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QUARTERLY

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Indian Delegation Visits Svalbard Global Seed Vault, Norway

An Indian delegation led by Mr Ashish Bahuguna, Secretary, Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, Dr Manas K. Mandal, Director General (Life Sciences), Defence Research and Development Organization (DRDO) and Dr K.C. Bansal, Director, NBPGR, ICAR (Ministry of Agriculture, Govt. of India) visited the Svalbard Global Seed Vault (SGSV) on April 9, 2014, and deposited 25 accessions of pigeonpea (*Cajanus cajan*) as 'safety duplicates' in the global genebank.

The SGSV is considered as an ultimate security net for the world's most important plant genetic resources for food and agriculture with maximum level of security. The SGSV, commissioned in February 2008, is located in the far north remote Arctic Svalbard archipelago on the Norwegian island of Spitsbergen near the town of Longyearbyen (780 North), only about 1,300 miles from the North Pole. Spitsbergen is an ideal location due to its permafrost condition and absence of tectonic activity. The location 130 m above sea level ensures that the site remains dry even if the ice caps melt. The SGSV

is jointly maintained and managed by the Government of Norway, the Nordic Genetic Resource Center (NordGen) and the Global Crop Diversity Trust (GCDT) under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). The purpose of the SGSV is to ensure future food security by conserving rare seed material or 'safety duplicates' of food and forage crops already conserved in the national genebanks across the world.

A Standard Seed Deposit Agreement was signed by Dr K.C. Bansal on behalf of NBPGR/ICAR, and the Director of NordGen on behalf of the Norwegian Ministry of Food and Agriculture. Earlier, Dr S. Ayyappan, Secretary, DARE and Director General, ICAR accorded approval for this first official deposit of germplasm from India. With this deposit from NBPGR, a total of 60 institutions have deposited their precious germplasm comprising over 0.8 million accessions.



The Indian delegation of (L to R) Mr Ashish Bahuguna, Secretary (DAC), Dr K.C. Bansal, Director, NBPGR and Dr Manas K. Mandal, DG (Life Sciences), DRDO, outside the SGSV



Dr K.C. Bansal inside the Vault holding the box for deposit of pigeonpea seeds from NBPGR. The box has a message from Dr S. Ayyappan pasted on the Box containing the first official deposit of seeds in SGSV from India

New Cucurbitaceae Species Described by NBPGR Scientists

A new species of cucurbit *Herpetospermum operculatum* K. Pradheep, A. Pandey, K.C. Bhatt & E.R. Nayar was collected from Sikkim and Nagaland, and described from India, Myanmar and China (*Blumea* 59: 1-5, 2014). This dioecious species was earlier confused with *Herpetospermum tonglense* (C.B. Clarke) H. Schaefer & S.S. Renner, but differs from it primarily in having operculum at the stylar end of fruit and prominent probracts and bracts. It occurs over thickets, bushes and small trees along riverbanks in little disturbed subtropical to temperate forests at altitudes varying between 1,500 - 2,500 m. Young shoots are harvested from the wild and used as leafy vegetable in Mon district of Nagaland. Its holotype (K. Pradheep 1449) was deposited at the Botanical Survey of India (CAL), Kolkata, and isotypes at the Forest Research Institute (DD), Dehradun and National Herbarium of Cultivated Plants (NHCP), New Delhi.



Fruits of *Herpetospermum operculatum* with operculum at distal end



Herbarium specimens of male (left) and female (right) plants of *Herpetospermum operculatum*

Exploration and Collection of Germplasm

Germplasm collection of pulses

A total of 25 accessions of lentil (15) and field pea (10) were collected by NBPGR Regional Station (R/S) Shimla, from changer region (drought prone) of Himachal Pradesh. Genetic diversity was recorded for traits like days to maturity, seed size, and seed colour. The data recorded from farmers revealed that cultivation of local landraces and cultivars of both lentil and field pea has decreased sharply in the last two decades in the entire changer region of HP.

Exploration and collection of *Moringa*

An exploration and germplasm collection tour of wild *Moringa* from Shiwalik foothills in

Uttarakhand was undertaken during June 16-20, 2014 by NBPGR R/S, Bhowali. A total of 23 accessions were collected and planted in greenhouse.

Exploration for cherry germplasm

A collaborative survey and selection programme for cherries was conducted by NBPGR R/S, Srinagar and Central Institute of Temperate Horticulture (CITH), Srinagar, during May, 2014. Some 21 plants of 'Siya Goal', 'Tontal', 'Awal No.', 'Makhmali' and 'Mishri' varieties with quality traits were identified and tagged in different cherry growing areas of Kashmir valley.

