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## 39<sup>th</sup> Foundation Day of ICAR-NBPGR Celebrated

ICAR-NBPGR celebrated its 39<sup>th</sup> Foundation Day on August 5, 2015. On this occasion, 3<sup>rd</sup> Harbhajan Singh Memorial Lecture was delivered by the Chief Guest, Professor Deepak Pental, Director, Centre for Genetic Manipulation of Crop Plants, Department of Genetics, South Campus, University of Delhi, Delhi entitled "Agriculture, Political Order and Germplasm". Dr. J.S. Chauhan, ADG (Seed), ICAR was the Guest of Honour. The dignitaries distributed various awards. A cultural programme was also organized by the students, staff and their children.



Dignitaries on the dais



Professor Deepak Pental delivering the lecture



Dr J.S. Chauhan presenting a memento to Professor Deepak Pental in the presence of Dr K.C. Bansal, Director, ICAR-NBPGR



Performance by children of NBPGR staff during the cultural programme

# PGR ACTIVITIES

## Exploration and Germplasm Collecting

### Seed spices from Jammu & Kashmir

ICAR-NBPGR Regional Station (RS) conducted an exploration and germplasm collecting programme in collaboration with National Research Center on Seed Spices, Ajmer (June and July, 2015) for seed spices from very remote areas of Jammu & Kashmir. A total of 28 samples of *Bunium persicum*, *Carum carvi*, *Coriandrum sativum*, *Trachyspermum ammi* and *Trigonella foenum-graecum* were collected.



***Bunium persicum* and *Carum carvi*  
collected from Jammu & Kashmir**

## Germplasm Exchange

### Import

A total of 11,043 accessions of various crops were imported from 14 countries. Some of the trait-specific promising introductions are given below:

Rice (EC852391-97), USA: Insect tolerant

Rice (EC852398-405), USA: Drought tolerant

Rice (EC852406-16), (EC852428-35), USA: Lodging tolerant

Rice (EC852417-27) (EC852436-42), USA: Excellent grain and cooking quality

Rice (EC859056), Philippines: Cold tolerant

Rice (EC859057-58), Philippines: Iron toxicity tolerant

### Export

FAO designated accessions and breeding material developed from FAO designated accessions of chickpea (65), pigeon pea (31), sorghum (22) and pearl millet (52) exported to Kenya after approval from Department of Agriculture, Cooperation and

Farmers Welfare, Ministry of Agriculture and Farmers Welfare.

## Plant Quarantine

At ICAR-NBPGR, New Delhi, a total of 16,778 samples of imported germplasm samples including transgenic samples as well as trial material of various crops and their wild relatives were processed for quarantine clearance (1486 samples were subjected to X-ray radiography). Of these, 565 samples were found infested/ infected comprising insects (370), fungi/ bacteria (121) and nematodes (74) and 474 samples were salvaged through physico-chemical methods viz., fumigation, X-ray radiography, hot water treatment, pesticidal treatment, mechanical cleaning and growing-on test. A total of 91 samples of were rejected due to *Tilletia barclayana* and *Fusarium solani*. A total of 7,886 samples were received from Division of Germplasm Conservation for seed health testing, of which 203 samples were infested with insects, 124 samples infected with fungi and 37 samples infected with nematodes. A total of 27 samples were rejected as they could not be salvaged. Three post-entry quarantine inspections (PEQI) were undertaken during July to September.

At ICAR-NBPGR, RS, Hyderabad, a total of 9,532 samples comprising 9,501 of import and 31 of export germplasm were processed for quarantine clearance. Import germplasm consisting of paddy, maize, barley, sorghum, mung bean, sunflower, cauliflower, cabbage, bitter melon, tomato, watermelon, and tobacco were received from various countries. Amongst the imported germplasm, 5,232 samples were infected/infested and 100% could be salvaged. In all, 13,073 accessions of imported germplasm were released to the consignees after mandatory treatments. Two Phytosanitary Certificates were issued. The quarantine service was provided to 22 institutions (public 3; private 15; AVRDC, CIMMYT, ICRISAT and IRRI). Some important interceptions made during quarantine processing are as follows:



