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Direct and Indirect Effects of Yield Contributing Characters on Seed Yield in Green Gram (*Vigna radiate* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was carried out to assess the genetic variability parameters, correlation and path analysis in 21 green gram genotypes for 13 quantitative traits at field experimentation center, during *kharif* 2022 in Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Uttar Pradesh in Randomized Block Design in three replications. Analysis of variance indicated high significant differences among the genotypes for all the traits. Green gram (*Vigna radiata* L.) is one of the important pulse crops because of its short growth duration, adaptation to low water requirement and soil fertility. Variability is a greater need for initiating a breeding program for yield and yield contributing traits. High seed yield per plant was recorded by SM-2029, SPM-2040, PHULEMOONG-95418, CO-8, CO-7. All the traits showed significant variation among the lines. High Genotypic Coefficient of Variance and Phenotypic Coefficient of Variance was recorded for Number of pods per plant, Number of clusters per plant, Number of primary branches and Plant

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height where Genotypic Coefficient of Variance exhibited at moderate level and Number of pods per plant exhibited highest percentage of broad sense heritability and also high in genetic advance followed by Plant height and Number of primary branches and Number of clusters per plant. The studies on Genotypic Coefficient of Variance and Phenotypic Coefficient of Variance indicated that the presence of high amount of variation and role of the environment on the expression of these traits. Seed index positively correlated to seed yield per plant at both phenotypic and genotypic levels. Seed index, Biological Yield and Number of Primary branches exhibited high positive direct effect to seed yield per plant at both phenotypic and genotypic path coefficient analysis. Correlation coefficients in most cases were higher than their phenotypic correlation coefficients indicating the association was largely due to genetic reason. At both genotypic and phenotypic levels, significant positive correlations were observed for Seed Index, Days to maturity, Days to 50% pod setting, Plant height, Number of pods per plant and Number of clusters per plant.

Keywords: Genotypic coefficient of variance; phenotypic coefficient of variance; heritability; correlation; path analysis green gram.

1. INTRODUCTION

"Green gram (*Vigna radiata* L. Wilczek) an important crop in the pulse category, is an annual legume belonging to Fabaceae family that is widely grown, with diploid chromosome 2n=2x=22" [1]. "It can be grown in various cropping systems. It is commonly known as mungbean, is classified into three subgroups: one domesticated (Vigna radiata subsp. radiata) and two wild (subsp. sublobata and subsp. glabra). It is highly valued in India, particularly among the predominantly vegetarian population, as it provides a rich source of easily digestible and high-quality protein. Mungbean seeds contain approximately 59 to 65% carbohydrates, 22 to 28% total protein, 21 to 25% amino acids, 1.5 to 2.63% lipids, 1.0 to 1.5% fat, 3.5 to 4.5% fiber, and 4-5% ash, offering approximately 334 to 344 kcal of energy per serving" [2]. "Mungbean serves as a vital protein source for India's vegetarian population. Moreover, it is recognized for its abundant folate and iron content, surpassing most other legumes" [3]. "Essential amino acids, such as phenylalanine, isoleucine, leucine, and lysine, are also present in significant amounts" [4]. "India holds the distinction of being the largest producer of Mungbean, accounting for 65% of the global cultivation area and 54% of production" [5,6]. "The crop occupies approximately 4.34 million hectares in India, resulting in a production of 2.12 million tonnes and a productivity rate of 489 kg per hectare" [7]. "Greengram is a self-pollinated and short duration crop. It provides a high-quality protein supply (22-24%) and boosts the incomes of small-scale farmers" [8]. "Mature grain has carbohydrates (62.6g), fibre (16.3g), fat (1.2g), protein (23.9g) and 347 calories per 100 grams" [9-15]. ~ 1911 ~ The Pharma Innovation Journal https://www.thepharmajournal.com Correlation reveals the degree and direction of association at phenotypic and genotypic levels btw the yield and its contributing traits. "However, it should be noted that the correlation can sometimes fail to give accurate insights into the individual impact of each character on the dependent character". [16,17] "It is understandable that a path analysis would be necessary to determine which characters actually affect seed yield. So path analysis is used to measure the indirect and direct effects of traits" [10].

