Important Crop Germplasm Introduced into India During 2003

RV Singh, Deep Chand, Vandana Tyagi, AK Singh, SP Singh and Surender Singh
Germplasm Exchange Division, National Bureau of Plant Genetic Resources, IARI Campus, New Delhi-110012

The paper contains the information about introduction of important promising introductions made for various biotic, abiotic stresses and other value added traits during 2003 and in this process overall 33,312 accessions of germplasm in 117 crops were introduced from 41 countries/International Agricultural Research Institutes.

Key Words: Introductions, Quality Traits, Agronomic Traits

The introduction of exotic germplasm has played a vital role in the development of varieties of different crops and given an impetus to Indian agriculture. In recent years, WTO and globalization of the market have raised the issues related to quality aspects particularly in cereals, pulses, oilseeds, fruits and floricultural crops, therefore our products should be at par in quality and meet the standards required for export purposes in the world market. On the other hand most of the high yielding varieties are more prone to diseases and insect pests resulting in the deterioration in quality as well as production. Moreover, India also has a sizeable area under saline and alkaline soils and the crops cannot be grown successfully in such problematic areas. Therefore, the emphasis is given for the introduction of germplasm having good quality traits for value addition and also sources of resistance for various diseases, insect pests and abiotic stresses. In this process germplasm having quality traits such as low content of erucic acid and glucosinolate lines in *Brassica*, low neurotoxin lines in *Lathyrus*, low gossypol lines in cotton, high protein lines in pulses and cereals and biotic and abiotic resistant sources in rice, wheat, maize, barley, pearl millet, french bean, pea, soybean, mustard, sunflower, sesame, chilli and tomato have been introduced. For the exploitation of heterosis, diverse sources of CMS and GMS lines in rice and pearl millet were also introduced. Some new crops, which are economically important and nutritionally rich like kiwi fruit, rambuttan, durian, pawpaw, mangosteen, seabuckthorn, broccoli, and brussel's sprout including improved varieties having good quality in temperate and tropical fruits have further been introduced for diversification of Indian agriculture. About 891 wild relatives of different crop plants were also introuduced to broaden the genetic base of the existing varieties through interspecific hybridization.

During January-December 2003, a total of 33,312 (thirty three thousand three hundred and twelve) accessions of germplasm representing of 117 crops were introduced from 41 countries/ International Agricultural Research Centres (IARC's). The information on the germplasm genes for specific traits that has been introduced by NBPGR is presented in Table 1.

Table 1. Promising introductions made during 2003

Crop. name	Acc. No./ Country	Sailent features	Distribution
		A. Biotic stress resistant	
Triticum aestivum (Wheat) Var. Zak	EC 524892 USA	Tolerant to hessian fly (*Mayetiola destructor*) biotypes E, F and GP	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var. Tara	EC 527045 USA	Tolerant to hessian fly (*Mayetiola destructor*), resistant to stripe rust (*Puccinia striformis*) and leaf rust (*Puccinia triticina*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var. Sisson	EC 533525 USA	Tolerant to hessian fly (*Mayetiola destructor*), resistant to powdery mildew (*Blumeria graminis*), *Barley yellow dwarf virus* and glume blotch (*Stagonospora nodorum*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var. Sabbe	EC 528127 USA	Resistant to powdery mildew (*Blumeria graminis*), septoria leaf blotch (*Septoria tritici*), soil borne *Wheat Mosaci Virus* and stripe rust (*Puccinia striformis*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.

