to bring together research leaders of diverse disciplines working on crops, veterinary biology, aquatic species, microbial biotechnology and medical sciences to assess the current status and to formulate future plans on low temperature science and biotechnology in various countries. Dr Maurizio Lambardi from National Research Council of Italy, who is the immediate past chair of SLTB, co-chaired the inaugural session. Prof. R.B. Singh, immediate past president, NAAS and Dr J.S. Sandhu (DDG, Crop Science) gave their remarks as Guests of Honour. Prof. Hugh Pritchard, Head, Seed Biology, RBG, Kew delivered the inaugural lecture entitled 'Plant Cryopreservation: Scale, Scope and Hope'. Prof. Pritchard highlighted the importance and need of seed banking through global partnership. Dr. K.C. Bansal, Director, NBPGR and Organizing Secretary, extended a warm welcome and thanked the delegates for their participation. The plenary session was chaired by Dr R.S. Paroda, Chairman, Trust for Advancement of Agricultural Sciences (TAAS), New Delhi. The conference was attended by 200 delegates, including 25 international participants, who made 47 oral and 89 poster presentations.

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PGR ACTIVITIES

New Plant Records



Flowering plant and fruit (inset) of *Thladiantha cordifolia*

***Thladiantha cordifolia* (Blume) Cogn.** - A wild bitter gourd, explored from Similipal Biosphere Reserve, Odisha was found to be a new record for Central India and first report to be used as fruit vegetable in India. This species was recorded earlier from Eastern India. The climber was found growing luxuriantly in dense semi-evergreen forests near a stream course inside the core zone of Similipal Biosphere Reserve, Odisha. The local inhabitants of 'Kolha' and 'Khadia' tribes consume the unripe fruits [locally called 'Buru kirla', 'Buru'=forest, 'Kirla'=bitter gourd] as vegetable and take as food along with day meal. The collected type specimens have been preserved in the National Herbarium of Cultivated Plants (NHCP), ICAR-NBPGR, New Delhi. (Mishra RC and Sahoo HK 2014. *Vegetos* 27: 274-278).

***Ocimum kilimandscaricum* Guerke** (Lamiaceae) was discovered from Dhenkanal and Khurda districts of Odisha and its wild occurrence was found to be a new species record for Peninsular India. This species is a native of Kilimanjaro, Kenya, and was recorded earlier from Uttarakhand and not reported elsewhere as natural born in India. Local tribals use the dry leaves/leaf powder for storage of rice grains, pulses and other food stuff for not only against the attack of pests but also to provide aromatic flavor to remove the pungent smell of storage, particularly during rainy season. The burnt leaf-smoke is also diffused in their huts to ward-off insects and mosquitoes. They consume juice of fresh leaves along with black pepper for curing flu, fever and bronchial asthma. Collected type specimens have been preserved as herbarium materials and seed germplasm (IC599299 and IC599345) have been conserved in the National Genebank (NGB), ICAR-NBPGR, New Delhi (Misra RC and Das G 2015. *Proc. Natl. Acad. Sci., India, Sect. B: Biol. Sci.*, DOI 10.1007/s40011-015-0526-9).



Flowering plant of *Ocimum kilimandscaricum*

Exploration and Germplasm Collecting

Collecting drought/terminal heat tolerant wheat germplasm from Rajasthan

An exploration was undertaken by ICAR-NBPGR, New Delhi, in collaboration with Maharana Pratap University of Agriculture and Technology, Agricultural Research Station, Banswara, to collect drought/terminal heat tolerant wheat from parts of Rajasthan under the NICRA project. A total of 21 samples of wheat were collected from three tribal

dominated districts namely Dungarpur, Banswara and Pratapgarh. Variability was collected for grain types (red and yellow), panicle size and panicle orientation. Terminal heat tolerant local germplasm is known in different places under various names : *Peshu*, *Davadkani*, *Indorikotiya*, *Wazia*, *Chapidya*, *Doraiya*, *Tukdi*, *Daula* and *Hiruma*. The farmers informed that exceptional quality of *roti* is made out of its flour due to climate resilient nature, hence they are still grown in selected localities.



Collecting drought/ terminal heat tolerant wheat occurring as an off type in C-370 wheat fields

Collecting *Brassica* germplasm from Rajasthan

An exploration for collecting mustard germplasm was undertaken by ICAR-NBPGR Regional Station (RS), Bhowali, in collaboration with Directorate of Rapeseed and Mustard Research, Bharatpur, Rajasthan, during May 18-23, 2015. A total of 35 samples of *Brassica juncea* var. *rugosa* (6), *B. nigra* (9), *B. juncea* (10) and *B. rapa* (10) were collected.