2. MATERIALS AND METHODS

The experiment was conducted during the Kharif season of 2022 at field experimentation centre of Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh. The experimentation site is situated 98m above sea level at 25.57^0N latitude and 81.56^0N longitude. This area's Subtropical Climate has extremely hot and cold seasons. Temperatures might drop as low as 1-2 degrees Celsius in December and January, especially during the rabi season. The temperature might reach 46 to 48 degrees Celsius during Zaid.

2.1 Experimental Material

The experimental material for present study is obtained from the Department of Genetics and Plant Breeding, SHUATS, Prayagraj (Allahabad) during *kharif* 2022.Three replications of a randomized block design (RBD) were used to raise twenty one different greengram genotypes tabulated in (Table 1).Using a 30 x 10 cm spacing, the Gross area is about131.5sq.m and

Net area is about 60 cm. the seeds were planted and after tenth day following sowing, the crop was thinned out, leaving one healthy seedling per hill. The observation was recorded on five randomly selected individual plant of each genotype for each replication for the following thirteen characters except days to 50% flowering, days to maturity which were recorded on plot basis. The characters included in the study were days to 50% flowering, days to 50% pod setting, plant height (cm), number of primary branches per plant, days to maturity, number of clusters per plant, number of pods per plant, pod length, number of seeds per pod, biological yield, seed index, harvest index, and seed yield per plant. The data recorded for these characters were subjected to biometrical and statistical analysis and the results were obtained on above mentioned characters.

2.2 Statistical Analysis

The estimation of correlation coefficient was done using formula given by Searle [2] and test of significance was carried out by method described by Snedecor and Cochran [3]. The correlation coefficient was further partitioned into direct and indirect effect with the help of path coefficient analysis as suggested by Wright [4] and elaborated by Dewey and Lu [7]. Seed yield was regarded as a dependent variable since it was thought to be a factor that was influenced by the other features, also known as independent variables, as causes. The software called "RLanguage" and INDOSTAT was used to perform the analysis mentioned above.

2.2.1 Phenotypic coefficients of correlation (rp)

$$R(x_i.x_j)p = Cov(x_i, x_j)p / \sqrt{(V(x_i)p.\ V(x_j)p)}$$

Whereas,
r (Xi. Xj) p = Phenotypic correlation between i^{th} and j^{th} character
COV (Xi. Xj) p = Phenotypic covariance between i^{th} and j^{th} character
V (Xi) p = Phenotypic variance of i^{th} character
V (Xj) p = Phenotypic variance of j^{th} character

2.2.2 Genotypic coefficient of correlation (rg)

$$r(x_i.\ x_j)g = Cov(x_i, x_j)g / \sqrt{(V(x_i)p.\ V(x_j)g)}$$

Whereas,
r (Xi. Xj) g = Genotypic correlation between i^{th} and j^{th} character
COV (Xi. Xj) g = Genotypic covariance between i^{th} and j^{th} character
V (Xi) g = Genotypic variance of i^{th} character
V (Xj) g = Genotypic variance of j^{th} character

2.3 Path Coefficient Analysis

Path coefficient analysis suggested by Wright [4] and elaborated to Dewey and Lu [7] was used to calculate the direct and indirect contribution of various traits towards yield.