Baseline survey in Assam

NBPGR R/S, Umiam, Meghalaya, conducted a

baseline survey at Howraghat area of Karbi Anglong, Assam during 10-12 May, 2014 for ICAR-Bioversity international project entitled 'Mainstreaming Agro-biodiversity Conservation and Utilization in Agricultural Sector to Ensure Ecosystem Service and Reduce Vulnerability' (UNEP-GEF funded). During the survey, data were collected on the prevailing agro-biodiversity of the site and 30 rice landraces were collected for conservation at NBPGR.

Germplasm Exchange

Import and export

A total of 7,689 accessions (6,528 germplasm and 1,161 trial material) of different crops were introduced from 21 countries. Germplasm of transgenic rice (4 samples), barley (67 samples) and wheat (443 samples) crops were exported to four countries.

Promising introductions

Cotton (EC807817), **USA**: A tufted-naked upland cotton mutant line.

Maize (EC808940-69), **Switzerland**: Core collection.

Maize (EC803523-40), **Mexico**: Twenty two new CIMMYT maize lines (CMLs) adapted to tropical/subtropical maize production environments with traits such as resistance to common mid altitude foliar diseases, *Maize streak virus* (MSV), Turicum leaf blight (TLB), Gray leaf spot (GLS), *Phaeosphaeria* leaf spot (PLS) ear rot and common rust (PS); insect pests of eastern and southern Africa namely spotted stem borer (*Chilo partellus*) and African stem borer (*Busseola fusca*); white grained, excellent combining ability under low N and drought conditions.

Potato (EC806225-38), **Germany**: Line resistant to late blight with high dry matter.

Rice (EC803403-40), **Philippines**: Blast resistant lines.

Rice (EC804017-356), **Philippines**: Breeding lines for high zinc.

Rice (EC807584-816), **Philippines**: Breeding lines for drought tolerance.

Rice (EC804559-EC806396), **China**: Lines tolerant to shattering, lodging, drought and insects, with good grain and cooking quality.

Tomato (EC802554-563), **Taiwan**: Lines tolerant to heat, leaf blight, gray leaf spot, bacterial wilt, fusarium wilt, *Tobacco mosaic virus*.

Tomato (EC804955-58), **Taiwan**: Tolerant to fusarium wilt and heat.

Wheat and barley (EC804989-90), **United Kingdom**: Wild species.

Plant Quarantine

At NBPGR, New Delhi, samples of import (12,873) and export (907) were processed for quarantine. At NBPGR R/S, Hyderabad, 37,502 samples consisting of import (8,262 samples) and export (29,240 samples) germplasm were processed for quarantine. A total of 30 phytosanitary certificates were issued. During quarantine processing, *Drechslera setariae* was intercepted on pearl millet from Canada; *Macrophomina phaseolina* on cotton from USA; *Botryodiplodia acerina*, *Colletotrichum orbiculare* and *Fusarium solani*, on bittergourd from Thailand; *Rhizoctonia solani* and *Alternaria raphani* on maize from Thailand and *Stemphylium* sp. on wheat from Mexico were intercepted. A total of 2,217 samples were processed for pest-free conservation.

In a survey conducted at ICRISAT for groundnut viruses, leaf samples (152) suspected with *Peanut stripe virus* (PStV) and *Peanut mottle virus* (PeMoV) infection, were collected from Arachis house, and the GRD glasshouses where conservation of wild groundnut germplasm is being done. In all, 22 samples were found positive to PStV and 11 to PeMoV. All the infected plants were uprooted and incinerated.

Germplasm Characterization and Evaluation

Characterization of jack bean

Fifteen accessions of jack bean (*Canavalia ensiformis*) germplasm were characterized for pod and seed traits at NBPGR R/S, Hyderabad. Variation was recorded in pod colour (light green to green); pod length (15.65-21.76 cm); pod width (1.58-2.23 cm); pod weight (9.87-22.04 g); pods/plant (17.53 – 34.46); seeds/pod (7-12.73); 100-seed weight (116.75-315.25 g); seed length (17.83-25.48 mm); seed breadth (8.87-18.77 mm). Seed colour variations comprised pink (NSA-34, PSR12202, NS 2009/059), brown, white, pale yellow (IC32881) yellowish brown



Variability in seed characters in jack bean germplasm

(N/06-158). Accession NS 2009/053, yielded highest test weight (315.25 g).

