Utilization of Exotic Germplasm in Improvement of Pulses

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Key Words: Exotic, Germplasm, Pulses, Utilization

The extent of variability in genetic resources collection of crops, and the effectiveness of its use are crucial for crop improvement programmes. This is more so in case of pulses since about 80 percent of these are grown on marginal lands characterized by moisture, temperature and fertility stress. Collectively, these groups of crops are notoriously sensitive to the vagaries of weather and climate, as a result they have been largely selected for features of adaptive value. Pulses have faced serious genetic erosion in their past evolutionary history since a large part of their genetic variability has been lost in the process of their adaptation to stress environment. Incorporation of diverse gene pools (from geographically diverse materials expected to have been subjected to different selection pressures), using intensive hybridization, would make it possible to recreate some of the lost variability in respect of productivity and other desirable traits. The National Bureau of Plant Genetic Resources has made considerable efforts in facilitating the free flow and exchange of pulse crop germplasm to strengthen the National Crop Improvement Programmes. Germplasm introduced in India comprising cultivated, elite lines, breeding lines, wild species and commercial varieties have played a significant role in the development of varieties and hybrids in pulse crops and figure prominently in the list of promising materials, original source material and parental lines of improved cultivars (Gautam *et al.*, 2000, Shanmugam *et al.*, 1995, 2003). The National Genebank at NBPGR holds 5,412 accessions of exotic pulse crop germplasm in the long-term storage facility. These comprise chickpea (1,758), pigeonpea (157), green gram (449), lentil (484), pea (622), cowpea (633), French bean (562), *Lathyrus* (163), moth bean(22), horsegram(8), guar (40), faba bean (228), adzuki bean (77), rice bean (175), winged bean (43), scarlet runner bean (26), sword bean (1) lima bean (2)and lablab bean (2) (Table 1).

Table 1. Traits available in exotic pulse germplasm and varieties released in different crops using exotic lines

Crops	Traits	Varieties released using exotic germplasm
Chickpea	Resistant to Ascochyta blight, Fusarium wilt, grey mold, leaf miner and pod borer, cold and drought tolerance, high yield and bold seeds, earliness, tall stature, erect growth habit, high nodulation, multiple resistance, photo insensitive, high seed protein content, kabuli types	C104, L550, L144, BG1003, BG203, BG209, BG261, BG244, BG267, BG391, BG1053(K), Gaurav, PhuleG 12, PBG1, BGD72
Pigeonpea	Early and medium duration, high yield, short stature	Sharda, Mukta, Pusa Ageti, Hy1, Hy2, Hy4, Hy5
Green gram	Resistant to Tungro mosaic virus, Cercospora leaf spot, powdery mildew and bruchids, wide adaptability, early, tolerant to drought, flood and heat, photoperiod insensitive, high yield, short and long duration, bold seeds and long pods	PS-16, Pusa 105, Vishal, RMG62, RMG492, Jalgaon 781
Urd bean	Resistant to bruchids, bean fly and yellow mosaic virus and high yield	
Lentil	Early, good plant vigour, bold seed, resistant to vascular wilt,Ascochyta, leaf minor, winter hardy, multiple resistance, high yield, drought tolerant	Narendra masoor-1, Mota masoor
Pea	Earliness, dwarf plant type, high seed no./ pod, long pod, powdery mildew, Ascochyta and Fusarium wilt resistant, drought tolerant, sugary pod, high yield, high seed protein content (>27%)	HPF4, KPMR522, KPMR400 DDR23, Uttra, Pusa Pragati, Arka Ajit
Cowpea	Resistant to aphid, bruchid, thrips and striga, powdery mildew, mosaic virus and charcoal rot, adaptation to tropical conditions, early, drought tolerant, high grain yield, bushy and dwarf types, long pods, bold seeds, photo insensitive	Aseem, C 152, S288, Shweta, Pusa Sawani, Rituraj, Co2, Co4, PTB-1, S488, Pusa Phaguni
Lathyrus	Low neurotoxin content, high yielding and drought tolerant.	
Moth bean	High yield, high branching, suitable for green manure and forage, resistant to YVMV.	
French bean	High yield, resistant to bacterial blight and BCMV, dwarf, early maturing, good seed color	PDR 14, Shalimar Rajmah
Rice bean	High yielding, drought tolerant, earliness	CXM P12-1
Faba bean	High yielding, resistant to chocolate leaf spot disease Ascochyta blight, Fusarium wilt, root knot nematode and heat tolerant	
Lablab bean	Bruchid resistant and high yielding	
Horsegram	High productivity	Hebbal Hurli-2
Guar	Photo insensitive and dwarf types	Suvidha, Naveen