For estimation of various direct and indirect effects, a set of simultaneous equations were formed:

$r_{1y} = P_{1y} + r_{12} P_{2y} + r_{13} P_{3y} + \ldots. + r_{1k}P_{ky}$
$r_{2y} = r_{21} P_{1y} + P_{2y} + r_{23} P_{3y} + + r_{2k}P_{ky}$
$r_{iy} = r_{i1} P_{1y} + r_{i2} P_{2y} + r_{i3} P_{3y} + \ldots. + r_{ik}P_{ky}$
$r_{ky} = r_{k1} P_{1y} + r_{k2} P_{2y} + r_{k3}P_{3y} + \ldots. + r_{kk}P_{ky}$

Whereas,

r_{1y} to r_{ky} = Coefficient of correlations between causal factors 1 to K and dependent character Y.
r_{12} to $r_{k-1,k}$ = Coefficient of correlations among causal factors.
P_{1y} to P_{ky} = Direct effects of characters 1 to k on character y

Table 1. List of green gram genotypes used in present investigation

S.NO.	GENOTYPES	S.NO.	GENOTYPES
1	SPM 20-47	**12**	PDM-139
2	GM-3	**13**	SHWETA
3	SM-20-103	**14**	SPM-2040
4	ML 337	**15**	CO-7
5	TYPE-51	**16**	JALAGAON-781
6	PHULE MOONG-9339	**17**	VBN-2
7	ML-331	**18**	TS-16
8	BM-2002-1	**19**	CO-8
9	T-44	**20**	PHULE MOONG 95418
10	SM-2029	**21**	SAMRAT (Check)
11	SML 1638		

3. RESULTS AND DISCUSSION

3.1 Correlation Analysis

3.1.1 Correlation coefficient analysis genotypic correlation

In present investigation, genotypic correlation coefficient of different characters with seed yield per plant and interrelationship among component characters are presented in Table 2.

3.1.2 Correlation between seed yield and other component characters

Seed yield exhibited positive significant correlation with seed index (0.852**) and number of primary branches (0.420**) and biological yield (0.394*) and positive non-significant association with days to maturity (0.038) and days to 50 percent flowering (0.1803) and negative significant correlation with pod length (-0.440**).

The correlation and path coefficient analysis was studied to understand the relationship between yield and other characters. The correlation analysis between seed yield per plant and other yield contributing characters in 21 green gram genotypes were calculated and presented in Table 1. Swetha showed early flowering (33 days), PDM-139 had characters like early maturity (61 days), PDM-139 showed early Days to 50 percent pod setting (61 days), Jalgaon-781 showed high Plant Height (42.96), High seed yield per plant was recorded by SM- 2029, SPM-2040, PHULEMOONG-95418, CO-8, CO-7 (7.2). All the traits showed significant variation among the lines. High GCV and PCV was recorded for Number of pods per plant, Number of clusters per plant, Number of primary branches and Plant height, highest percentage of broad sense heritability and also high in genetic advance followed by Plant height and Number of primary branches and Number of clusters per plant [18-22]. Seed index, Biological Yield and Number of Primary branches exhibited high positive direct effect to seed yield per plant at both phenotypic and genotypic path coefficient analysis. These characters should be given due consideration during selection for crop improvement. Correlation analysis among the yield and its contributing characters revealed that the genotypic correlation coefficients in most cases were higher than their phenotypic correlation coefficients indicating the association was largely due to genetic reason. At both genotypic and phenotypic levels, significant positive correlations were observed for Seed Index, Days to maturity, Days to 50% pod setting, Plant height, Number of pods per plant and Number of clusters per plant [23-26].

3.2 Path Analysis

Seed yield, a polygenic trait, was influenced by its various components directly as well as indirectly via other traits, which create a complex situation before a breeder for making selection. Therefore, path coefficient analysis could provide a more realistic picture of the interrelationship, as it considers direct as well as indirect effects of the variables by partitioning the correlation coefficient.

