Int.J.Curr.Microbiol.App.Sci (2018) *7*(9): 1232-1239

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 09 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.709.147

Correlation and Path Analysis in Soybean [*Glycine max* (L.) Merrill]

G.C. Shekar*, Pushpendra, M. Prasanth, H. Lokesha, M. Mahadeva Swamy, K. Lokesh, P.K. Shrotia and Kamendra Singh

College of Agriculture, Kalaburagi, UAS, Raichur-585 101, Karnataka, India

**Corresponding author*

Keywords

Soybean, Correlation, Path analysis, Seed yield and Gamma rays

Article Info

Accepted:
08 August 2018
Available Online:
10 September 2018

A B S T R A C T

The present investigation on study of correlation and path analysis was carried out in soybean cv, PK 1092 treated with three doses of gamma rays (20 kR 30 kR and 40 kR) and three concentrations of Ethyl methane sulphonate (EMS) (0.05%, 0.10% and 0.15%) and their combinations in M_2 generation for twelve quantitative characters. The seed yield per plant had strong positive association with number of pods per plant, number of seeds per pod, total day matters weight (g) per plant, harvest index, seed yield efficiency, oil content and protein content at both genotypic and phenotypic level. The characters days to 50% flowering, day to maturity, number of pods per plant, number of seeds per pod, total days matter weight (g/plant), harvest index, 100 seed weight, oil content and protein content had positive direct effect on seed yield per plant at genotypic level. The selection based on number of pods per plant, number of seed per pod, total day matter per plant, harvest index, seed yield efficiency and 100 seed weight could help in genetic improvement of seed yield per plant in soybean population under study.

Introduction

Soybean (*Glycine max* L. Merrill) is belong to family *Legumeniaceae* is one of the most important oilseed crop in the world that is cultivated mainly for its seed accounting more than 50 per cent of total of all the vegetables oils and ranked number one in world among the major oil seed crop such as rapeseed, groundnut, cotton seed, sunflower, linseed, sesame and safflower (Anonymous, 2016).

Soybean continues to rank number one oilseed crop of India followed by rapeseed and mustard, groundnut and sunflower. The production of the soybean in the country is 14.66 million tons from an area of 10.69 million ha with productivity of 1371 kg/ha (Anonymous, 2013). Among oilseeds, soybean is important oilseed crop grown in Madhya Pradesh, Rajasthan, Andhra Pradesh, Karnataka and Chhattisgarh during *Kharif* season. As yield is a very complex character and depends upon numerous genetic factors interacting with environment, it is always advisable to find out the interrelationship of yield component with highly heritable characters and giving selection pressure of these characters, which accounts for the indirect selection. To accumulate optimum contribution of yield contributing characters, it is essential to know the correlation of various

characters along with path coefficients. The present study was undertaken to estimate phenotypic and genotypic associations between yield contributing characters along with path analysis for developing suitable selection criterion for soybean improvement.

Materials and Methods

The experimental material for the present study consists of 657 individual plant progeny lines of M_2 generation of one soybean [*Glycine max* (L) Merrill] variety PK 1029, a popular variety adapted to North as well as south zone in India from three doses of physical mutagens, gamma-rays (20kR, 30kR and 40kR), three concentrations of Ethyl Methane Sulphonate (EMS) @ 0.05%, 0.10% and 0.15% and their three combinations (20 kR + 0.05% EMS, 20kR + 0.10% EMS and 20kR + 0.15%EMS).

These treated M_2 progenies along with control were raised in separate rows of 4.0 m length, spaced at 45 cm apart, and plant to plant distance was maintained at 5 to 7 cm. in Randomized Complete Block Design (RCBD) with three replications on during *Kharif* season at G.B. Pant University of Agriculture and Technology.

The observations were recorded on three randomly selected plants per replication from each progenies of treated and control population for days to 50% flowering, days to maturity, plant height (cm), number of pods per plant,), number of seeds per plant, total dry matter (g/plant), harvest index (%), seed yield efficiency (%), 100 seed weight (g), oil content (%) and protein content (%).

Correlations between twelve quantitative characters were estimated according to the method given by Singh and Chaudhary (1977); whereas path coefficient analysis was done by method given by Dewey and Lu (1959).