Crop. name	Acc. No./ Country	Sailent features	Distribution
Var.-Intrada	EC 533532 USA	Resistant to leaf rust (*Puccinia triticina*) and stem rust (*Puccinia graminis*) and wheat soil borne mosaic virus	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Wahoo	EC 533533 USA	Resistant to stem rust (*Puccinia graminis*), leaf rust (*Puccina triticina*) and hessian fly (*Mayetiola destructor*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Zea mays (Maize) Var.-N 547	EC 520260 USA	Resistant to European corn borer (*Ostrinia nubilalis*)	• Directorate of Maize Research, IARI, New Delhi. • NBPGR, New Delhi.
GM-MP 716	EC 523377 USA	Resistant to western corn borer (*Diatrae grandiosellta*) and fall armyworm (*Spodoptera frugiperda*)	• Directorate of Maize Research, IARI, New Delhi. • NBPGR, New Delhi.
	EC 514655-60 USA	Mould resistant varieties	• Bhabha Atomic Research Centre, Mumbai, Maharashtra.
Hordeum vulgare (Barley) Var.-AC Ranger	EC 523339 USA	Resistant to common root rot (*Cochlibolus sativus*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Trochu	EC 532634 USA	Resistant to covered smut (*Ustilago hordei*) and intermediate reaction to barley leaf scald (*Rhynchosporium secalis*) and net blotch (*Pyrenophora teras*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Farmington	EC 527044 USA	Resistant to stripe rust (*Puccinia striformis*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Drummond	EC 533523 USA	Resistant to net blotch (*Pyrenophora tears*), spot blotch (*Cochliobolus sativus*) and stem rust (*Puccinia graminis* sp.*tritici*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-6 NDRPG-1	EC 533524 USA	Resistant to fusarium head blight (*Fusarium gramineraum*)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Triticale Var. TCLF AN 31 Var. TCLF AN 34	EC 537921 EC-537922 Mexico	Resistant to stem rust (*Puccinia graminis* ssp. *tritici*), yellow rust (*Puccinia striformis*), fusarium head blight (*Fusarium* sp.)	• Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh.
Var. NE 422 T	EC 534274 USA	Resistant to prevalent races of stem rust (*Puccinia graminis* sp. *tritici*), leaf rust (*Puccinia recondita* sp. *tritici*), Wheat Streak Mosaic Virus and ergot (*Claviceps* sp.)	• Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh.
Phaseolus vulgaris (French bean)	EC 528359 AVRDC	Resistant to rust (*Uromyces appendiculatus*)	• Horticultural and Agroforestry Research Programme, Ranchi, Jharkhand. • NBPGR Regional Station, Shimla, Himachal Pradesh.
Var. MAB 84	EC 530832 USA	Resistant to angular leaf spot (*Phaeoisariopsis griseola*)	• GB Pant University of Agriculture and Technology, Pantnagar, Uttranchal. • NBPGR Regional Station, Shimla, Himachal Pradesh.

Crop. name	Acc. No./ Country	Salient features	Distribution
	EC 530891	Resistant to rust *(Uromyces appendiculatus)*	• GB Pant University of Agriculture and Technology, Pantnagar, Uttranchal. • NBPGR Regional Station, Shimla, Himachal Pradesh.
	EC 530898 CIAT, Columbia	Common bacterial blight *(Xanthomonas campestris* pv. *phaseoli)* resistant	• GB Pant University of Agriculture and Technology, Pantnagar, Uttranchal. • NBPGR Regional Station, Shimla, Himachal Pradesh.
	EC 528616-618 USA	Resistant to Curly Top Virus (CTV) and Bean common Mosaic Virus (BCMV)	• Horticultural and Agroforestry Research Programme, Ranchi, Jharkhand. • NBPGR Regional Station, Shimla, Himachal Pradesh.
Brassica napus (Rapessed)	EC 520224 USA	Broad adaptation ability	• National Research Centre for Rapessed and Mustard. Bharatpur, Rajasthan. • NBPGR Regional Station, Shimla, Himachal Pradesh.
Glycine max (Soybean)	EC 528619-629 AVRDC, Taiwan	Rust *(Phakopsora pachyrhizi)* resistant lines	• Nirmal Agricultural Research and Development Foundation, Jalgaon, Maharashtra.
Helianthus annus (Sunflower)	EC 524065-070 Bulgaria	Resistant to alternaria blight *(Alternaria helianthi)* and head rot *(Sclerotina scleotiorum*	• Directorate of Oilseeds Research, Hyderabad, Andhra Pradesh.
Sesamum indicum (Sunflower)	EC 519382 Bulgaria	Resistant to Antigastra, powdery mildew (*Microsphaera diffusc.*), wilt and bacterial blight *(Ralstonia solanacearum)*	• PC (Sesame and Niger), JNKVV, Jabalpur, Madhya Pradesh. • NBPGR Regional Station, Akola, Maharashtra.
Lycopersicon esculentum (Tomato)	EC 515140-5141 AVRDC Taiwan	Resistant to Tomato Yellow Leaf Curl Virus (TYLCV), bacterial wilt (*Ralstonia solanacearum*) and Tobacco Mosaic Virus (TMV)	• M/s Manjushtree Plantation Ltd., Tamil Nadu.
	EC 515144-5155 AVRDC Taiwan	Resistant to bacterial wilt (*Ralstonia solanaceraum), Tobacco mosaic virus* (TMV) and race F1 of fusarium wilt	• M/s Manjushree Planation Ltd, Tamil Nadu.
	EC 528360-369 AVRDC Taiwan	Resistant to Whiefly Transmitted Gemini virus (WTG), bacterial wilt *(Ralstonia solanacearum)*, tomato yellow leaf curl virus (TYLCV), Fusarium wilt race-(F1), race-2 (F 2) and Stemphyllium grey leaf spot	• Indian Institute of Vegetable Research Varanasi, Uttar Pradesh. • NBPGR, New Delhi.
Lycopersicon peruvianum	EC 532633 USA	Resistant to Tomato Leaf Curl Virus	• Indian Institute of Horticultural Research, Bangalore, Karnataka.