Table 2. Analysis of variance (mean sum of squares) for various characters studiedin Green gram

	Mean Sum of Squares		
Characters	**Replication d.f =2**	**Treatments d.f =20**	**Error d.f=40**
Days to 50% Flowering	6.3840	60.777**	5.391
Days to 50% Pod Setting	17.348	13.432*	5.694
Days to Maturity	20.991	24.941**	10.528
Plant Height	50.559	436.045**	25.329
Number of PrimaryBranches	0.7890	5.744**	0.396
Number of Clusters perPlant	0.660	4.251**	0.33
Number of Pods per Plant	1.4740	18.682**	0.736
Pod Length	0.7170	0.886**	0.353
Number of Seeds per Pod	1.0690	1.377**	0.532
Biological Yield	16.992	24.444**	8.506
Harvest Index	2.2280	47.943**	3.978
Seed Index	0.0040	0.028**	0.006
Seed Yield Per Plant	0.0950	0.111*	0.047

Table 3. Genetic Parameters of 13 quantitative characters in green gram genotypes studied in kharif 2022

Traits	GCV	PCV	h² (Broad Sense)	Genetic Advancement 5%	Gen. Adv as 5% of Mean
Days to 50% flowering	11.291	12.834	77.398	7.787	20.463
Days to 50% pod setting	2.493	4.466	31.176	1.847	2.868
Days to maturity	3.493	6.241	31.333	2.527	4.028
Plant height (cm)	17.985	19.578	84.387	22.142	34.034
Number of primary branches	17.751	19.625	81.814	2.488	33.075
Number of clusters per plant	19.83	22.195	79.823	2.104	36.496
Number of pods per plant	29.315	31.066	89.045	4.754	56.985
Pod length (cm)	5.609	9.695	33.471	0.502	6.685
Number of seeds per pod	4.761	8.095	34.59	0.643	5.768
Biological yield (g)	7.093	11.439	38.445	2.944	9.059
Harvest Index (%)	17.448	19.674	78.651	6.994	31.876
Seed Index (%)	2.22	3.032	53.646	0.129	3.35
Seed yield per plant (g)	2.044	3.657	31.238	0.168	2.353

Table 4. Genotypic correlation coefficient between yield and its component traits in greengram genotypes grown during *kharif 2022* at SHUATS, Prayagraj

	DF50	DP50	DM	PH	NPB	NCPP	NPPP	PL	NSPP	BY	HI	SI	SYPP
DF50	1	0.679**	0.708**	0.592**	0.1450	0.2187	0.1128	0.749**	0.681**	0.0678	0.0421	0.0979	0.1803
DP50		1	0.858**	0.384*	0.521**	0.887**	0.689**	0.484**	0.916**	-0.0129	0.261*	0.1877	-0.0861
DM			1	0.289*	0.321*	0.364*	0.559**	-0.1293	0.533**	0.310*	-0.1550	0.1928	0.0380
PH				1	-0.0116	0.259*	0.0915	0.1149	0.596**	0.255*	0.283*	-0.1827	-0.0729
NPB					1	0.822**	0.594**	-0.0543	0.1624	0.1258	0.1964	0.0807	0.420**
NCPP						1	0.558**	-0.0745	0.495**	0.385*	0.321*	0.0426	0.375*
NPPP							1	-0.1834	0.293*	0.0949	0.0824	-0.1748	-0.1139
PL								1	0.327*	-0.467**	-0.0040	-0.403*	-0.440**
NSPP									1	0.261*	0.0723	-0.0043	-0.1290
BY										1	-0.436**	0.1219	0.394*
HI											1	0.1614	-0.0130
SI												1	0.852**

DF50: Days to 50% flowering, DP50: Days to 50% pod setting, PH: Plant height (cm), NPB: Number of primary branches per plant, NCPP: Number of clusters per plant, DM: Days to maturity, NPPP: Number of pods per plant, PL: Pod length NSP: Number of seedsper pod, BY: Biological Yield (g), SI: Seed Index (g), HI: Harvest index (%), SYPP: Seed yield per plant (g)

