



## Research Article

# CORRELATION AND PATH COEFFICIENT ANALYSIS IN INDUCED MUTANTS OF SOYBEAN (*Glycine max* (L.) Merrill)

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**Abstract:** Correlation and path analysis was carried out using 123 mutants of soybean for 10 component characters including seed yield pods per plant, pod weight per plant, number of branches per plant, 100 seed weight and oil content had positive and significant correlation with seed yield both at genotypic and phenotypic levels. Path analysis showed positive and high direct effect of number of pods per plant and pod weight per plant and indirect effect of other component characters through these characters towards seed yield per plant. Hence, these traits should be given more emphasis while selecting mutants for yield improvement in soybean.

**Keywords:** Soybean, Correlation, Path analysis, Seed yield

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## Introduction

Soybean is world's leading grain legume crop. It is rich, cheap and easily available source of best quality protein (40%), oil (20%) and carbohydrate (23%). Productivity of soybean in India is very low (763 kg/ha) as compared to world's average yield of 2240 kg/ha. Therefore, organized and concerted efforts are required to enhance its productivity. Yield is a complex polygenic character. Thus, direct selection would not be a reliable approach on account of it being highly influenced by environmental factors. Correlation provides information on the nature and magnitude of association of different component characters with seed yield. Path analysis permits a critical examination of specific forces acting to produce a given correlation and measure the relative importance of each factor. Thus, characters highly contributing to yield can be selected. Since, mutants serve as the most valuable reservoir in providing needed attributes for developing superior varieties. The presents study was therefore conducted involving 123 lines of soybean genotype JS-335 along with parents.

## Materials and Methods

One hundred and twenty-three mutant lines of soybean genotype JS-335 were raised in augmented randomized block design with three rows of checks during kharif 2013 at Main Agricultural Research Station, BSP/BSP Seed Unit UAS, Dharwad. Each mutant entry was grown in a single row plot of 5 m length with a spacing of 60 cm between rows and 10 cm between plants. Five plants were taken at random from each line and data were recorded on 10 characters viz., days to 50 percent flowering, days to maturity, plant height, number of branches per plant, number of pods per plant, pod weight per plant, 100-seed seed weight, oil content, protein content and seed yield per plant, genotypic and phenotypic correlations were determined according to Fisher, (1954) [1] and Al-jbouri, *et al.* (1958) [2]. The path analysis was done according to the method of Dewey and Lu, (1959) [3].

## Results and Discussion

The values of genotypic correlation coefficient ( $r_g$ ) were higher than the corresponding phenotypic correlation coefficient ( $r_p$ ) for all the characters [Table-1]. This indicated role of environment in the expression of character,

which alter the magnitude of association between the characters. This was in accordance with Shinde, *et al.* (1996) [4]. Ramgiry and Rah, (1997) [5] and Shrivastava, *et al.* (1998) [6] reported in soybean. Seed yield per plant was positively and significantly correlated with number of pods per plant, pod weight per plant, number of branches per plant, 100-seed weight and oil content at both genotypic and phenotypic levels.

Similar results were reported for pods per plant and pod weight per plant by Amaranath, *et al.* (1990) [7], Jagtap and Choudhary, (1993) [8], Shinde, *et al.* (1996) and Taware, *et al.* (1997) [9] for branches per plant and hundred, seed weight by Amaramatha, *et al.* (1990) and Singh and Singh, (1996) [10] for seed yield per plant by Mehetre, *et al.* (1997) [11] and Shrivastava, *et al.* (1998) and for oil content by Ramgiry and Raha, (1997), Shrivastava, *et al.* (1998) and Chamundeswari and Aher, (2003) [12].

Component traits, which are directly correlated with seed yield showed positive and significant association with each other (Table 1). Number of pods per plant showed significant and positive correlation with the number of branches per plant, days to maturity, plant height. pod weight 100 seed weight and seed yield per plant. Similar, results were reported by Srivastava, *et al.* (1998), PooranChand, (1999) [13] and Chamundeswari and Aher, (2003). Seed yield per plant displayed significant positive correlation with plant height, number of branches per plant, pod weight plant, 100-seed weight while it showed negative correlation with oil content and protein content. Hence, it may be concluded that simultaneous selection for these characters would help in improving of yield.

Path coefficient analysis [Table-2] revealed the percent variability of seed yield was explained by these ten character and seed yield per plant showed positive and high direct effects with number of pods per plant and pod weight per plant, indicating that these were the major yield contributing traits in soybean. These findings were in confirmation with Ramgiry and Raha, (1997) who reported the greatest direct effect of pod weight per plant on seed yield. Narne, *et al.* (2002) [14] showed that number of pods per plant and pod weight per plant should be considered in selecting genotypes for higher yield in soybean. Negative direct effect was encountered in the case of days to maturity, plant height, number of branches per plant and 100-seed weight.

