Important Crop Germplasm Introduced in Field Crops in India during 2009

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Germplasm Exchange Unit of NBPGR is constantly working towards introduction of promising trait specific germplasm having tolerance/resistance to various biotic and abiotic stresses. India has been benefited tremendously by importing germplasm and varieties and new crops in various field crops from other countries, which have improved productivity and lead to diversification of crop species. Exchange of plant genetic resources (PGR) offers enormous opportunity for addressing these issues and there is continuous need of genetic resources for developing varieties resistant to various pests and diseases and to improve quality, quantity and other value addition traits. During 2009, the Bureau introduced 28,225 accessions in field crops from 43 countries which included trait-specific germplasm in crops namely wheat, barley, rice, maize, soybean, lentil and cotton.

Key Words: Exotic, Field crops, Germplasm, Introduction, Trait

Introduction

National Bureau of Plant Genetic Resources (NBPGR), New Delhi under Indian Council of Agricultural Research and Department of Agricultural Research and Education (DARE) of the Government of India, is playing a very dynamic and key role in overall regulation and management of Plant Genetic Resources (PGR) in India. NBPGR is augmenting the large amount of variability for broadening the genetic base by importing genetic wealth of different crop plants from different ecological areas of the world. These materials have been used all over the country by various institutes in various crop improvement programmes. Field crops are crops (other than fruits or vegetables) grown for agricultural purposes over a wide area and constitute mainly cereals, grain legumes, oilseeds, fibres and forages. In the current scenario, particularly with technological advances in the field of molecular biology and genetic engineering appreciation of the monetary and non-monetary value of genetic resources have led to inequity of historical free flow of germplasm. Access to genetic resources are now based on the principle of 'Sovereign rights of Nations' as promulgated under the legally binding Convention on Biological Diversity (CBD), 1992. The Convention provides for appropriate access to genetic resources and transfer of relevant technologies on mutually agreed terms, subject to prior informed consent. At national level various regulatory mechanisms have been put in place, which govern access to PGR occurring in India (Brahmi, 2009).

Materials and Methods

As per the existing procedure for import of germplasm for research or experimental purposes, the Government of India by enacting the New Seed Development Policy (1989) and Plant Quarantine (Regulation of Import into India) Order 2003 (PQ Order 2003), has made it obligatory for all plant breeders and researchers intending to import seed/planting materials, to fulfill the two mandatory requirements, first the import permit before import of any material and second the phytosanitary certificate from the country of origin. These two documents must accompany every consignment of seed/planting material imported from abroad for research purposes. The provisions of PQ Order are applicable to import of transgenic seeds as well.

The requests received for importing seed material in different field crops for research/experimental purposes in the name of the Director, NBPGR, New Delhi, on a prescribed application form (PQ 08), were facilitated for the issuance of Import permit and import of seed material into the country. Based on survey of literature and other references, applications for procurement of trait-specific germplasm were forwarded to various source institutes. Germplasm Exchange Unit, NBPGR, is continuously making all efforts for introducing diverse PGR by way of bibliography screening of various journals/ periodicals, reports, catalogues, index seminums and online databases. The widely searched websites are detailed at the end for reference.

Results and Discussion

In the year 2009, a total of 429 import permits were issued to public and private organisations for import of germplasm

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of field crops for research purposes. Of the total import permits issued, 47% belonged to private seed companies/ sector and 53% to public organizations/institutes. Of the public sector, 39% were issued to applicants from NBPGR, 17% to ICAR institutes, 30% to SAUs, 2% to ICRISAT and 12% to other government organizations. During the period, 28,225 accessions in field crops were introduced from 43 countries which included trait-specific germplasm in crops namely wheat, barley, rice, maize, soybean, lentil and cotton. The trait-specific germplasm and wild species introduced during 2009 are given in Table 1 and 3 respectively. A total of 170 accessions of transgenic seed material were also introduced as described in Table 2.

The seed material was procured for various biotic and abiotic stresses and value added traits. Important traits which were procured include tolerance to drought, lodging, submergence and heat in paddy, wheat, and barley; biotic stresses primarily resistant to rust, smut, sheath blight, blast, fusarium. *Tungro virus*, mosaic, and nematode in paddy, wheat, barley and soybean. Agronomic traits