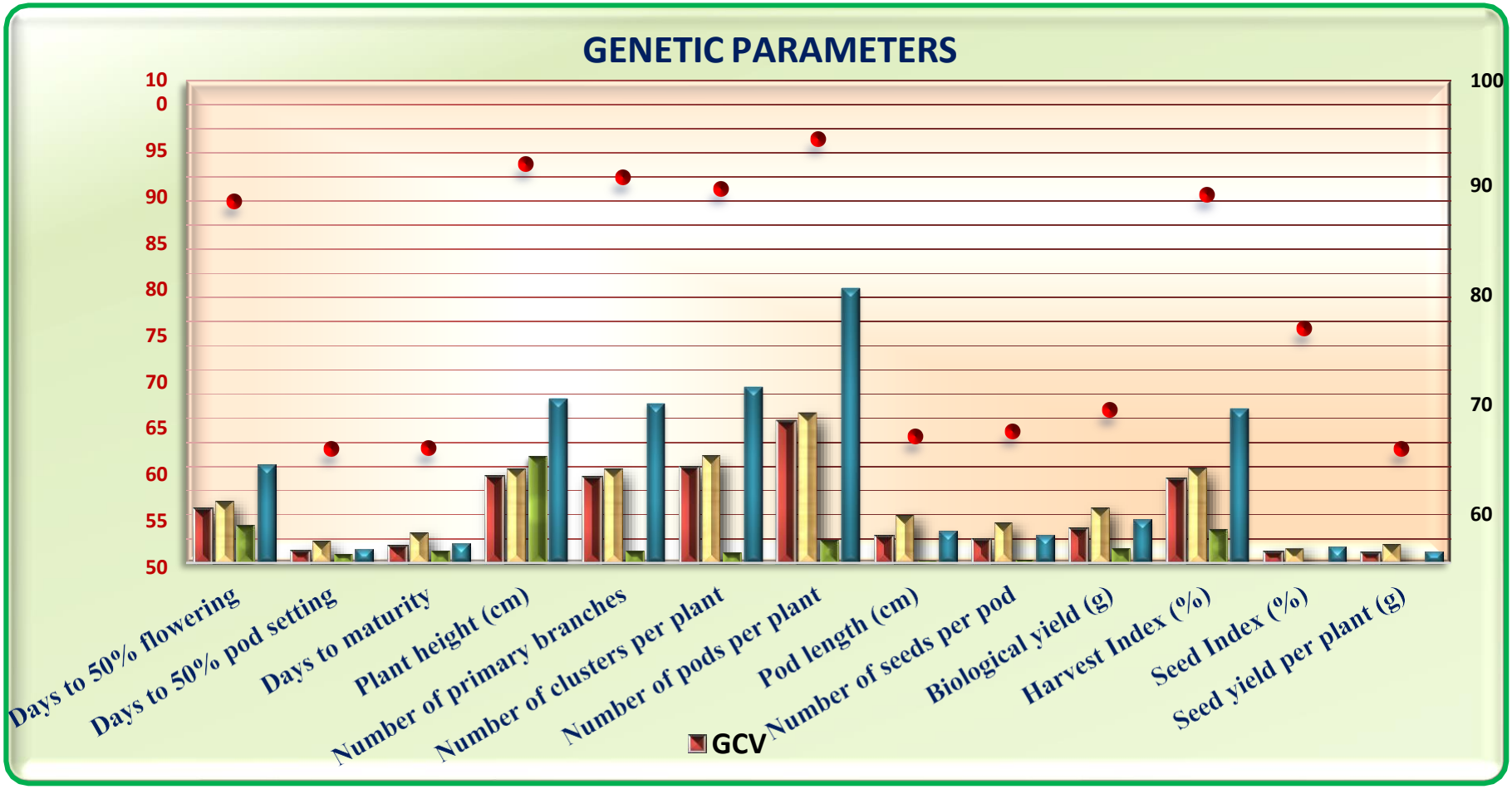

Fig. 1. Histogram representing estimates of variance and genetic parameters

Table 5. Phenotypic correlation coefficient between yield and its component traits in greengram genotypes grown during *kharif 2021* at SHUATS, Prayagraj