Introduction of wild species of various pulses viz. *Cicer reticulatum, C. echinospermum, C. canariensis, C. oxoydon, C. anatolicum* and *C. songaricum*; *Cajanus albicans, C. platycarpus, C. cajanifolia, C. cinereus, C. scarabeoides, C. kerstingii, C. judaicum, C. pinnatifidum, C. cuneatum, C. yamashitae, C. bijugum; Lens culinaris, L. orientalis, L. nigricans, L. odemensis; Lathyrus cicera, L. cilliolatus, L. ochrus* and similarly in other pulses, have enriched our collections and contributed to germplasm enhancement and pre breeding.

References

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Performance of Exotic Pulses in Arid and Semi-Arid Region of India

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Key words: Exotic Pulses; Characterization; Promising Accessions

Pulses have been grown in India since time immemorial under various agro-ecological situations. This led to the development of enormous genetic variability during the course of evolution (Asthana, 1988). India is an important centre of diversity for several grain legumes (De Condolle, 1884; Vavilov, 1926; Zhukovsky, 1950). The important pulses grown in the arid and semi-arid region of India are chickpea (*Cicer arietinum*), cowpea (*Vigna unguiculata*), field pea (*Pisum sativum*), guar (*Cymaopsis tetragonoloba*), horsegram (*Macrotyloma uniflorum*), mothbean (*V. aconitifolia*), mungbean (*V. radiata*), pigeonpea (*Cajanus cajan*) and Urd bean (*V. mungo*). National Bureau of Plant Genetic Resources, New Delhi has been endeavouring to build up the genetic resources in pulses from India as well as from abroad. Present communication deals with characterisation, preliminary evaluation and identification of promising accessions in exotic cowpea, guar, mothbean and mungbean germplasm.

Four hundred and twelve exotic accessions comprising of cowpea (269 accessions), guar (12 accessions), mothbean (48 accessions) and mungbean (83 accessions) including two wild species of guar (*Cyamopsis senegalensis* and *Cyamopsis serrata*) were introduced from Mexico, Nigeria, Srilanka, Taiwan, USA and erstwhile USSR during 1975-2004 through NBPGR, New Delhi. These accessions were characterized for various morpho-agronomical traits at NBPGR Regional station, Jodhpur (26° 18' N and 73° E, altitude 224m) during *kharif* seasons of 1976-1977, 1978-1979, 1991-1992, 1994-1995 and 2004-2005 in an augmented design under rainfed (cowpea, guar and mothbean) and irrigated conditions (mungbean). Each accession was grown in two rows of 3m length, with inter and intra-row spacing of 60 and 15 cm, respectively. The data were recorded on five plants selected randomly from each of the accessions and observations were recorded on plant habit and height; size, shape and colour of leaves; days to 50% flowering and maturity; flower colour; number of branches; cluster per plant; pods per cluster and per plant; length of cluster, peduncle and pod; shape and colour of pod; presence of pod grooves and beak; size, shape and colour of seeds; seed hilum/eye colour; type of seeds; number of seeds per pod; pod and seed yield per plant and 100 seed weight. The data for individual plants were pooled and range, mean, standard deviation and phenotypic coefficient of variation were calculated for the observed parameters.

There was considerable variability in the introduced germplasm of each crop for most of the important traits (Table 1). Early maturing grain type accessions were EC 101929, EC 109493-2010-1 (cowpea); EC 37745 (guar); EC 100065 (mothbean); EC 520038 and EC 520041 (mungbean). Maximum number of branches was recorded in EC 36954 (guar); EC 100064, EC 100066 (mothbean); EC 512792 and EC 520009 (mungbean).