Table 1. Trait-specific germplasm introduced in field crops during 2009

Crop/EC No.	Country	Specific traits	Distribution
Hordeum vulgare (Barley) EC657889	Canada	High yielding for both grain and biomass, good grain quality for malting, resistant to the spot form of net blotch, surface borne smuts and spot blotch	DWR, Karnal
EC657888	Canada	Six rowed, hulled, smooth-awned, spring feed barley, lodging resistance, higher plump seed percentage, good resistance to covered smut and false loose smut	
Oryza sativa (Paddy)			
EC637732–35	USA	High yielding lines	BASF India Limited
EC659913–14		Improved resistance to sheath blight, bacterial panicle blight, and narrow brown leaf spot	NBPGR Regional Station, Cuttack
EC637984	Philippines	Submergence tolerant	Annamalai University, Annamalainagar
EC638154–161, 166–178	Philippines	Blast resistant	Rice Research Station, Chinsurah, WB
EC639758–797, 820–822	Kenya	Blast resistant	Devgen Seeds and Crop Technology Pvt. Ltd
EC657109–118	France	Blast resistant	TNAU, Coimbatore
EC638162–165	Philippines	Tungro virus tolerant	Rice Research Station, Chinsurah, WB
EC659921	Vietnam	Drought tolerant	NBPGR Regional Station, CuttacK
EC639584–757, 798–819, 823-826	Kenya	Drought tolerant	Devgen Seeds and Crop Technology Pvt. Ltd
Triticum aestivum (Wheat)			
EC638278	USA	Alien disomic addition line with resistance to fusarium head blight	DWR, Karnal
EC638314	USA	Winter wheat, white grained, excellent bread baking quality, good pre-harvest sprouting tolerance	DWR, Karnal
EC638315	USA	Good disease resistance and excellent yield potential	DWR, Karnal
EC641860	USA	Var. NEO16432, superior grain yield performance, winter hardy, resistant to fusarium head blight, stem rust, moderately resistant to leaf rust, stripe result and Hessian fly	DWR, Karnal
EC665054	UK	Winter type	BCKV, Kalyani
EC664600	Argentina	Hard red winter wheat, excellent grain yield potential, resistance to leaf rust, conferred mainly by the Lr 47 gene, and good bread making quality	DWR, Karnal
Zea mays (Maize) EC659915–17	Nigeria	Lower levels of aflatoxin, good agronomic traits and resistance to important diseases in the lowlands, including southern corn leaf blight., southern corn rust and ear rot	DMR, New Delhi
Glycine max (Soybean)		Excellent yield potential. Resistant to soybean mosaic virus, stem canker, bacterial pustule and frogeye leaf spot	NRC Soybean, Indore
EC638228	USA		
EC638229	USA	Resistant to *Soybean mosaic virus* and peanut root knot nematode, frogeye leaf spot and bacterial pustule	NRC Soybean, Indore

contd.

Table 1 contd.

Crop/EC No.	Country	Specific traits	Distribution
EC644409	USA	Small seeded,100 seed weight is 7.3g, resistant to shattering, *Soybean mosaic virus*, frog eye leaf spot and bacterial pustule	NRC Soybean, Indore
EC644410	USA	Variety N 8001 has purple flowers, gray pubescence, tan pod wall color at maturity, and shiny yellow seeds with imperfect black hila, resistant to *Soybean mosaic virus* and stem canker	NRC Soybean, Indore
EC656640	USA	High yield potential and broad resistance to soybean cyst nematode, southern root knot nematode and reniform nematode	NRC Soybean, Indore
EC656641	USA	High yield potential, broad resistance to soybean cyst nematode, southern root knot nematode and sudden death syndrome	NRC Soybean, Indore
EC656642	USA	High yield potential, higher seed protein and resistance to root knot nematode	NRC Soybean, Indore
EC656643	USA	High yield potential and disease resistant	NRC Soybean, Indore
Lens culinaris (Lentil) EC666214–952, 5016–5052	Syria	Early maturing	ICRISAT Patancheru, AP
Gossypium hirsutum (Cotton) EC657081–104	Israel	Restorers and maintainer	Bayer Bioscience Pvt. Ltd, Hyderabad
Gossypium barbadense (Cotton) EC657105–108	Israel	Restorer lines	Bayer Bioscience Pvt. Ltd, Hyderabad