Sr. No.	Characters	DF50	DP50	DM	PH	NPB	NCPP	NPPP	PL	NSPP	BY	HI	SI	SYPP
1.	**DF50**	1	0.334*	0.370*	0.488**	0.1243	0.1850	0.1278	0.291*	0.293*	-0.0084	0.0278	0.0695	0.0992
2.	**DP50**		1	0.364*	0.1758	0.2424	0.432**	0.375*	0.0277	0.1874	0.0758	0.0422	-0.0153	-0.1291
3.	**DM**			1	0.1296	0.1254	0.2273	0.303*	0.0493	0.1290	0.0845	-0.0788	0.0419	0.0028
4.	**PH**				1	-0.0073	0.2297	0.0831	0.0317	0.318*	0.0264	0.2067	-0.1089	-0.0588
5.	**NPB**					1	0.725**	0.549**	-0.1437	0.0573	0.0397	0.1752	0.0672	0.2022
6.	**NCPP**						1	0.513**	-0.0646	0.2349	0.1766	0.263*	0.1460	0.1732
7.	**NPPP**							1	-0.1359	0.1173	0.0534	0.1091	-0.0723	-0.1126
8.	**PL**								1	0.427**	-0.1142	0.1031	-0.1601	-0.0906
9.	**NSPP**									1	0.0633	0.1395	-0.0772	-0.0534
10.	**BY**										1	-0.298*	-0.0270	0.1576
11.	**HI**											1	0.0820	-0.0530
12.	**SI**												1	0.2151

DF50: Days to 50% flowering, DP50: Days to 50% pod setting, PH: Plant height (cm), NPB: Number of primary branches per plant, NCPP: Number of clusters per plant, DM: Days to maturity, NPPP: Number of pods per plant, PL: Pod length NSP: Number of seedsper pod, BY: Biological Yield (g), SI: Seed Index (g), HI: Harvest index (%), SYPP: Seed yield per plant (g)

Table 6. Genotypical path matrix for Seed yield per plant showing direct (in bold) and indirect effects of various characters.

Sr. No.	Characters	DF50	DP50	DM	PH	NPB	NCPP	NPPP	PL	NSPP	BY	HI	SI	SYPP
1.	**DF50**	**-0.4736**	-0.3216	-0.3353	-0.2804	-0.0687	-0.1036	-0.0534	-0.3547	-0.3224	-0.0321	-0.0199	-0.0464	0.1803
2.	**DP50**	0.4757	**0.7005**	0.6011	0.2691	0.3651	0.6210	0.4824	0.3389	0.6416	-0.0091	0.1825	0.1315	-0.0861
3.	**DM**	-0.4924	-0.5968	**-0.6954**	-0.2006	-0.2233	-0.2532	-0.3884	0.0899	-0.3708	-0.2158	0.1078	-0.1341	0.0380
4.	**PH**	0.6161	0.3998	0.3002	**1.0406**	-0.0121	0.2692	0.0953	0.1195	0.6202	0.2657	0.2948	-0.1901	-0.0729
5.	**NPB**	0.0889	0.3197	0.1970	-0.0071	**0.6134**	0.5039	0.3642	-0.0333	0.0996	0.0772	0.1205	0.0495	0.420**
6.	**NCPP**	-0.0975	-0.3953	-0.1624	-0.1154	-0.3663	**-0.4459**	-0.2488	0.0332	-0.2206	-0.1718	-0.1433	-0.0190	0.375*
7.	**NPPP**	0.0386	0.2356	0.1911	0.0313	0.2031	0.1909	**0.3421**	-0.0627	0.1003	0.0325	0.0282	-0.0598	-0.1139
8.	**PL**	0.5517	0.3564	-0.0953	0.0846	-0.0400	-0.0549	-0.1350	**0.7366**	0.2410	-0.3442	-0.0030	-0.2967	-0.440**
9.	**NSPP**	-0.7119	-0.9578	-0.5576	-0.6233	-0.1699	-0.5173	-0.3065	-0.3422	**-1.0457**	-0.2728	-0.0756	0.0045	-0.1290
10.	**BY**	0.0442	-0.0084	0.2022	0.1663	0.0820	0.2510	0.0618	-0.3044	0.1699	**0.6515**	-0.2838	0.0794	0.394*
11.	**HI**	-0.0205	-0.1268	0.0754	-0.1378	-0.0956	-0.1564	-0.0401	0.0020	-0.0352	0.2119	**-0.4865**	-0.0785	-0.0130
12.	**SI**	0.1610	0.3087	0.3170	-0.3003	0.1326	0.0700	-0.2873	-0.6622	-0.0070	0.2004	0.2653	**0.8320**	0.852**