***Myrothecium roridum* infection on sorghum seed from Argentina; colonies on seed, sporodochium with phialides and conidial mass (from left to right)**



**Anthracnose (*Colletotrichum graminicola*) infection on sorghum seed from Argentina; Orange colonies on seed, single acervulus and conidia with setae (left to right)**

Crop	Interception	Source Country
Sorghum	<i>Colletotrichum graminicola</i> , <i>Myrothecium roridum</i> <i>Drechslera setariae</i>	Argentina
Sorghum	<i>Sporisorium cruentum</i>	Niger
Bottle gourd	<i>Pseudoperonospora cubensis</i>	USA
Maize	<i>Rhizoctonia solani</i>	Mexico
Maize	<i>Lasiodiplodia maydis</i> , <i>Rhizopertha dominica</i> , <i>Stenocarpella maydis</i> , <i>Sitophilus zeamais</i>	Thailand
Paddy	<i>Sitophilus oryzae</i> , <i>S. zeamais</i>	Philippine
Maize	<i>Corcyra cephalonica</i> and <i>Tribolium castaneum</i>	Nigeria

### Germplasm Characterization and Evaluation

#### Crop evaluation and multiplication at Akola

At ICAR-NBPGR, RS, Akola, morpho-agronomic traits of horse gram and sesame germplasm were recorded. Fifty-five accessions of *Abelmoschus tuberculatus* germplasm were characterized for 13 agro-morphological traits and screened for YVMV. Regeneration/ multiplication of 1,539 accessions of sesame (504), foxtail millet (289), niger (583), kodo millet (113) and winged bean (50) was carried out. *Cucumis sativus* var. *hardwickii* is a wild progenitor of cucumber of Indian origin. A recently collected accession IC614594 (ND/DC-16) was identified as



**Fruiting plant (left) and cross-section of a fruit (right) of *Cucumis sativus* var. *hardwickii* accession IC614594**

a promising for fruit length and weight. It was originally collected from Kumbawe, Dapoli, Ratnagiri, Maharashtra.

#### Field crops evaluation at Delhi

At ICAR-NBPGR, Delhi, 3,731 accessions of germplasm comprising maize (470), finger millet



**Characterization and preliminary evaluation of bottle gourd (220 accessions) at Issapur Farm, ICAR-NBPGR**

(1,052), pulses (1,309), vegetables (796), medicinal and aromatic plants (82) and crop wild relatives (22) were grown for characterization and evaluation for agronomic traits.



**Characterization and preliminary evaluation of 1,052 accessions of finger millet at New Area Farm, ICAR-NBPGR**

Under biotic stresses, 725 accessions of cultivated okra and 21 accessions of three wild species were screened for *Yellow Vein Mosaic Virus* resistance under field conditions. In blackgram 327 accessions were evaluated against *Mungbean Yellow Mosaic Virus* and *Urdbean Leaf Crinkle Virus*. Accessions IPU 2K-22, IPU 99-219, IPU 2-H-21, IPU 99-16, IPU



**Screening of 845 accessions of cowpea germplasm against *Cowpea mosaic virus* at Issapur Farm, ICAR-NBPGR**

99-31, IPU 99-229 exhibited field resistance. Wide range of genetic diversity for agronomic traits such as growth habit, flowering time, pod length, seeds/pod and also for tolerance to *Cowpea mosaic virus* was observed in the core set of 845 accessions.

### Crops raised at Hyderabad

At ICAR-NBPGR, RS, Hyderabad, 30 accessions of *Vigna trilobata* were sown in RBD as part of the multi-location trials under the All India Co-ordinated Research Network on Potential Crops. In addition, accessions of brown top millet (28), small millets (100) and chilli (81) were sown for characterization and evaluation along with appropriate check varieties. Besides this, farmers' varieties and promising accessions comprising maize (33), sorghum (10), black gram (4) and green gram (7) were also sown for multiplication. Harvesting of 84 accessions of green gram sown earlier was completed.