Collecting mustard germplasm from local farmers



Variability of walnut kernels

Walnut germplasm collecting from Jammu and Kashmir

The state of Jammu & Kashmir accounts for more than 98% of total walnut (*Juglans regia*)

production in India. Tremendous variability in nut characteristics exists in the state. NBPGR, RS, Srinagar has amassed good walnut diversity from the districts of Budgam, Anantnag, Pulwama and Kishtwar. Attempts are being made to maintain this diversity at the station in its field genebank.

Germplasm Exchange

Import

A total of 9,783 accessions of various crops (trial material-714, germplasm-9,069) were introduced from 27 countries.

Promising Introductions

Rice (EC846059-64) Philippines: Submergence, Lowland

Rice (EC846750-64) China: Disease tolerance

Rice (EC846765-81) China: Shattering tolerance

Rice (EC846782-801) China: Lodging tolerance

Rice (EC846802-19) China: Good grain quality

Rice (EC846820-37) China: Drought tolerance

Rice (EC846838-48) China: Good cooking quality

Rice (EC846849-61) China: Insect tolerance

Rice (EC848427-41) Philippines: Drought tolerance

Rice (EC848596-622) Philippines: Submergence tolerance

Rice (EC850074-83) Brazil: Insect tolerance

Rice (EC850084-93) Brazil: Grain quality

Rice (EC850094-103) Brazil: Lodging tolerance

Rice (EC850104-108) China: Disease tolerance

Rice (EC850109-114) China: Shattering tolerance

Rice (EC850115-125) China: Lodging tolerance

Rice (EC850126-143) China: Grain quality

Rice (EC850144-160) China: Drought tolerance

Rice (EC850161-848) China: Good cooking quality

Plant Quarantine

A total of 14,227 samples of imported material were processed for quarantine clearance. A total of 137 samples were found infested/infected/contaminated, of which 43 were rejected and incinerated. Prophylactic treatments included pesticidal dip/spray treatment (149), hot water treatment to paddy (11,118) and tri-sodium phosphate (410). Interceptions made in imported samples comprised *Tilletia barclayana* on *Oryza sativa* (from China) and *Aphelenchoides besseyi* on *Oryza sativa* (from Philippines).

Number of indigenously collected/multiplied accessions processed for seed health testing for conservation in genebank were 5,446 of which 335 samples were X-rayed, and 140 were found infected/infested/contaminated. A total of eight samples were rejected and released for MTS, while 5,438 samples were sent to LTS.

Post-entry quarantine inspections (PEQI) undertaken:

IQ No.	Crop (no. of inspection)	Site of PEQI (date of samples)
275/2009 29/2010	Citrus (4)	ICAR-Central & Citrus Research Institute, Nagpur (7-8 April, 2015)
15/2015	Apple (20)	ICAR-CITH, Srinagar, Jammu & Kashmir (29-30 June, 2015)

Quarantine at ICAR-NBPGR, RS, Hyderabad

Samples of import (8,927) and export (12,971) germplasm were processed from quarantine point of view. Import germplasm consisting of paddy, wheat, maize, sorghum, blackgram, chickpea, groundnut, sunflower, soybean, *Brassica napa*, bitter gourd, bottle gourd, ridge gourd, tomato, brinjal, watermelon, *Cucumis* sp. and tobacco were received from different countries. Import germplasm (2,231 samples) was released to the consignees after necessary mandatory treatments. In all, 43 samples were not released of which two sunflower samples from USA were infected with downy mildew pathogen; soybean samples from Costa Rica and USA with downy mildew incidence (12) and seed borne viruses

(19) were rejected. Soybean seed borne viruses were detected at ICAR-NBPGR, New Delhi. Remaining 10 soybean samples did not produce any seed. In all, four Phytosanitary certificates were issued.

During processing, downy mildew pathogen, *Plasmopara halstedii*, and leaf spot pathogen, *Myrothecium roridum* on sunflower from USA; *Peronospora manshurica*, a quarantine pest on soybean from Costa Rica and USA; *Pseudoperonospora cubensis* and *Choanephora* sp. on bitter gourd from Thailand, *Alternaria brassicicola* on *Brassica rapa* from UK and mites on maize from Brazil were intercepted.

