Int.J.Curr.Microbiol.App.Sci (2021) *10*(03): 1776-1782

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 10 Number 03 (2021)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2021.1003.221

Genetic Variability, Correlation and Path Analysis for Grain Yield and its Components in Soybean

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Keywords

Soybean, Heritability, Genetic advance, Correlation, Direct effect

Article Info

Accepted:
15 February 2021
Available Online:
10 March 2021

A B S T R A C T

Present investigation of geneticvariability, correlation, path and genetic divergence analysis for yield and yield contributing characters in 30genotypes of soybean was carried out during kharif, 2019 at JNKVV, College of agriculture (Ganj Basoda, M.P.). The genotypes MAUS-71, SL-525 and JS 71-05 found highest yielding among all the 30 genotypes. Highest estimates of PCV were observed for primary branching per plant, secondary branching per plant, grain yield per plant, harvest index and seed yield per plot, and higher GCV were observed for primary branches per plant, secondary branches per plant, grain yield per plant, harvest index and seed yield per plot. High estimates of heritability was recorded for primary branches per plant, plant height, secondary branches per plant, number of pod plant, day to 1stpod initiation and grain yield per plant and high genetic advance was recorded for primary branches per plant, secondary branches per plant, grain yield per plant. The correlation analysis revealed that grain yield per plant had significant positive association with harvest index, number of seed per pod, secondary branching per plant and primary branching per plant. Path coefficient analysis at phenotypic level revealed that number of seed per pod was observed the maximum positive direct effect on grain yield per plant followed by number of pod per plant, secondary branches per plant, 1st pod initiation, days to 50% flowering and number of seeds per plant.

Introduction

Soybean (*Glycine max L. Merrill)* crop belong to family leguminеceae its chromosome number is 2n=40. It is a legume crop that grows in tropical, sub tropical and temperate climates. Soybean is also known as the "Golden bean" or "Miracle crop" or "Wonder crop" because of its multiple uses. It is an excellent source of good quality vegetable protein (40%) and edible oil (20%). It is native of China and was introduced to India in 1968 from USA (Nagata 1970).Soybean is used for green vegetable, soybean milk and oil which is used for food preparation as well as in several industrial products. Soybean is high in protein content and this may find a place in Indian diet. Soybean may be used as green vegetable if a variety is found suitable for vegetables. Madhya Pradesh is the leading state in the country for soybean production which contributes about 86 per cent of the

total production of the country. Due to the highest acreage (6.6 Lakh hectares) and production (5.94 Lakh metric tonnes), the state is known as "Soybean state".

The presence of genetic variability in source population is primary prerequisite for making selection for crop improvement programme. Therefore study of variability in terms of estimating coefficient of variation, heritability and genetic advance to find out response to selection. The variance component analysis suggested by Jinks and Hayman (1953). Hayman (1954) and the combining ability analysis of Griffing (1956) and graphical analysis of Hayman (1956) provide useful information on the nature of inheritance of quantitative characters and also help in identifying the superior parents and the combination likely to yield superior recombinants. The study of correlations further provides an indication about the various associations existing between yield and its components. The studies of correlation and path coefficient analysis are required to formulate the selection criteria for adopting soybean improvement programs. It is necessary to find out the list of yield per plant. The study of genetic diversity is useful tool in quantifying the degree of divergence between biological population at genotypic level and to assess relative contribution of different components to the total divergence, both at the inter and intra cluster levels. The path coefficient analysis which is a standardised partial regression coefficient originally proposed by Wright (1921) and further elucidated by Li (1956) and Dewey and Lu (1959) permits the separation of the correlation coefficient into direct and indirect effects.

Materials and Methods

In the present study, the estimates of genetic variability, correlation and path analysis for grain yield and its components in soybean and it's 30 genotypes for 11 characters including yield and contributing traits during *kharif*2019 at, instructional farm, College of Agriculture, Ganj Basoda (M.P). The design adopted was Randomized Block Design with three replications. Each plot consisted of10 rows of 3 m length with a spacing of 22.5 x 10 cm. the fertilizer dose of 40:40:0 kg NPK/ha and seeds were sown by hand dibbling.