Characterization of field pea

A total of 1,058 accessions of field pea germplasm were evaluated for 19 characters using seven check varieties at NBPGR R/S, Shimla. Accessions EC598700 P-3536, 6044/P-3039, 6318/P-3299, 6018/P-3014, 6020/P-3016 and 6319/P-3300 were found promising for multiple traits like early maturity, no. of pods /plant and seed/plant.



Accession 6020/P-3016 of pea found superior for no. of pods/plant

Salinity tolerant rice germplasm identified

A set of 63 accessions of rice germplasm was collected from high salt affected areas of Sundarvans Biosphere Region, during 2011-12 by NBPGR R/S, Cuttack. The germplasm was screened for salt tolerance at seedling stage along with five check varieties, Pokkali, CSR-10, SR- 26B (salt tolerant) and IR29 and IR64 (salt susceptible). Based on the modified standard evaluation system (IRRI, 1997) for rating the visual symptoms of salt injury at seedling stage, 33 tolerant genotypes were selected and evaluated at two locations, namely, Canning Town, West Bengal (EC-10.0 dS m⁻¹) and Kujang, Odisha (EC-8.2 dS m⁻¹). The rice genotypes varied significantly for salt tolerance and also for agro-morphological traits at seedling and reproductive stage. Four accessions namely, IC594013 (Kumrogoor), IC596840 (Kalonunia), IC594020 (Talmugur) and IC594027 (Nonabokra) exhibited high degree of salt tolerance as measured by higher estimates for seven yield attributing traits as compared to the tolerant check Pokkali, CSR-10 and SR-26B.

Validation of wheat core collection developed from national genebank

During the *rabi* season (2013-14), the composite core collection of 3,000 accessions of wheat were grown for validation at NBPGR, Issapur farm, along with four checks viz., HD2967, PBW343, C306 and Raj3765. Data were recorded for 22 highly heritable qualitative and 12 quantitative parameters. The wheat core set was validated using Shannon diversity index which was larger for plant height (0.88), days to maturity (0.75), grain yield (0.85), spike density (1.00) and waxiness on leaf blade (0.74). Range of



Variability in spike shape, colour, density and awnness in the wheat core collection

variability in the core set was observed in the field for growth classes, cultivated species, maturity duration, qualitative and quantitative traits. The days to spike emergence ranged from 64 to 152.

Evaluation of apricot and nectarines



Apricot accession EC346008 with early maturity, high productivity and attractive fruit colour

In apricot, 34 accessions were evaluated at NBPGR R/S, Shimla for wide range of traits like maturity days, fruit size, fruit taste, TSS etc. Accessions IC584511, EC539004, EC522701, and EC346008 exhibited early maturity, high TSS and high productivity. Among seven varieties of nectarine EC566147 was found superior for fruit weight, fruit length and TSS.

Genomic Resources and Bioinformatics

Transcriptome analyses

In finger millet, blast (*Pyricularia grisea*) is one of the limiting factors for its production and subsequent yield losses. To understand the regulatory genes associated with tolerance to blast disease, a transcriptome profiling of leaf samples of resistant (GPU28) and susceptible (PR202) varieties of finger millet was conducted on Illumina platform. The analyses of expressed genes revealed WRKY transcription factor, putative NAC domain transcription factor, LRR receptor like serine/threonine protein kinase, prolyl endopeptidase like, cytochrome P450 as candidates among the differentially expressed

genes. The sequence information generated in the above work is being exploited to develop SSR markers.

Diversity analysis in rice

Polymorphism survey was conducted on a set of rice varieties, to identify polymorphic SSR markers. A total of 50 SSR markers were identified to be polymorphic. Out of these, 30 polymorphic SSR markers were used to genotype a set of 150 rice accessions.



Representative gel profile of genotyping of 24 rice varieties with polymorphic SSR marker RM5

Bioinformatics analyses

SNPs have been identified for a few gene families with ESTs database of pigeonpea available in public domain as reference. Effects of the identified non-synonymous SNPs on respective proteins have been studied. Additionally, population of crop genomic resource information for development of PGR genomic resources web portal has been done. Efforts have also been made to improve web portal of PGR genomic resources. Protein modelling of AVR gene from pigeonpea pathogen *Fusarium udum* employing modelling software is in progress.

GMO testing

The practical applicability of the real-time PCR based multi-target system was tested and validated using the test sample of stacked GM cotton event MON15985 x MON88913 for presence/absence of 47 targets in duplicate. Additionally, the PCR and real-time experiments for the proficiency testing, organized by European Commission-Joint Research Centre, were conducted for species identification and to identify and quantify GM events detected.