Germplasm Characterization and Evaluation

Characterization of vegetable crops at ICAR-NBPGR, RS, Thrissur

Ivy gourd (*Coccinia grandis*)



Fruit variability in ivy gourd

Eight accessions were characterised for fruit characters. Fruit length varied from 5.5 - 10.0 cm at vegetable stage and single fruit weight from 9.0-23.6 g. Accession JPM/14-09 (IC612310) was the best yielder with an average single fruit weight of 9.8 g and fruit length of 6.0 cm, giving a fruit yield of 15.78 kg/plant during 45 days harvesting period.

Brinjal (*Solanum melongena*)

Seventy-two accessions of brinjal were raised in augmented block design along with two check varieties for screening against bacterial wilt and shoot and stem borer attack. Thirteen accessions, EC304983-1, EC316227, EC379244, IC089888, IC090931, IC112830, IC333527, IC345747, IC354140, IC354707, IC383195, IC545919 and NIC023962 were found to be field tolerant to both the diseases.

Kokum (*Garcinia indica*)



Accession IC136687-3 of *Garcinia indica*

Among the 31 accessions of kokum that came to fruiting this year, IC136682-2 and IC136687-3 were sweet types with TSS 16% and 20%, respectively, compared to the normal types with 12%. Accession IC136687-3 can be popularised for direct use as a table fruit.

Evaluation of germplasm in FGB at Ranchi



Jackfruit germplasm with heavy fruit bearing

The field genebank (FGB) at ICAR-NBPGR RS, Ranchi, has a rich collection of germplasm of horticultural crops. These include accessions of *Artocarpus* spp. (314), *Aegle marmelos* (170), *Syzygium* spp. (52), *Tamarindus indica* (51) *Musa* spp. (34), *Lawsonia inermis* (25), *Mangifera indica* (19), *Phyllanthus emblica* (19) and *Moringa* sp. (14). Systematic recording of characterization data has been initiated, especially in jackfruit variability.

Evaluation of fruit tree germplasm

A total of 75 accessions of apricot (20), plum (23) and peach (32) were characterized and evaluated at ICAR-NBPGR, RS, Shimla. In apricot, EC539004, IC584510 and EC552702 were found superior for fruit weight and high TSS. In plum, IC20085, EC117604 and Shiro were found superior for early maturity, high TSS, fruit juiciness. In peach, EC280769, EC38737 and summer glow were found to have superior fruit size, fruit weight and high TSS.



Plum accession Shiro superior for early maturity, high TSS, fruit juiciness



Fruits of peach (summer glow) with superior size, weight and high TSS

Characterization and evaluation of germplasm at Delhi

Germplasm comprising 946 accessions of lentil (745), tomato (60) and wheat (141) were characterized for various agronomic traits and terminal tolerance in wheat at ICAR-NBPGR, New Delhi. Wide range of genetic variability was recorded and trait-specific promising lines were identified. In lentil, lines for early flowering (≤ 69 days) were IC560117, IC560331, IC560332; no. of pods/plant (≥ 62) were IC560181, IC560182, EC223207 and no. of clusters/plant (≥ 28) were IC560182, IC560181, IC559744, IC560206. In tomato, EC68654 and

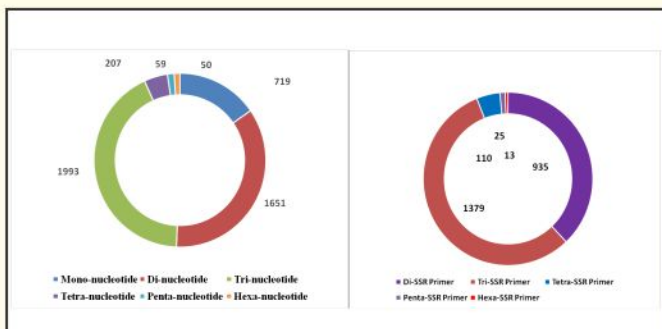
EC631962 for TSS (>8°B); EC659270 and EC654703 for large fruit size (>50 g); IC528094, EC686554 for red and EC610651 for yellow cherry were found promising.