Crop. name	Acc. No./ Country	Sailent features	Distribution
Capsicum annuum (Chillies)	EC 533896-901 USA	Resistant to southern knot nematode *(Meloidogyne incognita)*	• Indian Institute of Horticultural Research, Bangalore, Karnataka.
Capsicum sp.	532396-89 AVRDC, Taiwan	Resistant to bacterial wilt *(Ralstonia solanacearum)* and poty virus-Y	• Punjab Agricultural University, Ludhiana, Punjab. • Indian Institute of Vegetable Research, Varanasi, UP.
Citrullus sp.	EC 531947-532028 USA	Resistant to anthracnose race II, Mosaic Virus II, powdery mildew, downey mildew	• Pradham Biotech Pvt. Ltd., Hyderabad, Andhra Pradesh.
Nicotiana tabacum (Tobacco)	EC 516587-586 USA	Resistant to black shank root knot nematode, granville wilt, Tobacco Mosaic Virus (TMV), southern root knot nematode *(Meloidogyne incognita)*	• Central Tobacco Research Institute, Rajahmundry, Andhra Pradesh.
		B. Abiotic stress tolerant	
Oryza sativa (Rice)	EC 517348-401 IRRI, Philippiness	Salinity tolerant lines	• Pt. Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, Kerala.
	EC 526554-561 IRRI, Philippiness	Submergence tolerant lines	• Narendra Dev University of Agriculture and Technology, Faizabad, Uttar Pradesh.
	EC 526562-614	Salt tolerant lines	• Narendra Dev University of Agriculture and Technology, Faizabad, Uttar Pradesh.
	EC 526615-620 IRRI, Philippines	Zinc deficiency tolerant lines	• Narendra Dev University of Agriculture and Technology, Faizabad, UP.
Triticum aestivum (Wheat) Var.Sabbe	EC 528127 USA	Good Winter hardiness	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
	EC 533526-531	Drought resistant populations	• Birsa Agricultural University, Ranchi, Jharkhand. • Banaras Hindu University, Varanasi, Uttar Pradesh. • Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Zea mays (Maize)	EC 517308 USA	Lodging tolerant	• Sher-e-Kashmir University of Agricultural Science and Technology (K), Jammu and Kashmir. • Directorate, of Maize Research, IARI, New Delhi.
Hordeum vulgare (Barley)	EC 523339 Canada	Lodging tolerant	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var. Farmingtion	EC 527044 USA	Lodging tolerant	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Triticale Var. TCLF AN 31 Var, TCLF AN 34	EC 537921-22 CIMMYT, Mexico	Low pH tolerant lines	• Indian Grassland and Forage Research Institute, Jhansi, Uttar Pradesh.