Results and Discussion

The estimates of genotypic and phenotypic correlation coefficients between different characters of soybean genotypes are presented in Table 1 and 2. In present investigation, the total day matter weight exhibited highly significant positive correlation with seed yield per plant at genotypic and phenotypic level. The number of pods per plant is significant and positive correlated with seed yield plant at genotypic level. The harvest index, seed yield efficiency, 100 seed weight, and oil content protein content and number of seeds was positively correlated with seed yield per plant at genotypic and phenotypic level. Days to maturity are significantly positive correlated with seed yield at genotypic level. It suggested that, increase in growth related traits, pod character and growth character might contribute to high yield in soybean. This situation meant to select high yielding genotypes of soybean, it was essential to consider the above characters with their increasing magnitude. It helped in simultaneous improvement of all the positively correlated characters. Similar results were reported by Mehetre *et al.*, (1994), Momin and Mishra (2004) and Samiullah and Wani (2006) who indicated that number of pods per plant is reliable trait for improving the grain yield in soybean. Plant height is negatively correlated with seed yield per plant at genotypic and phenotypic level, where days to 50% flowering negatively correlated with seed yield per plant at genotypic level.

Days to 50% flowering and days to maturity were positively and significantly correlated with each other at both phenotypic and genotypic level, while they had positive correlation with plant height, number of seeds per pod and 100 seed weight (g) and negative correlation with oil content and protein content at genotypic and phenotypic level. These characters positively correlated with

seed yield per plant at phenotypic level and negatively correlated with oil content and protein content at genotypic and phenotypic level. Dhedhi *et al.,* (2016) observed significant and positive correlation for days to maturity with days to 50% flowering.

Plant height, number of seeds per pod is positive and significantly correlated with each other and positively correlated with harvest index, seed yield efficiency, oil content and protein content. It is negatively correlated with number of pods per plant, total dry matter (g/plant), 100 seed weight and seed yield per plant. Number of pods per plant, total dry matter (g/plant) and 100 seed weight is positive and significantly correlated with each other.

The number of seeds per pod is positive and significantly correlated with harvest index, seed yield efficiency, oil content and protein content at genotypic level. Harvest index, number of seeds per good, seed yield efficiency and oil content are positive and highly significantly correlated with each other. 100 seed weight is positive and significantly correlated with number of pods per plant and protein content. Protein content and oil content is positively correlated with each other. These results are in agreement with Mehetre *et al.,* (1994b), Savithramma *et al.,* (1999), Kharkwal (2003), Momin and Misra (2004) Misra and sahu (2005), Konda (2008), Chauhan *et al.,* 2007 Shivade, *et al.,* (2011). On the basis of correlation studies more emphasis is to be given on number of pods per plant and total dry matter per plant as yield contributing characters based on their strong correlation with seed yield per plant in soybean.

When more of variables were considered in correlation, the association becomes more complex and doesn't have the meaningful interpretation obvious. Hence, genotypic correlation portioned into direct and indirect effects to specify the cause and their relative importance (Table 3). Days to 50% flowering, days to maturity, number of pods per plant number of seeds per plant, total dry matter (g/ plant), harvest index, 100 seed weight, oil content and protein content have exhibited positive direct effect on seed yield per plant. These characters have also been identified as major direct contributors towards seed yield in soybean by earlier workers Mehetre *et al.,* (1994b), Kharkwal (2003), Momin and Misra (2004), Misra and Sahu (2005), Amitava and Singh (2007), and Konda 2008 and Shivade *et al.,* (2011).

Plant height showed negative direct effect on seed yield per plant. This character had positive indirect effect through days to 50% flowering, days to maturity, number of seeds per plant, seed yiied efficiency, oil content and protein content, which resulted in negative and non-significant association between plant height and seed yield per plant.

Highest positive direct effect exhibited by total dry matter weight (g/plant) on seed yield per plant. This resulted positive and highly significant association between days to first flowering and seed yield per plant.

The direct positive effect of number of pods per plant and its positive indirect effect through total dry matter (g/plant), harvest index, 100 seed weight, protein content and plant height resulted in positive and significant association with seed yield per plant.

The strong positive association of harvest index was observed due to their positive direct effects on seed yield per plant and positive indirect through days to flowering, days to maturity, plant height, number of pods per plant, number of seeds per pod, oil content and protein content.