Observations were recorded on five plants for 11 yield component characters viz.,Days to 50% flowering, Days to 1st pod initiation, Primary branching per plant, Secondary branching per plant, Number of pods per plant, Number of seeds per pod, Pod length (cm), Plant height (cm), Yield per plant (g), Seed yield per plot (kg) and Harvest index (%). Genetic parameters, correlation coefficients were computed according to the method suggested by Singh and Chaudhry (1979). Path coefficients were worked out by the methods used by Dewey and Lu (1959).

Results and Discussion

Genetic parameters

The genetic coefficient of variation provides a measure to compare the genetic variability present among various quantitative and qualitative traits. The moderate magnitude of genotypic coefficient of variation (GCV) was recorded for harvest index, grain yield per plot and secondary branching per plant. Similar finding were observed by Bhairav *et al.*, (2006) and karad *et al.*, (2005) (Table 1).

The phenotypic coefficient of variation was found to be highest for primary branching per plant and moderate magnitude of phenotypic coefficient of variation (PCV) was recorded for secondary branching per plant, grain yield per plant, harvest index, seed yield per plot, days to 50% flowering, number of pods per

plant, plant height and number of seeds per pod. Similar finding were observed by Jain and Ramgiry (2000).

The highest heritability was recorded for primary branching per plant, plant height, secondary branches per plant, number of pod plant, day to 1st pod initiation and grain yield per plant. The results are in accordance with reports of earlier work reported by Karad *et al.*, (2005), Kumar (2003) and Malik *et al.*, (2006).

The highest genetic advance was recorded for primary branches per plant, secondary branches per plant, grain yield per plant and moderate values of plant height, number of pods per plant, seed yield per plant, number of seed per pod and day to 50% flowering. The present result was supported by the findings observed by Ganeshmurthy and seshadri (2004) and Dilnesaw *et al.*, (2013).

Correlation studies

The phenotypic and genotypic correlation coefficients between yield and yield components and inter-relationship among them were estimated and presented in the (Table 2).

Grain yield was found to be positively and significantly associated with harvest index, number of pod per plant, secondary branching per plant, and primary branching per plant, day to 1st pod initiation at phenotypic level indicating the importance of these traits for yield improvement in soybean. The present result was supported by the findings observed by Chand (1999), Iqbal *et al.*, (2003), Mukheker *et al.*, (2004).

Table.1 Estimation of genetic parameters for different quantitative characters in soybean

S.No.	Character	Mean	Range		PCV	GCV	h^2 (bs) %	GA as% of mean
			Minimum	Maximum				
1	**DTF**	44.40	37.00	55.00	12.19	8.36	47	11.81
2	**DPI**	60.86	53.70	65.78	7.61	6.15	65	10.23
3	**PB**	3.35	2.18	4.23	18.61	16.95	83	31.81
4	**SB**	6.50	4.78	9.26	16.98	14.28	70	24.75
5	**NPP**	40.19	31.94	49.31	11.72	9.68	68	16.45
6	**NSP**	2.36	1.97	3.02	10.87	8.68	63	14.28
7	**PL (cm)**	3.71	3.26	4.36	9.24	5.15	31	5.91
8	**PH (cm)**	59.97	49.67	73.79	11.02	9.58	75	17.16
9	**GYPP (g)**	15.01	12.09	22.04	15.96	12.81	64	21.17
10	**HI (%)**	32.69	27.18	47.09	15.94	12.65	63	20.68
11	**SYPP (kg)**	223.28	177.42	289.65	15.43	10.46	46	14.61

Table.2 Genotypic and phenotypic correlation between grain yield and its components in soybean