Crop. name	Acc. No./ Country	Sailent features	Distribution
Cicer arietinum (Chickpea)	EC 519355-9381 Australia	Cold tolerant lines	• Punjab Agricultural University, Ludhiana, Punjab. • Indian Institute of Pulses Research, Kanpur, UP.
	EC 530806-808 Australia	Chilling tolerant lines	• Punjab Agricultural University, Ludhiana, Punjab. • Indian Institute of Pulses Research, Kanpur, UP.
Phaseolus vulgaris (French bean)	EC 530819 CIAT, Columbia	Heat tolerant	• GB Pant University of Agriculture and Technology, Pantnagar, Uttranchal. • NBPGR Regional Station, Shimla, Himachal Pradesh.
	EC 530858 CIAT, Columbia	Drought resistant	• GB Pant University of Agriculture and Technology, Pantnagar, Uttarachal. • NBPGR Regional Station, Shimla Himachal Pradesh.
Pisum sativum (Pea)	EC 530809-819 USA	Heat tolerant lines	• Horticultural and Agroforestry Research Programme, Ranchi, Jharkhand.
Seasmum indicum (Sesame)	EC 520261-62 Sri Lanka	Excessive moisture tolerant types	• Project Coordinator (Seasame and Niger), JN Krishi Vishvavidyalaya, Jabalpur, Madhya Pradesh. • NBPGR Regional Station, Akola, Maharashtra NBPGR, New Delhi.
Salix alba (Willow)	EC 515105 Hungary	Flood tolerant line	• YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh.
		C. Quality traits	
Triticum aestivum (Wheat) Var. Intrada	EC 533532 USA	Good bread making quality	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.- Wahoo	EC 533533 USA	Good milling and baking quality	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Explorer	EC 523376 USA	Excellent baking quality	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Zea mays (Maize)	EC 531818-30 CIMMYT, Mexico	Germplasm having high amylose, high oil content with good protein quality	• Directorate of Maize Research, IARI, New Delhi. • NBPGR, New Delhi.
	EC 531831-834 CIMMYT, Mexico	White and yellow grained quality protein maize (QPM)	• Directorate of Maize Research, IARI, New Delhi. • NBPGR, New Delhi.
	EC 517102-106 Bulgaria	High protein content	• Directorate of Maize Research, IARI, New Delhi. • NBPGR, New Delhi.
Hordeum vulgare (Barley) Var. Drummond	EC 533523 USA	Superior malting quality, plump kernels	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var. Farmington	EC 527044 USA	Semi-dwarf, two rowed; spring feed barley, plump kernels, and good malting quality, high grain protein (11%)	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.

Crop. name	Acc. No./ Country	Sailent features	Distribution
Var. AC Ranger	EC 523339 Canada	Six rowed, spring forage barley with superior forage quality	• Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh.
Phaselous vulgaris (French bean)	EC 530828 CIAT, Columbia	High iron content	• GB Pant University of Agricultrue and Technology Pantnagar, Uttranchal. • NBPGR, New Delhi.
Macroptilium atropurpureum (Horse gram)	EC 533895 Australia	Forage type	• Indian Grassland and Fooder Research Institute, Jhansi, UP. • NBPGR Regional Station, Jodhpur, Rajasthan.
Helianthus annuus (Sunflower)	EC 517095-96 Bulgaria	High oil content type	• Directorate of Oilseeds Research Hyderabad, Andhra Pradesh. • NBPGR, New Delhi.
	EC 524065-070 Bulgaria	High oil type (>48-50%) with high oletic acid (>60%) content	• Directorate of Oilseeds Research Hyderabad, Andhra Pradesh. • NBPGR, New Delhi.
Linum usitatissimum (Linseed)	EC 537910 Canada	Germplasm having low linolenic acid	• Punjab Agricultural University, Ludhiana, Punjab. • Project Coordinator, Linseed, CSAUA&T, Kanpur, Uttar Pradesh. • NBPGR RS, Akola, Maharashtra.
	EC 537911-12 Canada	Germplasm having high linolenic acid	• Punjab Agricultural University, Ludhania, Punjab. • Project Coordinator Linseed, CSAUA&T Kanpur, Uttar Pradesh. • NBPGR RS, Akola, Maharashtra.
Carthamus tinctorius (Safflower)	EC 523375 USA	High oil content type (>40%)	• Directorate of Oilseeds Research, Hyderabad Andhra Pradesh. • NBPGR RS, Akola, Maharashtra.
Gossypium hirsutum (Cotton)	EC 516301-02 USA	Good fibre quality	• Paras Extra Growth, Hyderabad, Andhra Pradesh.
Hibiscus cannabinus (Roselle)	EC 532034-52 USA	Good fibre quality	• CRIJAF, Barrackpore, West Bengal. • NBPGR, New Delhi.
Lycopersicon esculentum (Tomato)	EC 515142-43 AVRDC, Taiwan	Contains ten times more beta carotene than a red fruited tomato	• Manjushree Planation Hosur, Karnataka.
Lycopersicon esculentum var *cerasiforme*	EC 531800-801 AVRDC, Taiwan	High beta carotene, fresh market use cherry type	• Indian Institute of Vegetable Research, Uttar Pradesh. • NBPGR, New Delhi.
Opuntia ficus indica (Cactus)	EC 527043 CIMMYT, Mexico	Edible cactus	• Central Institute of Arid Horticulture, Bikaner, Rajashtan.
Nicotiana tabacum (Tobacco)	EC 517324-25	Flue cured variety	• Central Tobacco Research Institute, Rajahmundry, AP.