Table-1 Genotypic (rg) and phenotypic (rp) correlations among ten characters studied in soybean mutants

Characters	r	Days to Maturity	Plant height (cm)	Number of branches/ plant	Number of pods/plant	Pod weight/ plant (g)	100-seed weight/ plant (g)	Oil content (%)	Protein content (%)	Seed yield/plant (g)
Days to 50 % flowering	rg	0.462**	0.592**	0.249**	0.304**	0.372**	-0.320**	0.080	-0.289**	-0.014
	rp	0.378**	0.524**	0.211**	0.189**	-0.885**	-0.339**	-0.018	0.013	0.084
Days to maturity	rg		0.381**	0.176**	0.377**	0.087	0.064	0.283**	-0.151	-0.067
	rp		0.029**	0.087	0.363**	0.079	0.046	0.452**	0.066	0.073
Plant height (cm)	rg			0.358**	0.042	0.439**	-0.280**	0.741**	0.164	-0.514**
	rp			0.183*	0.032	0.257**	0.255	-0.279**	0.057	-0.257**
Number of branches / plant	rg				0.367**	0.258**	-0.226	-0.168	-0.354**	0.121
	rp				0.343**	0.131*	-0.031	-0.133*	-0.110	0.204*
Number of pods / plant	rg					0.628**	-0.0574**	-0.116	-0.071	0.609**
	rp					0.545**	-0.582**	-0.029	-0.284**	0.505**
Pod weight per plant (g)	rg						0.231*	0.726**	0.155	0.994**
	rp						0.427*	0.531**	-0.071	0.974**
100-seed weight (g)	rg							0.560**	-0.713**	0.224*
	rp							0.679**	-0.127**	0.451**
Oil content (%)	rg								-0.247**	0.212**
	rp								-0.210**	0.553**
Protein content (%)	rg									-0.274*
	rp									-0.354**

\*Significant at 5 percent level of probability, \*\* Significant at 1 percent level of probability

Table-2 Path coefficient analysis matrix of direct (Diagonal) and indirect effect of ten quantitative traits in soybean mutants

Characters	Days to 50% flowering	Days to Maturity	Plant height (cm)	Number of branches/plant	Number of pods / plant	Podweight/ plant (g)	100-seed weight / plant (g)	Oil content (%)	Protein content (%)	Genotypic correlation with Seed yield
Days to 50 % flowering	0.013	-0.002	0.015	0.026	0.005	-0.0365	-0.002	0.004	0.030	-0.414
Days to maturity	0.001	-0.002	0.002	0.007	0.041	0.086	0.000	0.016	0.016	-0.067
Plant height (cm)	0.001	-0.003	-0.03	0.014	0.001	-0.431	0.009	-0.097	0.017	-0.514**
Number of branches/plant	-0.009	-0.007	0.011	-0.038	0.000	0.146	0.000	0.056	-0.037	0.121
Number of pods/plant	-0.004	-0.004	0.001	0.001	0.617	-0.016	0.001	0.006	0.007	0.609**
Pod weight per plant (g)	-0.005	-0.004	0.013	-0.006	0.040	0.983	-0.002	-0.010	-0.016	0.994**
100-seed weight (g)	0.004	0.003	0.039	0.001	0.001	0.227	-0.007	0.031	-0.075	0.224*
Oil content (%)	-0.001	-0.012	0.053	-0.038	-0.002	0.714	-0.004	0.056	-0.164	-0.212**
Protein content (%)	0.004	-0.006	-0.005	0.013	-0.001	-0.153	0.005	-0.087	0.105	-0.271*

Residual = 0.0483, \*Significant at 5 percent level of probability, \*\* Significant at 1 percent level of probability

The characters like days to 50 percent flowering, days to maturity, number of branches per plant, 100-seed weight, oil content and plant height showed high positive indirect effect of seed yield [Table-2]. Thus, based on path analysis, it may be concluded that seed yield per plant is dependent on the number of pods per plant and pod weight per plant and are the important yield determinants. Hence, selection should be practiced for these characters in order to isolate superior mutants having higher yield.

### Conclusion

Based on the path coefficient analysis it is concluded that seed yield per plant showed positive and high direct effects with number of pods per plant and pod weight per plant.

**Application of research:** Study indicating these are the major yield determinant traits in soybean. Hence, selection should be practiced for these characters in order to isolate superior mutants for higher yield.

**Research Category:** Correlation and Path analysis.

**Abbreviations:** JS-335- Jawahar soybean

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**Cultivar / Variety / Breed name:** JS-335- Jawahar soybean

**Conflict of Interest:** None declared

**Ethical approval:** This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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