Table.1 Genotypic correlation coefficients for yield and its components in soybean

Sl. No.	Character	Days to 50 % flowering	Days to maturity	Plant height (cm)	No. of pods per plant	No. of seeds per pod	Total dry matter (g/plant)	Harvest index (%)	Seed yield efficiency (%)	100- seed weight(g)	Oil content (%)	Protein content (%)	Seed yield per plant (g)
		1	2	3	4	5	6	7	8	9	10	11	12
1.	Days to 50% flowering	1	0.99**	0.20	-0.37	0.40	-0.079	0.02	0.10	0.40	-0.27	-0.18	-0.010
2.	Days to Maturity		1	0.18	-0.28	0.43	0.027	-0.001	0.023	0.50	-0.39	-0.20	0.084
3.	Plant height (cm)			1	-0.10	0.60*	-0.46	0.30	0.08	-0.08	0.34	0.32	-0.27
4.	No. of pods per plant				1	0.01	0.66*	-0.20	-0.05	0.69*	-0.32	0.39	0.56*
5.	No. of seeds per pod					1	0.24	0.72**	0.69*	0.44	0.54*	0.76**	0.41
6.	Total dry matter weight (g) per plant						1	0.16	-0.11	0.43	-0.01	0.34	1.04**
7.	Harvest Index %							1	0.85**	-0.28	0.78**	0.13	0.32
8.	Seed yield efficiency %								1	0.13	0.53	0.30	0.14
9.	100 seeds-weight (g)									1	-0.42	0.54*	0.45
10.	Oil content (%)										1	0.20	0.09
11.	Protein content (%)											1	0.32
12.	Seed yield per plant (g)												1

*, ** denotes significance of correlation coefficient at 5% and 1% respectively.

Table.2 Phenotypic correlation coefficients for yield and its components in soybean

Sl. No.	Character	Days to 50 % flowering	Days to maturity	Plant height (cm)	No. of pods per plant	No. of seeds per pod	Total dry matter (g/plant)	Harvest index (%)	Seed yield efficiency (%)	100- seed weight(g)	Oil content (%)	Protein content (%)	Seed yield per plant (g)
		1	2	3	4	5	6	7	8	9	10	11	12
1.	Days to 50% flowering	1	0.97**	0.14	-0.22	0.21	-0.06	0.06	0.06	0.21	-0.16	-0.19	0.02
2.	Days to Maturity		1	0.11	0.18	0.18	0.01	0.03	-0.007	0.19	-0.17	-0.19	0.08
3.	Plant height (cm)			1	-0.15	0.39	-0.26	-0.05	-0.02	-0.12	0.25	0.20	-0.34
4.	No. of pods per plant				1	0.07	0.55*	0.07	0.006	0.45	-0.15	0.15	0.63
5.	No. of seeds per pod					1	0.19	0.39	0.30	0.36	0.12	0.41	0.27
6.	Total dry matter weight (g) per plant						1	0.008	-0.08	0.36	-0.03	0.25	0.83**
7.	Harvest Index %							1	0.75**	-0.12	0.42	0.08	0.39
8.	Seed yield efficiency %								1	0.07	0.33	0.27	0.13
9.	100 seeds-weight (g)									1	-0.60*	0.31	0.28
10.	Oil content (%)										1	0.11	0.10
11.	Protein content (%)											1	0.19
12.	Seed yield per plant (g)												1

*, ** denotes significance of correlation coefficient at 5% and 1% respectively.

Table.3 Path coefficient analysis for yield and its components in soybean

Sl. No.	Character	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of pods per plant	No. of seeds per pod	Total dry matter (g/plant)	Harvest index (%)	Seed yield efficiency (%)	100-seed weight (g)	Oil content (%)	Protein content (%)
		1	2	3	4	5	6	7	8	9	10	11
1.	Days to 50 % flowering	**0.004**	0.18	-0.03	-0.05	0.002	-0.017	0.02	-0.012	0.003	-0.022	-0.015
2.	Days to Maturity	0.004	**0.18**	-0.033	-0.042	0.001	0.026	0.007	0.003	0.003	-0.023	-0.014
3.	Plant height (cm)	0.0009	0.033	**-0.18**	-0.031	0.003	-0.109	-0.035	0.009	-0.002	0.032	0.014
4.	No. of pods per plant	-0.0009	-0.028	0.020	**0.28**	-0.000009	0.350	0.021	0.005	0.0085	-0.0280	0.011
5.	No. of seeds per pod	0.0008	0.027	-0.055	-0.0002	**0.01**	0.043	0.184	-0.076	0.006	0.028	0.032
6.	Total dry matter weight (g/plant)	-0.00014	0.008	0.033	0.165	0.0008	**0.60**	-0.013	0.029	0.006	-0.015	0.018
7.	Harvest Index %	0.0002	0.003	0.014	0.013	0.005	-0.017	**0.44**	-0.174	-0.002	0.062	0.006
8.	Seed yield efficiency (%)	0.0002	-0.002	0.007	-0.006	0.004	-0.075	0.338	**-0.23**	0.001	0.051	0.021
9.	100 seeds-weight (g)	0.001	0.035	0.020	0.128	0.003	0.216	-0.060	-0.014	**0.01**	-0.086	0.024
10.	Oil content (%)	-0.0007	-0.030	-0.041	-0.055	0.002	-0.063	0.196	-0.083	-0.011	**0.14**	0.009
11.	Protein content (%)	-0.0009	-0.035	-0.034	0.042	0.004	0.137	0.037	-0.063	0.005	0.017	**0.07**