In wheat, IC316091 showed terminal heat tolerance based on early maturity and chlorophyll content index; IC543360 for chlorophyll content index and membrane stability index and IC252625 for relative water content and membrane stability index. Under quality evaluation, 50 wheat accessions were analyzed for moisture content (11.9-13.3%), hectoliter weight (70-84 kg/hl), sedimentation value (31-64) and gluten content (22.7-47.2%). Falling number values indicating alpha-amylase activity were also determined and no activity was observed among the analyzed accessions.

Genomic Resources and PGR Informatics

Microsatellite database for *Tinospora cordifolia* and *Andrographis paniculata*

Microsatellites, also known as simple sequence repeats (SSRs) or simple tandem repeats (STRs) have been extensively exploited as molecular markers for diversity analyses, DNA fingerprinting, marker assisted selection (MAS), including candidate gene determination. Recently, gene-based SSRs (EST-SSR) application in understanding gene regulation and genome evolution has been extensively studied. Considering SSRs wide application, TcMDB (*Tinospora cordifolia* Microsatellite Database) and ApMDB (*Andrographis paniculata* Microsatellite Database) have been developed. Both are user-friendly web-based relational database of microsatellites generated from entire transcriptome.



Distribution of predicted SSRs in *Andrographis paniculata* (A) and *Tinospora cordifolia* (B) in the database for different repeat classes

Gene cloning and allele mining

Oleate desaturase (*FAD2*) also known as delta-12 desaturase is responsible for catalyzing conversion of oleic acids into linoleic acids and thus is an important regulatory gene for maintaining the overall composition of PUFAs (polyunsaturated fatty acids) in seed oil. The complete coding sequence (CDS) of *FAD2* gene was amplified from thirty centrally released Indian mustard (*Brassica juncea*) varieties using gene-specific primers with the objective of digitizing each variety with unique signature sequence. The amplified product of expected size (~1.1 Kb) was gel-purified and subjected to TA cloning. The identity of cloned *FAD2* fragment was further verified by using vector-borne primers. The preliminary analyses indicated presence of two haplotypes belonging to A and B genome of *Brassica rapa* and *B. nigra* species, respectively, in mustard varieties.

Decision Support System Software

For processing and validating the ICRISAT exports with respect to the status of 'FAO designation' and 'Indian origin', a Decision Support System has been developed at the ICAR-NBPGR, RS, Hyderabad. The program has inbuilt database of 1,13,841 FAO designated accessions (sorghum-36,771; pearl millet-21,563; chickpea-17,124; pigeonpea-13,389; groundnut-14,803; finger millet -5,949; foxtail millet - 1,535; proso millet-835; little millet -462; kodo millet- 656; barnyard millet-743) and 44,787 accessions of Indian origin (sorghum-14,602; pearl millet-7,189; chickpea-7,488; pigeonpea-5,988; groundnut-6,060; finger millet-1,151; foxtail millet-980; proso millet- 65; little millet-385; kodo millet-491; barnyard millet-388). The program verifies the status of a given accession and gives results such as 'FAO designated' or 'Non designated' and 'Indian Origin' or 'Non-Indian



Homepage of the Software Decision Support System

PGR FOR FARMERS AND USE



Distribution of seedlings of sweet gourd and spine gourd at Maniyankinar tribal hamlet, Peechi

On-Farm Conservation

About 100 seedlings of sweet gourd (*Momordica cochinchinensis*) and 50 of spine gourd (*M. dioica*) were distributed by ICAR-NBPGR, RS, Thrissur to the tribal farmers of Maniyankinar tribal village, Panachery Panchayat in the Peechi Reserve Forest area of Thrissur district. They were given adequate information regarding planting, cultural practices and nutritional aspects of these crops.

Farmers' Meet

A Farmers' Meet was organized by the ICAR-NBPGR, RS, Thrissur in association with Krishi Bhavan, Porathissery and Agricultural Technology Management Agency (ATMA), Thrissur on 30 May 2015 at Porathissery, Irinjalakkuda in Thrissur District. In addition to a



Interaction with farmers at Porathissery, Irinjalakkuda

detailed audio-visual presentation, the farmers had an hour-long interaction with ICAR-NBPGR, RS, Thrissur scientists and 100 seedlings of spine gourd (*Momordica dioica*) were distributed among them.

Agrobiodiversity Exhibition

Staff of ICAR-NBPGR, RS, Hyderabad, participated in the International Day for Biological diversity (IDB) celebrations hosted by the Telangana State Biodiversity Board on May 22, 2015 and organized an agrobiodiversity exhibition stall from NBPGR. The objective was to create awareness among children, students, local community, departments and institutions for conservation of biological diversity, sustainable utilization of biodiversity and fair and equitable benefit sharing for utilization of biological resources.