Table 2. Details of transgenic seed material introduced in field crops

Crop/EC No./ Source Country	Specific Traits	Distribution
Gossypium hirsutum EC654298–303 Texas Tech University USA	Coker 312 with 35S promoter and npt II as selectable marker	Ankur Seeds Pvt. Ltd. Aurangabad
Gossypium hirsutum EC640276-285 Hazera Seeds Limited, Israel	Containing stacked traits bollgard II and Roundup Ready flex (Event MON 88913 X Event MON 15985) gene	Monsanto India Limited, New Delhi
Oryza sativa EC660466–660500 EC636963–637009 Bayer Bio Science, Belgium	Containing *Cry 1Ab, Cry1Ca* and *bar* genes	Bayer Bioscience Pvt. Ltd., Gurgaon
Oryza sativa EC659713–721 Huazhong Agricultural University, China	Bt rice lines containing *Cry1c*, *Cry 1Ac* and *Cry 2A* genes to conduct efficacy evaluation against rice stem borers and rice leaf folder	Pioneer Overseas Corporation, Bangalore
Oryza sativa ssp. *japonica* EC657644–656 Australia	Variety Nipponbare silenced for the rice *Myc* gene and rice Phytochrome and Flowering Time 1 (*PFT1*) gene by RNA interference (RNAi) conferring resistance to sheath blight, rice fungal diseases and other pathogens	TNAU, Coimbatore
Oryza sativa EC660501–505 Bayer Crop Science USA	Transgenic rice of event LLRICE62 containing bar gene	Bayer Bioscience Pvt. Ltd, Gurgaon
Zea mays EC643857–62 Pioneer Hi Bred, USA	Transgenic seed material expressing stacked event IARI 1507 (*cry IF & PAT* gene) and NK 603 (*CP4EPSPS* gene)	Pioneer Overseas Corporation, Bangalore
Zea mays EC648319, EC661295–96 Syngenta, Philippines	Seeds containing *Cry 1Ab* gene (Bt 11event)	Sygenta India Limited,
Zea mays EC664605 Syngenta Agro SA, Argentina	Containing *Cry1Ab* gene (Bt 11 event) and *MEPSPS* gene GA21 event	Sygenta India Ltd, Pune

Table 3. Wild species imported in different field crops

Genus (Country)	Species	Distribution
Aegilops (USA)	*A. comos, A. geniculata, A. markgrafii. hammer, A. neglectal, A. peregrina, A. searsii hammer, A. speltoide, A. tauschi, A. triunciali., A. umbellulata*	Bioinformatics Centre School of agricultural Biotechnology, PAU, Ludhiana
Brassica (Japan)	*B. barrelieri, B. cretica, B. elongata, B. gravinae, B. maurorum, B. souliei,*	Zakir Husain College, New Delhi
Bunium (USA)	*B. persicum*	SKUAST (S), J&K
Cicer (Syria)	*C.echinospermum, C. reticulatum*	Department of Botany, University of Delhi
Diplotaxis (Japan)	*D. assurgens, D. catholica, D. erucoides, D. virgata*	Zakir Husain College, New Delhi
Eucalyptus (Australia)	*E. camaldulensis ig. camaltereti, E. cameldulensis var.cameldulensis, E. gomphocephala, E. pellita, E. pellita x brassiana, E. smithii*	Tamil Nadu Newsprint and Papers Limited, Karur, Kagithapuram, Tamil Nadu
Helianthus (USA)	*H. anomalus, H. atrorubens, H. bolanderi, H. debilis* subsp. *cucumerifolius, H. debilis* subsp. *debilis, H. debilis* subsp. *silvestris, H. debilis* subsp. *tardiflorus, H. debilis* subsp. *vestitus, H. decapetalus, H. deserticola, H. exilis, H. gigantecus, H. hybrid, H. maximilianii, H. mollis, H. niveus* subsp. *canescens, H. niveus* subsp. *tephrodes, H. occidentalis* subsp. *plantagineus, H. pauciflorus, H. pauciflorus* subsp. *subrhomboideus, H. petiolaris* subsp. *petiolaris, H. praecox, praecox* subsp. *hirtus, H. praecox* subsp. *praecox, H. praecox* subsp. *runyonii, H. strumosus*	Directorate of Oilseeds Research, Rajendra Nagar, Hyderabad
Oryza (Philippines)	*O. alta swallen, O. australiensis, O. barthii, O. glumaepatula stud, O. grandiglumis, O. granulata nees, O. latifolia, O. atifolia, O. longiglumis, O. longistaminata, O. meridionalis, O. officinalis, O. minuta, O. nivara, O. punctata, O. rhizomatis, O. rufipogon*	NDUAT, Faizabad; Ankur Seeds, (MS); ANGRAU, Hyderabad
Triticum (Mexico)	*T. monococcum, T. turgidum* subsp. *dicoccum*	PAU, Ludhiana
Vicia (Syria)	*V. hyaeniscyamus, V. hybrida, V. johannis, V. johannis var. johannis, V. kalakhensis, V. melanops, V. narbonensis, V. serratifolia*	Botany Department, University of Delhi

include high yielding lines, good grain quality, higher plump seed percentage, early maturing types in paddy, wheat, barley, maize, soybean and lentil.

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