Crop. name	Acc. No./ Country	Sailent features	Distribution
	EC 519004-06	Hybrid barley type	• Central Tobacco Research Institute, Rajahmundry, AP.
		D. Agronomic traits	
Oryza sativa (Rice)	EC 512353-361 IRRI, Philippines	New plant types (NPT), less tillering, all tillers bear panicle, more no of grains per panicle and high harvest index	• Tamil Nadu Agricultural University Coimbatore, Tamil Nadu.
	EC 513198-237 IRRI, Philippines	New plant types (NPT), less tillering, all tillers bear panicle, more no. or grains per panicle and high harvest index	• Directorate of Rice Research, Hyderabad, Andhra Pradesh.
	EC 518781-820 IRRI, Philippines	New plant types (NPT), less tillering, all tillersbear panicle, more no. or grains per panicle and high harvest index	• Shere-e-Kashmir University of Agriculture Science and Technology (K) Shalimar, Srinagar, Jammu & Kashmir.
Triticum aestivum (Wheat) Var.-Sisson	EC 533525 USA	Early maturing high yielding	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Tara	EC 527045 USA	High grain yield	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Sabbe	EC 528127 USA	Excellent straw strength and yield potential	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Intrada	EC 533532 USA	High yielding, high weight	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Var.-Zak	EC 524892 USA	High grain yield, semi dwarf	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Hordeum vulgare (Barley) Var.-Trochu	EC 532634 Canada	High yielding	• Directorate of Wheat Research, Karnal, Haryana. • NBPGR, New Delhi.
Triticale Var.-TCLF AN 31 Var-TCLF AN 34	EC 537921 Mexico EC 537922 Mexico	Hexaploid triticale, good forage quality	• Indian Grassland and Fodder Research Institute, Jhansi Uttar Pradesh.
Var.-NE 422 T	EC 534274 USA	High yielding, superior forage quality	• Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh.
Vicia villosa	EC 517311 USA	Ealy flowering and high yielding	• Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh. • NBPGR Regional Station, Bhowali, Nainital.
Capsicum sp.	EC 532386-89 AVRDC, Taiwan	Cayenne type	• Punjab Agricultural University, Ludhiana, Punjab. • Indian Institute of Vegetable Research Varanasi, Uttar Pradesh.

Crop. name	Acc. No./ Country	Sailent features	Distribution
Gossypium hirsutum (Cotton)	516300 USA	Early maturing	• Paras Extra Growth, Hyderabad, Andhra Pradesh.
Salix alba (Willow)	EC 515100-105 Hungary	High yielding, fast growing	• YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh.
		E. Lines for heterosis exploitation	
Oryza sativa (Rice)	EC 51691-235 IRRI, Philippines	CMS, maintainers and restorer lines	• Vibha Agrotech Ltd., Hyderabad, Andhra Pradesh.
	EC 523464-486 IRRI, Philippines	CMS, maintainers and restorers	• Pt. Jawaharlal Nehru College of Agriculture and Research Institute Karaikal, Kerala.
	EC 523487-489 IRRI, Philippines	TGMS lines	• Pt. Jawaharlal Nehru College of Agriculture and Research Institute Karaikal, Kerala.
	EC 523487-489 IRRI, Philippines	TGMS lines	• Pt. Jawaharlal Nehru College of Agriculture and Research Institute Karaikal, Kerala.
	EC 523490-91 IRRI, Philippines	Wide compatibility genes	• Pt. Jawaharlal Nehru College of Agriculture and Research Institute Karaikal, Kerala.
Pennisetum glaucum (Pearl millet)	EC 516577-83 USA	CMS and restorer lines	• All India Coordinated Research Project on Pearl Millet, Mandor, Rajasthan. • NBGPR Regional Station, Jodhpur, Rajasthan.

The NBPGR is continuing its efforts to identify promising germplasm through literature search and personal contact; and to introduce the same for utilization by Indian plant breeders.