Genomic resources repository

Genomic resources (3,700), belonging to 14 crops, have been conserved at the National Genomic Resources Repository and the database of the repository updated and its prototype version is submitted for approval and subsequent web display.

Meeting of the NABMGR

The 5th meeting of the National Advisory Board on Management of Genetic Resources (NABMGR) was held on June 16, 2014 at NBPGR, New Delhi. The meeting was chaired by Dr R.S. Paroda, Chairman, NABMGR & Chairman, Trust for Advancement of Agricultural Sciences (TAAS) and Chairman, Farmers' Commission of Haryana, and Co-Chaired by Dr S. Ayyappan, Director General ICAR and Secretary, Department of Agricultural Research and Education (DARE). Board Members and eminent invitees participated in the meeting. Director, NBPGR made presentation on achievements of NBPGR and ATR on the recommendations of the previous meetings was discussed and specific recommendations were made. During the meeting NBPGR facilities, namely, NABMGR Secretariat and Dr R.S. Paroda Committee Room were inaugurated.



Fifth meeting of the NABMGR (from left to right) - Drs S.K. Datta, P.L. Gautam, S. Mahadevappa, S. Ayyappan and R.S. Paroda



Dr R.S. Paroda inaugurating the 'Dr R.S. Paroda Committee Room' at NBPGR



Dr S. Ayyappan inaugurating the 'Secretariat Office of the NABMGR' at NBPGR



Dr R.S. Paroda releasing a publication on the occasion

Plant Germplasm Registration Committee Meeting

The XXIXth Plant Germplasm Registration Committee (PGRC) meeting was held at NBPGR, New Delhi on May 5, 2014 under the Chairmanship of Dr R.P. Dua, ADG (F&FC), ICAR, New Delhi. In this meeting, total 84 proposals (66 new and 18 revised) were considered for registration. Finally, 18 (14 new and 4 revised)

proposals belonging to seven species were approved for registration. Some notable registered germplasm were: tea clones with very high Darjeeling flavour; wheat with resistance to foot rot and nutmeg with high sabinene and myrcene content.

Group Meeting of AICN on Under-Utilized Crops

NBPGR R/S, Shimla organized the XXV Group Meeting of All India Coordinated Network on Under-Utilized Crops on June 12-13, 2014. Mr Deepak Shanan, Additional Chief Secretary, Govt. of



Mr Deepak Shanan and other dignitaries from ICAR releasing a publication during XXV AICN on Underutilised Crops

Himachal Pradesh was the Chief Guest while Dr R.P. Dua, ADG (F&FC), and Dr J.S. Chauhan, ADG (Seed), were Chairman and Guest of Honour,

respectively. It was attended by more than 45 scientists from different State Agricultural Universities and ICAR Institutes.

Biodiversity Day Celebrations

The 'International Biodiversity Day' (IBD) on May 22, 2014 was celebrated on the theme of 'Island Biodiversity'. At NBPGR New Delhi, all the scientific and technical staff participated in two presentations on 'Uniqueness of Biological Diversity of Flora and Fauna of Andaman & Nicobar Islands' by Dr Rekha Chaudhury and 'Plant Genetic Resources - Collection Perspective for Bay Islands Biodiversity' by Dr K.C. Bhat. Dr K.C. Bansal, presented his views on role of NBPGR in nurturing the island biodiversity of Andaman and Nicobar islands. This was followed by general discussion on Island biodiversity and its importance and utilization which was coordinated by Dr Shashi Bhalla, OIC, PME Cell.

NBPGR R/S, Thrissur, celebrated the day by sowing seeds of polyembryonic mangoes and *Salacia fruticosa* by the staff of the station.

At NBPGR R/S, Shimla, an exhibition on plant genetic diversity was made, depicting diversity through wide range of seeds, live plants, posters, photographs and literature. Around 500 school children and people from city visited the exhibition. A discussion on biodiversity management was also telecast on Doordarshan and radio.

PERSONNEL NEWS

Deputations Abroad

Dr Gurinder Jit Randhawa, Principal Scientist, Division of Genomic Resources (DGR), NBPGR, New Delhi, was invited to participate as technical expert by European Commission in the Training Workshop on 'Implementation of Quality Systems/ISO 17025 accreditation' at Institute for Health and Consumer Protection, Joint Research Centre, Ispra, Italy from May 20-22, 2014. Thirty four participants from 31 countries participated. Audit simulation was also conducted by the participants in European Union Referral Laboratory (EURL) at JRC, Italy.