### Synthetic hybrids of *Abelmoschus* species

At ICAR-NBPGR, RS, Thrissur, 13 combinations of *Abelmoschus* synthetic amphidiploids with okra as maternal parent were raised for stabilizing the genotypes. While all the cultivated okra germplasm including check varieties Pusa Sawani, Salkeerthi and Arka Anamika were highly susceptible to YVMV, some of the wild species *A. angulosus* var. *grandiflorus* and *A. mizoramensis* (sp. nova) showed high level of field resistance. CF<sub>2</sub> generations of *A. cailliei* x *A. angulosus* var. *grandiflorus* and *A. esculentus* x *A. angulosus* var. *grandiflorus* were highly field resistant. Progenies of *A. cailliei* x *A. mizoramensis* (sp. nova), *A. esculentus* x *A. mizoramensis* (sp. nova) and *A. esculentus* x *A. tetraphyllus* var. *tetraphyllus* showed very low incidence of YVMV. Even though



CF<sub>2</sub> progeny of cross *A. esculentus* x *A. mizoramensis* with more than 25 fruits/plant (left)

CF<sub>2</sub> progeny of cross *A. esculentus* x *Abelmoschus* sp. nova showing prolificacy (right)

susceptible to YVMV, *A. esculentus* x *Abelmoschus* sp. nova (Dehradun) and *A. esculentus* x *A. mizoramensis* showed prolificacy with over 25 fruits/plant. While majority of F<sub>2</sub> populations showed pungent hairs on fruit surface, few segregants of *A. esculentus* x *A. angulosus* showed smooth pod shape nearly resembling okra and a fruit length of 10 cm. Progenies of *A. esculentus* x *A. angulosus* var. *grandiflorus* segregated for photoperiod sensitivity with majority of plants inheriting late flowering habit of *A. angulosus* var. *grandiflorus*.

### Temperate fruits characterization

At ICAR-NBPGR, RS, Shimla, accessions of pear (24) and apple (49) were characterized and evaluated. In pear, IC558066, EC552671, IC20821,



Apple accession EC38729, superior for high TSS, fruit weight

IC20108 were found superior for high TSS, fruit pressure and fruit weight. In apple, EC38683, EC38729, EC145094, EC38683 and IC349911 were found superior for high TSS, fruit weight.

### Morphological variant in *Garcinia* species

In the field germplasm collection of *Garcinia* at NBPGR, RS, Thrissur, a morphological variant was



A variant from *Garcinia* germplasm identified as *Garcinia kydia*

identified as *Garcinia kydia* Roxb. It is characterised by sweet pulp akin to mangosteen and the TSS recorded was 18%. The rind is sour like Malabar tamarind. Thus, it can be popularised as dual purpose fruit/spice.

In agriculture crops, amaranth EC289376, EC328891, EC289381, EC289396, EC289398 showed early maturity, high shattering and long inflorescence while in chenopod IC341713, IC7959, IC7960, NIC22492 showed plant height, leaf length and inflorescence length. In kidney bean WB161, EC755514, SRS13482 showed early maturity, with more no of pod/plant and seed/pod. In adzuki bean EC87896, IC24522, IC108854 found superior for early maturity, pod/plant.

## Genomic Resources and Bioinformatics

### Genomic resource generation

Microsatellite markers identified in moth bean were tested for their transferability to mungbean. Following screening of 257 SSR primer combinations from moth bean, 39 primers were observed to be polymorphic. The genetic diversity analysis revealed that among the 15 groups of cultivars from 15 different states, the average Nei's gene diversity ( $h$ ) was 0.389 and Shannon information index was highest for varieties from Telangana. The results demonstrate the utility of new markers developed in cultivar identification, genetic diversity analyses and gene tagging in this important pulse crop.

In *Trichosanthes*, screening of novel 55 SSR primer pairs with snake gourd cultivars resulted in identification of 22 polymorphic markers which are likely to be useful in cultivar identification and genetic diversity analysis. In bottle gourd, 96 accessions were DNA profiled for validation with additional 37 SSR markers developed earlier. In *Luffa*, sequences of DNA barcoding loci ITS, rbcL, matK, trnH-psb A spacer for three accessions *Luffa graveolens* and two accessions of *L. echinata* were generated to establish barcoding loci with species identity.