S.N.	Characters		DFF	DPI	PBPP	SBPP	NPPP	NSSP	PL (cm)	PH (cm)	HI (%)	SYPP (kg)	YPP (g)
1	DFF	P	1	0.0633	0.2036	0.0865	0.0542	0.2252 *	-0.2149 *	0.0496	-0.0465	-0.0528	-0.0055
		G	1	0.1290	0.2767	0.2584	0.0751	0.4342	-0.4685	0.0745	-0.0583	-0.1093	-0.0189
2	DPI	P		1	0.3029 **	0.2422 *	0.2918 **	0.2426 *	0.0432	-0.1014	-0.1794	0.0284	0.2241*
		G		1	0.3636	0.3276	0.3893	0.3099	-0.1924	-0.1406	0.1772	-0.2500	0.2210
3	PBPP	P			1	0.8255 ***	0.7286 ***	-0.0761	-0.0915	-0.4675***	0.4728 ***	-0.3354 **	0.4908***
		G			1	0.8938	0.7813	-0.1511	-0.2184	-0.5973	0.5150	-0.4989	0.5327
4	SBPP	P				1	0.8581 ***	0.0034	-0.0587	-0.3014 **	0.6372 ***	0.1897	0.6584***
		G				1	0.9008	-0.0842	-0.2612	-0.4156	0.6509	-0.3844	0.6916
5	NPPP	P					1	-0.0724	-0.0678	-0.2627 *	0.7484 ***	-0.1405	0.7758***
		G					1	-0.1402	-0.2928	-0.3327	0.7364	-0.3160	0.7667
6	NSSP	P						1	-0.0197	0.0589	0.0744	-0.0090	0.1057
		G						1	0.0809	0.1099	0.0997	0.1149	0.0757
7	PL (cm)	P							1	0.0422	0.0570	0.5537 ***	-0.0214
		G							1	0.1118	-0.0215	0.3576	-0.2131
8	PH (cm)	P								1	0.1905	0.7633 ***	-0.2689
		G								1	-0.2451	0.9857	-0.3544
9	HI (%)	P									1	-0.0263	0.9596***
		G									1	-0.1553	0.9702
10	SYPP (KG)	P										1	-0.1314
		G										1	-0.3462

Table.3 Phenotypic path analysis table

S.N	Character	DFF	DPI	PB	SB	NPP	NSP	PL (cm)	PH (cm)	HI (%)	SYPP (kg)	GYPP (g)
1	**DFF**	**0.0340**	0.0022	0.0069	0.0029	0.0018	0.0077	-0.0073	0.0017	-0.0016	-0.0018	-0.0055
2	**DPI**	0.0024	**0.0384**	0.0116	0.0093	0.0112	0.0093	0.0017	-0.0039	0.0069	-0.0011	0.2241
3	**PB**	-0.0276	-0.0411	**-0.1358**	-0.1121	-0.0989	0.0103	0.0124	0.0635	-0.0642	0.0455	0.4908
4	**SB**	0.0040	0.0113	0.0386	**0.0468**	0.0401	0.0002	-0.0027	-0.0141	0.0298	-0.0089	0.6584
5	**NPP**	0.0081	0.0438	0.1092	0.1287	**0.1499**	-0.0108	-0.0102	-0.0394	0.1122	-0.0211	0.7758
6	**NSP**	0.0067	0.0073	-0.0023	0.0001	-0.0022	**0.0299**	-0.0006	0.0018	0.0022	-0.0003	0.1057
7	**PL (cm)**	0.0105	-0.0021	0.0045	0.0029	0.0033	0.0010	**-0.0487**	-0.0021	-0.0028	-0.0270	-0.0214
8	**PH (cm)**	-0.0049	0.0100	0.0459	0.0296	0.0258	-0.0058	-0.0041	**-0.0982**	0.0187	-0.0750	-0.2689
9	**HI (%)**	-0.0399	0.1539	0.4056	0.5466	0.6420	0.0639	0.0489	-0.1635	**0.8578**	-0.0226	0.9596
10	**SYPP (kg)**	0.0010	0.0005	0.0065	0.0037	0.0027	0.0002	-0.0107	-0.0147	0.0005	**-0.0193**	-0.1314

RSQUARE=0.9452 RESIDUALEFFECT=0.2340

Path coefficient analysis

The direct and indirect effects of different yield components on grain yield worked out through path analysis at phenotypic levels are presented in the (Table 3). Path coefficient analysis at phenotypic level revealed that harvest index registered the maximum positive direct effect (0.8578) on grain yield per plant followed by number of pod per plant (0.1499), secondary branches per plant (0.0468),1st pod initiation (0.0384), days to 50% flowering (0.0340) and number of seeds per plant (0.0299). While substantial negative direct effects on grain yield per plant were contributed by primary branches per plant (-0.1358), plant height (-0.0982), pod length (-0.0487) and seed yield per plot (-0.0193). Similar result reported by Sharma *et al.,* (1983), Chettri *et al.,* (2003) and Inderjit Singh (1999).

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How to cite this article:

Vasundhara Dangi and Kamal K. Sharma. 2021. Genetic Variability, Correlation and Path Analysis for Grain Yield and its Components in Soybean. *Int.J.Curr.Microbiol.App.Sci.* 10(03): 1776-1782. doi: https://doi.org/10.20546/ijcmas.2021.1003.221