Residual factor 0.0742

The negative direct effect of seed yield efficiency was nullified by the positive indirect effects through days to 50% flowering, plant height, and number of seeds per plant, harvest index, 100 seed weight, oil content and protein content which resulted in the positive association with seed yield per plant. 100 seed weight had positive direct effect on seed yield per plant and positive indirect effect through days to 50% flowering, days to maturity, plant height, number of pods plant, number of seeds per pod, total dry matter and protein content resulted in positive association with seed yield per plant. Oil content and protein content exhibited positive association with seed yield per plant due to their positive direct effect on seed yield per plant and positive indirect effect through each other and number of seeds per pod and harvest index.

The study revealed that selection based on number of pods per plant, number of seeds per pod and total dry matter per plant, harvest index, seed yield efficiency and 100 seed weight could help in genetic improvement of seed yield per plant in soybean population under study.

References

Amitava-Paul and Singh, D.P. 2007. Gamma-rays induced variability for polygenic traits in lentil. *J. of Food Legumes.* 20(2): 150-152.

Anonymous 2013. Annual Report. Director Report and Summary Table of Experiments. National Research Centre for Soybean, Indore, ICAR, Pi.

Chauhan, M.P., Misra, A.C. and Singh, A.K. 2007. Correlation and path analysis in urdbean. *Legume Res.* 30(3):205-208.

Dewey, D.R. and Lu, K.H. 1959. A correlation and path coefficient analysis of component of wheat grass production, *Agron J.*51:515-518.

Dhedhi, K.K., Ansodariya, V.V., Chaudhari., N.N., Sanghani. J.M. and Sorathiya, J.S. 2016. Genetic variation among forage pearl millet genotypes for fodder yield and its component traits under rainfed conditions of Gujarat. *The Bioscan* 11(1): 45-48

Kharkwal, M.C. 2003. Induced mutations in chickpea (*Cicer arietinum* L.). VI. Significance of induced altered correlations. *Indian J. of Genet*. 63(3):219-224.

Kond, C.R. and Salimath, P.M. and Mishra, M.N. 2008. Correlation and path coefficient analysis in black gram (*Vigna mungo* (L) Hepper). *Legume Res.*31 (3): 202-205.

Mehetre, S.S., Mahajan, C.R., Dhumal P.M. and Hajare D.N. 1994a. Induced genetic variability in the M_2 and M_3 generations of soybean. *Soybean Genetics Newsletter*. 21: 113-120.

Mehetre, S.S., Mahajan, C.R., Ghatge, R.D. and Dhumal P.M. 1994b. Induced genetic variability and character association in soybean. *Crop Research, Hisar*. 8(2): 348-353.

Misra, R.C. and Sahu, P.K. 2005. Gamma-rays and EMS induced variability, character association and path-coefficient analysis in mutant lines of little millet. *Environment and Ecology*. 23(3): 580-583.

Momin, B.W. and Misra, R.C. 2004. Induced variability, character association and path-coefficient analysis in mutant cultures of greengram. *Environment and Ecology*. 22(3): 608-611.

Samiullah Khan and Wani, M.R. 2006. Induced mutations for yield contributing traits in green gram. *International J. of Agriculture and Biology*. 8(4):528-530.

Savithramma, D.L., Sridhara, Umashankar and Shivakumar, S. 1999. Genetic variability and D^2 analysis in black

gram [*Vigna mungo* (L.)] *Mysore J. of agric. Sci.* 33 (1):64-68

Shivade, H.A., Rawale A.P. and Patil, S.B. 2011. Correlation and path analysis for yield and yield components in black gram [*Vigna mungo* (L.) Hepper]. *Legume Res.* 34 (3): 178-183.

Singh, R.K. and Chaudhari, B.D. 1977. Biometrical methods in quantitative genetic analysis. Kalyani Publishers, New Delhi. pp. 3938.

How to cite this article:

Shekar, G.C., Pushpendra, M. Prasanth, H. Lokesha, M. Mahadeva Swamy, K. Lokesh, P.K. Shrotia and Kamendra Singh. 2018. Correlation and Path Analysis in Soybean [*Glycine max* (L.) Merrill]. *Int.J.Curr.Microbiol.App.Sci.* 7(09): 1232-1239.
doi: https://doi.org/10.20546/ijcmas.2018.709.147