### DNA fingerprinting and cultivar identification

The cotton hybrid SVHH-139 along with its parents SVGCA-02 (male) and SVGCA-40 (female) was DNA profiled using 23 microsatellite markers which generated 55 alleles for comparison. The sponge gourd lines DSG-6 and DSG-7, along with eight other varieties (as a reference set) were DNA profiled using two SSR primer pairs, three SRAP primer pairs, five ISSR primers and eight SCOT primers. DNA profiling of 18 safflower accessions that includes released cultivar, parental lines and

genetic stocks were conducted by using 10 polymorphic genomic SSR markers.

### Gene isolation and characterization/ expression analyses

Molecular characterization of CDPK gene family identified in pigeonpea was completed. The full length coding sequence of fatty acid elongase 1 gene from 15 released varieties of Indian mustard (*Brassica juncea*) were cloned in T/A vector. Full length of DREB2a gene sequenced from 10 lines of rice. Additionally, identified and analysed 78 miRNA from rice wild relatives. Characterization of zinc responsive genes in *Zea mays* by RNAseq led to identification of 50 SNP/Indel from the transcriptome data of maize.

### GMO testing

Real-time PCR experiments for Brazil Proficiency Program were conducted and results submitted. Real-time PCR experiments for proficiency testing (organized by European Commission-Joint Research Centre) have been completed (as a part of GM detection lab, the experiments are conducted by different operators in replicates) and final results were submitted. Multiplex PCR assay (5-plex) targeting commonly employed transgenic elements for screening >90% of globally commercialized GM maize events have been determined and experiments on determining the practical utility is in progress.

## Technology Transfer

ICAR-NBPGR signed a Memorandum of Agreement (MoA) with M/s DSS Imagetech Private Ltd., Delhi, facilitated by Agrinnovate India Ltd. (AgIn) on August 19, 2015, on non-exclusive basis at a total cost of fifteen lakhs, for transfer of five DNA-based GMO screening technologies. These technologies provide efficient GMO screening tools to check the GM status of a sample, irrespective of GM crop/trait, in a rapid, cost-efficient way. Visual and real-time LAMP technologies, when combined with fast DNA extraction method, would facilitate on-site GMO screening in farmer's fields and at ports of entry. The commercialization of these technologies in the form of user-friendly kits would help in building the confidence of consumers, assisting in post-release monitoring of GM crops and solving legal disputes, if any.

## TRAINING PROGRAMMES, FIELD DAYS AND MEETINGS

### Short Course on Crop Wild Relatives



Faculty and participants of the Short Course on CWR

A short course entitled 'Crop Wild Relatives (CWR): Identification, Collecting and Utilization' was organized at ICAR-NBPGR, New Delhi from 19-28 August, 2015. It was attended by 17 participants drawn from six disciplines (Economic Botany, Genetics, Fruit Science, Floriculture, Plant Breeding, Seed Technology) representing 12 ICAR institutes and 5 SAUs from 12 states of India. A total of 28 lectures and practicals were conducted. All aspects of PGR management (systematic, survey, collecting, characterization, evaluation, conservation, documentation, utilization) in relation to CWR were covered. Trainees were given field experience on on-spot identification and germplasm collecting of CWR.

### Training Programme and Workshop on Basil

A day's training programme and workshop was conducted at ICAR-NBPGR, RS, Bhowali, on September 4, 2015, sponsored by Integrated Eco-Development Research Project (IERP). G.B. Pant Institute of Himalayan Environment and Development (GBPIHED) Kosi-Katarmal, Almora. Dr R.C Sundriyal, Group Head, Rural Technology, GBPIHED a noted environmentalist was the Chief Guest. Lectures on different aspects on basil were delivered by well-known Agricultural Scientist, Botanist, Pharmacologist and Technicians. These included Indigenous Traditional Knowledge (ITK), ethnobotany, agro-techniques, industrial importance, extraction of essential oil/ phytochemicals, pharmaceutical uses, marketing, economic uses, utilization etc. The event was attended by 60 farmers from different parts of Uttaranchal including non-governmental organizations and self-help groups, who expressed great satisfaction about the

