



Ancestral analysis of soybean varieties: An overview

C. Tara Satyavathi¹, P.G. Karamakar, Ch. Bharadwaj and S.P. Tiwari

National Research Centre for Soybean, Khandwa Road, Indore 452 017

(Received: December 2001; Revised: January 2003; Accepted: January 2003)

Soybean [*Glycine max* (L.) Merrill] is the third most important oilseed crop after groundnut and rapeseed mustard in India. Narrow genetic base of the soybean varieties released in India is one of the most important cause of the low average national yields. To study the genetic base of the soybean varieties of India, the pedigree information of 66 released and notified soybean varieties of India from 1968-2000 was obtained from the Soybean Varieties of India [1] and from variety release/notification proposals and notification details published by Government of India from time to time. The formal soybean breeding in India started only after the initiation of All India Coordinated Research Project on Soybean (AICRPS) in 1968 by Indian Council of Agricultural Research (ICAR), can be conveniently looked at in 3 different phases i.e. 1968-1980, 1981-1990 and 1991-2000 (Table 1).

Table 1. Breeding methods and average number of parents per variety during different time periods

Breeding method	1968-1980	1981-1990	1991-2000
Introduction	7	1	-
Selection	6	3	8
Hybridization	4	15	18
Mutation	1	1	2
Average number of parents per variety	1.39	1.30	1.07

Traditionally soybean breeders initiated the breeding programmes with pureline selection or natural variant selections within land races that led to the development of cultivars like Kalitur and Type 49 or from the exotic introductions such as Lee, Bragg, Davis, Improved Pelican, Clark 63 etc. The genetic base of a crop may be thought of as the foundation upon which cultivar production rests and may be defined as all those genetic stocks/ ancestors that have contributed to a cultivar development/improvement [2]. The decrease in the average number of parents per variety is a clear indication of the narrowing genetic base of the new varieties. Most of the Indian cultivars were derived from a limited number of common ancestors

(Table 2). Three groups of ancestors, 8 from exotic introductions, 7 from varieties and breeding lines and 6 from land races were identified to be frequently appearing in the pedigree of the Indian cultivars. Land races have also contributed to 9 varieties. This shows the repeated use of few parents for breeding programmes indicating the reason for narrowing down of the genetic base.

Table 2. Main ancestors and the number of cultivars derived from them

Exotic introduction	No. of cultivars	Breeding lines and varieties	No. of cultivars	Land races	No. of cultivars
Bragg	12	Punjab-1	5	JS 2	3
Improved Pelican	5	JS 80-21	3	Kalitur	2
Hardee	4	PS 73-7	2	Tehri Garhwal material	1
CNS	4	Hark	2	Type 49	1
Lee	3	UPSM534	2	VHC 3055	1
Semmes	2	PK 317	2	VHC 856007	1
EC 7034	2	PK 416	2		
EC 39821	2				

There existed four types of parentage for Indian soybeans, i.e., land races, released/improved cultivars, breeding lines and exotic introductions. The importance of the four types of parentage varied with the advance of soybean breeding. For cultivars released before 1980, almost all the parents were either exotic introductions or land races. For those released during 1981-90, the parentage included 65.72% exotic introductions, 20.0% breeding lines, 8.57% land races and 5.71% cultivars. For the varieties released and notified during 1991-2000, the parents comprised 8.51% land races, 21.28% exotic introductions, 34.04% cultivars and 36.17% breeding lines. There appeared a tendency to utilize more often the breeding lines as parental material during this period. Though the contribution of the breeding lines increased during 1991-2000 compared

to 1981-90, the genetic base in terms of average number of parents per variety is reduced because of the repetitive use of the same parents for the development of the genetic stock or breeding material. Though with advance in time, the number of pairing ways of parents in hybridization has increased, the genetic base of the varieties has not widened due to the repeated use of the same parents in different combinations. Also in the recent years there was an increasing trend of use of cultivar \times breeding line and cultivar \times cultivar in the parentage. Most of the Indian soybean varieties come from a few exotic introductions and breeding lines generated using the exotic introductions and the native land races. These were then repeatedly crossed with the existing cultivars and were further crossed among themselves. This led to a sort of inbreeding within a selected group of genotypes and has contributed to the decline in the average number of parents per variety. This trend of narrowing genetic base of the Indian soybean varieties is a major concern and challenge put forward to the Indian soybean

breeders. This challenge may be met through widening the genetic base of the soybean varieties through the efficient use of unexploited variability present in the germplasm and wild annual as well as perennial *Glycine* species in breeding programmes [3]. Apart from this soybean breeding in India can take remarkable strides in combination with molecular breeding and biotechnology.

References

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