Germplasm Registration

The XXXI Plant Germplasm Registration Committee (PGRC) meeting was held at ICAR-NBPGR, New Delhi on April 21, 2015 under the Chairmanship of Dr J.S. Chauhan, ADG (Seed), ICAR, New Delhi. In this meeting, a total of 65 proposals (53 new and 12 revised) were considered for registration. Finally, 13 (9 new and 4 revised) proposals belonging to 9 species were approved for registration. Some notable registered germplasm were: rice for resistance to leaf and neck blast; barley with high antioxidant activity and garden pea with triple pods at every node.



Garden pea (*Pisum sativum*) germplasm (IC610501; INGR15009) with triple pod at every node

PERSONNEL NEWS

Appointments

Dr J.C. Rana, joined as Head, Division of Germplasm Evaluation, ICAR-NBPGR, New Delhi, w.e.f. April 6, 2015.

Ms Sushmita, jointed as Scientist, ICAR-NBPGR, New Delhi w.e.f. April 9, 2015.

Deputations Abroad

Dr Gurinderjit Randhawa, Principal Scientist, Division of Genomic Resources (DGR), ICAR-NBPGR, New Delhi, was invited by Secretariat of Convention on Biological Diversity (CBD) and United Nations Environment Programme (UNEP), Montreal, as a resource person to participate in workshop on 'Network of Laboratories for the Detection and Identification of Living Modified Organisms (LMOs)' at Ispra, Italy from 9-11 June, 2015. She made a presentation on 'Current Status of GMO Detection in India and Asian Region', and also Chaired a session for designing the outline for capacity-building workshops on the detection and identification of LMOs.

Dr Amit Kumar Singh, Scientist, DGR, ICAR-NBPGR, New Delhi, is on deputation from August 2015 to January 2016, to pursue post doctoral research in the area of advanced genomics at University of Queensland, Australia under Endeavor Research Fellowship, 2015, awarded by Government of Australia.

Dr Pratibha Brahmi Principal Scientist and Officer-in-Charge, Germplasm Exchange Unit, ICAR-NBPGR, New Delhi, participated as Country Representative in the Final Meeting of the FAO project on 'Enhancing the Understanding and Implementation of the ITPGRFA' organized by FAO Regional Office, Bangkok, Thailand from April 22-25, 2015. A country report on implementation of the ITPGRFA in India and the status of PGRFA management in India was presented during the meeting.

Transfers

Dr Kuttubhddvi Ali Mola, Scientist, Division of Genomic Resources, ICAR-NBPGR, New Delhi

transferred to Central Rice Research Institute, Cuttack on May 2, 2015.

Dr. A. K. Trivedi, Senior Scientist, ICAR-NBPGR, RS Bhowali, transferred to Central Institute of Subtropical Horticulture, Lucknow on July 17, 2015.

Retirements

Mr Rameshwar Dayal, LDC, ICAR-NBPGR, New Delhi superannuated on May 31, 2015.

Mr Chander Shekher Rai, SSS, ICAR-NBPGR, New Delhi superannuated on June 31, 2015.

Death

Mrs V. S. Rugmini, SSS, ICAR-NBPGR, RS, Thrissur expired on April 16, 2015.

Trainings Attended

Dr Jameel Akhtar, Senior Scientist, Division of Plant Quarantine, ICAR-NBPGR, New Delhi, attended online training course under Global Taxonomy Initiative of CBD on 'DNA Barcoding' organized by Ontario Institute of Biodiversity, University of Guelph, Canada from March 2 to April 28, 2015.

Dr A. Kandan, Senior Scientist, Division of Plant Quarantine, ICAR-NBPGR, New Delhi, attended training on 'RNA-interference as a tool for Plant Functional Genomics and Crop Improvement', organized by ICAR-NRCPB, New Delhi, May 6-26, 2015.

Mr Pardeep Kumar Division of Plant Quarantine, ICAR-NBPGR, New Delhi, attended International training on 'Quarantine Pest: Detection and Identification' organized by National Institute of Plant Health Management, Hyderabad, April 8-28, 2015.

Visitors

Dr N.K. Krishna Kumar, DDG (Hort. Sci.), ICAR visited the NBPGR, RS, Bhowali on May 9, 2015.