programme, and strongly requested for more workshops on similar pattern for other medicinal and aromatic (MAP) plants. Seeds and pamphlets with detailed scientific agro-techniques for basil cultivation were distributed to the farmers. The programme concluded with a field visit where 80 diverse germplasm accessions were planted, including eight species namely, *Ocimum basilicum* (sweet basil), *O. canum* (hoary basil), *O. citriodorum* (lemon basil), *O. gratissimum* (shrubby basil), *O. sanctum* (holy or sacred basil), *O. viridi* (fever basil) and *O. thyrsoiflora* (compact basil).

### Germplasm Field Day on Okra and Cucurbits

A germplasm field day on okra and cucurbits was held at ICAR-NBPGR, RS, Thrissur on August 19, 2015, in which 40 participants representing ICAR



Workshop participants in basil field

institutes and State Agricultural Universities (SAUs) attended. A total of 184 accessions comprising bitter melon (41), snake melon (17), ash melon (11), pumpkin (21), cucumber (50), synthetic



Participants of Germplasm Field Day in okra field

amphidiploids of okra (8) and wild *Abelmoschus* representing 11 species, and wild species of *Cucumis* and *Momordica* (36) were available for field observation.

### Plant Germplasm Registration Committee Meeting

The XXXII<sup>nd</sup> Plant Germplasm Registration Committee (PGRC) meeting was held at ICAR-NBPGR, New Delhi, on August 17, 2015 under the Chairmanship of Dr J.S. Sandhu, DDG (CS) ICAR, New Delhi. In this meeting total 43 proposals (19 new and 24 revised) were considered for registration. Finally, 23 (6 new and 17 revised) proposals belonging to 13 species were approved for registration. Some notable registered germplasm were, included cotton for high ginning outturn, wheat for high gluten index (86%), rice with open florets; garden pea resistant to powdery mildew, berseem with pentafoolate leaves and black seeds.



***Oryza sativa* ANR 38 (IC0613963/INGR15014), a rice accession with sufficiently open florets for exceptionally long time. The anthers are considerably protruded outside the spikelet and stigma is well exposed**



***Pisum sativum* VRP-343 (IC0598280; INGR15029), a garden pea resistant to powdery mildew**

### Indo-Swiss Collaborative Project Sanctioned

A project entitled "Improvement of pigeonpea for plant type, pod borer resistance and moisture stress tolerance" was sanctioned which is jointly funded and steered by the Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India and the Swiss Agency for Development and Cooperation (SDC), Federal Department of Foreign Affairs, Government of Switzerland.

### RAC and IRC Meetings of ICAR-NBPGR

The XVII meeting of the Research Advisory Committee (RAC) of ICAR-NBPGR was held on July 7, 2015 at New Delhi under the Chairmanship of Dr Tej Pratap, Vice-Chancellor, Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar. Other RAC members included Dr S. Edison, Dr Sushama Chaphalkar, Dr K.S. Ravi, Dr J.S. Chauhan, Dr K.C. Bansal (Director, ICAR-NBPGR) and Dr K.V. Bhat (Member Secretary). All the HODs/OICs from headquarters and regional stations presented the salient achievements and discussions were held on constraints and emerging issues.