Dr Veena Gupta, Principal Scientist, Division of Germplasm Conservation, NBPGR, New Delhi, attended the International Conference on 'Enhanced Gene Pool Utilization-Capturing Wild Relatives and Landrace Diversity for Crop Improvement' organized by the PGR Secure Project and European Association for Research on Plant Breeding (EUCARPIA) at National Institute of Agricultural Botany (NIAB), Cambridge, UK, from June 16-20, 2014 and presented a paper on 'Priorities and strategies for conservation of crop wild relatives at Indian National Genebank'.

Dr Rashmi Yadav, Senior Scientist, Division of Germplasm Evaluation, NBPGR, New Delhi, participated and made oral presentation on 'Indian traditional crops having functional bio-actives and their potential health benefits' in 5th Annual Conference of American Council for Medicinally Active Plants, North Dakota State University, Fargo, USA, June 15-18, 2014.

Awards and Honors

Dr Parimalan Rangan, Scientist, DGR, NBPGR, New Delhi, awarded the Indo-Australian Career Boosting Gold Fellowship (IACBG-fellowship) sponsored by DBT, Govt. of India, to pursue a two year advance training in the area of agricultural biotechnology at University of Queensland, Australia.

Dr Tapan Kumar Mondal, Senior Scientist, DGR, NBPGR, New Delhi, selected as 'member' of National Agricultural Science India (NASI), Allahabad, for the year 2014.

Dr Sandeep Kumar, Senior Scientist, Division of Germplasm Evaluation, NBPGR, New Delhi, received 'Dr P.R. Verma Young Scientist Award 2014' given by Society of Rapeseed-Mustard Research, Bharatpur, for the paper entitled 'Quality characteristics in rapeseed-mustard along with role of some anti-nutritional factors in plant defence and future strategies' in National Brassica Conference 2014 on 'Brassicas for addressing edible oil and nutritional security', during Feb. 14-16, 2014.

Retirements

Dr Z. Abraham, Principal Scientist (Economic Botany), NBPGR R/S, Thrissur, superannuated on April 30, 2014.

Dr N.K. Dwivedi, Officer-in-Charge & Principal Scientist, (Economic Botany), NBPGR R/S, Thrissur, superannuated on June 30, 2014.

Mr Bhag Chand, Senior Technical Officer, NBPGR R/S, Jodhpur, superannuated on May 31, 2014

Appointments

Dr Dinesh Chand, appointed as Senior Scientist (Economic Botany and Plant Genetic Resources), NBPGR, R/S, Akola on April 21, 2014.



Dr Gayacharan, joined NBPGR, New Delhi, as Scientist (Agriculture Biotechnology) on April 1, 2014.

Dr (Ms) Vartika Srivastava, joined NBPGR, New Delhi, as Scientist (Fruit Sciences) on April 7, 2014.



Dr Harish G.D. joined NBPGR, New Delhi, as Scientist (Genetics & Plant Breeding) on April 7, 2014.

Mr Kutubuddin Ali Mola joined NBPGR, New Delhi, as Scientist (Agriculture Biotechnology) on April 9, 2014.



Mr Pardeep Kumar, joined NBPGR, New Delhi, as Scientist (Agriculture Biotechnology) on April 9, 2014.

Promotions and Transfers

Dr Manas Kumar Bag, Senior Scientist, (Plant Pathology), Division of Germplasm Evaluation, NBPGR, New Delhi, promoted to Senior Scientist (PB-IV) at Central Rice Research Institute (CRRI), Cuttack, Odisha w.e.f. June 13, 2014.

Dr Om Prakash Dahiya, Assistant Chief Technical Officer, Division of Germplasm Evaluation, NBPGR, New Delhi, promoted as Director (Farm Information), Directorate of Extension, DAC, Krishi Bhawan, New Delhi w.e.f. May 21, 2014.

Dr Deep Narayan Saha, Senior Scientist (Biotechnology), Division of Genomic Resources (DGR), NBPGR, New Delhi, transferred to Central Research Institute for Jute and Allied Fibres (CRIJAF), Barrackpore on May 24, 2014.

Mr Bhadra Kumar S., Assistant Administrative Officer (AAO), joined NBPGR R/S Thrissur on April 25, 2014, on transfer from IARI, R/S, Pune.

Mr S.S. Wange, AAO, NBPGR, R/S, Akola, transferred to IARI, R/S, Pune.

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DIRECTOR

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Anuradha Agrawal, Kavita Gupta and Lalit Arya

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