

## Variability Studies in Soybean [*Glycine max* (L.) Merrill]

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### Abstract

Genetic variability, heritability and genetic advance were studied for thirty genotypes of soybean sown in RBD with three replications and data was analysed for eleven quantitative characters. It was observed that high amount of genetic variability with high heritability was present for most of the yield components studied.

**Key words:** Genetic variability, heritability, genetic advance and soybean

Examination of genetic variance is important for plant breeder in general and particularly in a crop like soybean, which is grown commercially in India. New genotypes are an important source to help and meet our national food and oil demand as well as in the development of commercial varieties on the basis of desirable plant traits (Dong *et al.*, 2001). The extent of genetic variability available in a crop is pre-requisite for crop improvement due to the fact that efficiency of selection depends mainly on it. Heritability is a good index of transmission of quantitative characters from parents to their offspring given by Falconer, (1989). Improvement in the mean genotypic value of selected plants over parental population is known as genetic advance. Thus, there is a need to study genetic variability, heritability and genetic advance in soybean.

### Materials and Methods

The 30 genotypes of soybean were sown at Botany Farm, College of Agriculture, Pune during *khariif*, 2013 in a randomized block design with three replications and observations were recorded for randomly selected five plants for eleven characters viz., days to 50 per cent flowering, days to maturity, plant height (cm), number of branches per plant, number of pods per plant, number of seeds per pod, 100 seed weight (g), seed yield per plant (g), protein

content (%), oil content (%) and pod shattering (%).

Phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were estimated by using the formula suggested by Burton (1952). Genetic advance was calculated by the formula given by Johnson *et al.* (1955 a).

### Results and Discussion

Variability in seed yield per plant ranged from 13.59 to 56.81 g with general mean 26.06 g. Similarly, the other characters also showed wide range of variability viz., days to 50% flowering (36.87 to 51.53), days to maturity (91.20 to 118.13), plant height (33.40 to 60.13 cm), number of branches per plant (3.40 to 8.47), number of pods per plant (48.33 to 130.33), number of seeds per pod (2.07 to 3.13), 100 seed weight (11.48 to 20.16 g), protein content (35.34 to 35.79 %), oil content (19.96 to 20.64 %) and pod shattering (9.03 to 20.71 %).

The genotype KDS-726 recorded highest *per se* performance for seed yield per plant, 100 seed weight and oil content. NRC-94 recorded higher number of pods per plant and number of seeds per pod. Similarly, KDS-722 exhibited desirable *per se* performance for plant height and number of branches per

plant. In the present study, the genotypes RKS-115 and JS-335 were the earliest to flower, while JS-9305 and Monetta were earliest to mature. Therefore, it can be concluded that genotypes *viz.*, KDS-726, NRC-94, KDS- 722, RKS-115, JS-335, JS-9305 and Monetta were the best genotypes having desired *per se* performance for yield components and can be used as potential parents in future crop improvement programme.

The phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all characters. This indicates the effect of environmental factors on these characters. The characters seed yield per plant, number of pods per plant, pod shattering, number of branches per plant and plant height showed higher estimates of GCV and PCV. This shows presence of large variation in the genotypes for these characters. Therefore, simple selection can be opted for the improvement of these characters.

The estimates of GCV and PCV were high for plant height, number of pods per plant and seed yield per plant. These results were in confirmation with the findings of Ramana *et al.* (2000) and Patil *et al.* (2011). In addition to this, similar results were obtained by Agrawal *et al.* (2001), Saharan *et al.* (2006) and Datt shiv *et al.* (2011) for number of branches per plant and plant height.

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Chamundeswari and Aher (2003), Kumar *et al.* (2013) and Osekita and Ajayi (2013) obtained similar results for seed yield per plant.

In the present study, high heritability values were observed for seed yield per plant, followed by 100 seed weight, days to maturity, plant height and days to 50% flowering, which indicates the least influence of environment on these characters. Similarly, high heritability for protein content, pods per plant and 100 seed weight was observed by Ramana *et al.* (2000), Dhillon *et al.* (2005), Patil *et al.* (2011) and Osekita *et al.* (2013).

In present investigation, high heritability with high genetic advance was observed for plant height, number of pods per plant and seed yield per plant. Similar finding were reported by Ramana *et al.* (2000), Agrawal *et al.* (2001) and Patil *et al.* (2011).

From the present study, it was observed that plant height, number of pods per plant, 100 seed weight and seed yield per plant are important characters which can be considered for future yield improvement programme in soybean

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**Table No. 1. Parameters of genetic variability in 30 genotypes of soybean**

Sr. No.	Character	Mean	Range	GCV (%)	PCV (%)	h <sup>2</sup> % (B.S)	Genetic Advance	Gen. Adv as % of Mean
1	Days to 50% flowering (No.)	42.53	36.87-51.53	10.12	10.14	99.56	8.85	20.80
2	Days to maturity (No.)	109.55	91.20-118.13	6.86	6.87	99.83	15.48	14.13
3	Plant height (cm)	47.22	34.40-60.13	16.61	16.63	99.69	16.13	34.16
4	Branches/plant (No.)	4.89	3.40-8.47	17.61	18.83	87.48	1.66	33.93
5	Pods/plant (No.)	82.53	48.33-130.33	23.39	23.44	99.53	39.67	48.07
6	Seeds/pod (No.)	2.57	2.07-3.13	9.77	12.70	54.54	0.40	15.50
7	100 seed weight (g)	15.32	11.48-20.16	14.03	14.04	99.87	4.43	28.89
8	Seed yield/ plant (g)	26.06	13.59-56.81	38.11	38.12	99.95	20.45	78.49
9	Protein content (%)	35.58	35.34-35.79	0.32	0.40	64.10	0.19	0.53
10	Oil content (%)	20.27	19.96-20.64	0.85	0.88	92.50	0.34	1.68
11	Pod shattering (%)	15.05	9.03-20.71	21.57	21.84	97.52	6.60	43.87

**Table 2. Mean performance of 8 clusters for 11 characters in soybean**

Cluster no.	Days to 50% flowering (No.)	Days to maturity (No.)	Plant height (cm)	Bran-ches/ plant (No.)	Pods/ plant (No.)	Seeds/ pod (No.)	100 seed weight (g)	Seed yield/ plant (g)	Protein content (%)	Oil content (%)	Pod shattering (%)
<b>I</b>	41.46	108.73	46.10	4.73	78.13	2.54	15.26	22.76	35.58	20.31	14.60
<b>II</b>	47.22	115.15	55.03	5.88	93.78	2.80	17.06	30.80	35.64	20.17	17.05
<b>III</b>	48.80	117.13	60.07	4.87	64.53	2.33	13.67	17.15	35.56	20.26	12.51
<b>IV</b>	38.40	91.20	34.40	4.73	64.40	2.27	15.61	26.35	35.35	19.97	12.18
<b>V</b>	40.40	113.93	45.87	5.80	102.40	2.67	11.48	14.88	35.46	20.08	19.56
<b>VI</b>	41.80	115.04	45.51	4.62	114.17	2.73	13.88	40.05	35.64	20.25	18.78
<b>VII</b>	40.40	93.47	41.07	4.33	48.33	2.73	14.14	13.59	35.51	20.06	9.03
<b>VIII</b>	47.53	107.87	48.60	4.47	74.93	2.13	20.16	56.81	35.64	20.64	10.72