The RAC was followed by the 26<sup>th</sup> Institute Research Council (IRC) meeting from July 8-9, 2015, under the Chairmanship of Dr K.C. Bansal, Director, ICAR-NBPGR. Dr J.S. Chauhan, ADG (Seed) & Member, RAC was a special invitee. The progress report of 88 institute projects operational at headquarters and regional stations were presented by the Principal Investigators of the respective projects and OICs/ Scientists of the respective Regional Stations. Presentations were made by HoDs of Divisions and OICs of Units/Regional Stations followed by the PIs of the respective projects. Important thrust areas requiring efforts attention were identified: (i) Consortium Research Platform on Agrobiodiversity (ii) Modernization of National Genebank (iii) Identification of new crops for food and agriculture (iv) Identification of premium germplasm for popularisation among farmers directly (v) identification of specific areas for in situ/on-farm conservation of landraces and crop wild relatives (vi) Evaluating germplasm from the perspective of nutritional security and the natural resource-use efficiency (vii) Popularising unique/ elite/ potential germplasm instantaneously for use by breeders

## Plant Genetic Resources Education (PG School, IARI)

### Teachers' Day Celebration and Freshers' Welcome

On September 4, 2015, Teacher's Day Celebration cum Fresher's Welcome was organized in the Dr B.P. Pal Auditorium of ICAR-NBPGR, New Delhi. Students of PGR Club organized the twin function that was attended by M.Sc. and Ph.D. (PGR) students, faculty and staff of ICAR-NBPGR. The new Ph.D. students who joined for PGR discipline are Mr Sushil K. Chourey, Mr Shailendra Solanki and Mr Rakesh K. Bairwa. The new M.Sc. students are Ms Manju Kumari, Mr Prabhakaran S., Mr Sunil Naik S. and Mr Anto James. In the Freshers' welcome party, Mr Sushil Chourey and Mr Sunil Naik were adjudged the best freshers for Ph.D. and M.Sc, respectively.



Faculty and students of PGR celebrating Teachers cum Freshers' Day

## PERSONNEL NEWS

### Deputations Abroad

**Dr V. Celia Chalam**, Principal Scientist, Division of Plant Quarantine, ICAR-NBPGR, New Delhi, undertook a study tour to Australia as part of an inter-ministerial delegation under the UNEP-GEF capacity building project on biosafety of LMOs, from September 28 to October 2, 2015.

### Retirements

**Mr J.K. Ingle**, Senior Technical Officer, ICAR-NBPGR, RS, Akola, superannuated on July 31, 2015.

### Transfers

**Dr I.S. Bisht**, Principal Scientist and Officer-in-Charge, Technical Cell, ICAR-NBPGR, New Delhi transferred to ICAR-NBPGR, RS, Bhowali, Uttarakhand, w.e.f. August 1, 2015.

**Mr V.K. Rai**, Assistant Finance and Accounts Officer, ICAR-NBPGR, New Delhi, transferred to NAIP, ICAR, New Delhi, w.e.f. September 1, 2015.

**Mr Sandeep Gaur**, Assistant, ICAR-Directorate of Floriculture, Pune, joined ICAR-NBPGR, New Delhi w.e.f. September 19, 2015.

### Awards

**Dr S.R. Pandravada**, Principal Scientist, ICAR-NBPGR, RS, Hyderabad was bestowed with the "Award for Excellence in Research" under 3<sup>rd</sup> Science

and Technology Awards-2015 instituted by EET CRS at Bangalore on June 14, 2015.

### Important Visitors

**Dr J.S. Sandhu**, DDG (Crop Science), ICAR and **Dr T. Mohapatra**, Director, ICAR-CRRI, Cuttack visited the ICAR-NBPGR Base Centre Cuttack on June 11, 2015.



Dr J.S. Sandhu and Dr T. Mohapatra visiting the nethouse facilities at ICAR-NBPGR, Cuttack

**Dr S.B. Dandin**, Liaison Officer, Bioversity International, Bangalore Office, visited ICAR-NBPGR, RS, Thrissur on July 16, 2015.

**Dr J.S. Sandhu**, DDG (Crop Science), ICAR, **Dr J.S. Chauhan**, ADG (Seeds), ICAR, **Dr T. Mohapatra**, Director, ICAR-CRRI, Cuttack, and other delegates from different Institutes of ICAR, visited ICAR-NBPGR, RS, Ranchi on July 26, 2015.

**Dr J.S. Sandhu**, DDG (Crop Science), ICAR, visited the laboratory and field facilities at ICAR-NBPGR, RS, Hyderabad, and interacted with the scientists on August 8, 2015.