DF50: Days to 50% flowering, DP50: Days to 50% pod setting, PH: Plant height (cm), NPB: Number of primary branches per plant, NCPP: Number of clusters per plant, DM: Days to maturity, NPPP: Number of pods per plant, PL: Pod length NSP: Number of seedsper pod, BY: Biological Yield (g), SI: Seed Index (g), HI: Harvest index (%), SYPP: Seed yield per plant (g)

Table 7. Phenotypical path matrix for Seed yield per plant showing direct (in bold) and indirect effects of various characters

Sr. No.	Characters	DF50	DP50	DM	PH	NPB	NCPP	NPPP	PL	NSPP	BY	HI	SI	SYPP
1.	**DF50**	**0.2394**	0.0800	0.0885	0.1167	0.0297	0.0443	0.0306	0.0697	0.0702	-0.0020	0.0067	0.0166	0.0992
2.	**DP50**	-0.0775	**-0.2321**	-0.0845	-0.0408	-0.0562	-0.1001	-0.0869	-0.0064	-0.0435	-0.0176	-0.0098	0.0036	-0.1291
3.	**DM**	0.0052	0.0051	**0.0140**	0.0018	0.0017	0.0032	0.0042	0.0007	0.0018	0.0012	-0.0011	0.0006	0.0028
4.	**PH**	-0.0681	-0.0245	-0.0181	**-0.1396**	0.0010	-0.0321	-0.0116	-0.0044	-0.0445	-0.0037	-0.0289	0.0152	-0.0588
5.	**NPB**	0.0237	0.0463	0.0239	-0.0014	**0.1910**	0.1384	0.1048	-0.0274	0.0109	0.0076	0.0335	0.0128	0.2022
6.	**NCPP**	0.0438	0.1022	0.0538	0.0544	0.1717	**0.2369**	0.1216	-0.0153	0.0557	0.0418	0.0622	0.0346	0.1732
7.	**NPPP**	-0.0360	-0.1054	-0.0851	-0.0234	-0.1543	-0.1443	**-0.2813**	0.0382	-0.0330	-0.0150	-0.0307	0.0203	-0.1126
8.	**PL**	-0.0296	-0.0028	-0.0050	-0.0032	0.0146	0.0066	0.0138	**-0.1016**	-0.0433	0.0116	-0.0105	0.0163	-0.0906
9.	**NSPP**	-0.0064	-0.0041	-0.0028	-0.0070	-0.0013	-0.0052	-0.0026	-0.0094	**-0.0220**	-0.0014	-0.0031	0.0017	-0.0534
10.	**BY**	-0.0011	0.0095	0.0106	0.0033	0.0050	0.0221	0.0067	-0.0143	0.0079	**0.1252**	-0.0373	-0.0034	0.1576
11.	**HI**	-0.0012	-0.0018	0.0033	-0.0087	-0.0074	-0.0111	-0.0046	-0.0044	-0.0059	0.0126	**-0.0423**	-0.0035	-0.0530
12.	**SI**	0.0070	-0.0015	0.0042	-0.0109	0.0067	0.0146	-0.0073	-0.0161	-0.0077	-0.0027	0.0082	**0.1003**	0.2151
13.	**SYPP**	0.0992	-0.1291	0.0028	-0.0588	0.2022	0.1732	-0.1126	-0.0906	-0.0534	0.1576	-0.0530	0.2151	**1.0000**

DF50: Days to 50% flowering, DP50: Days to 50% pod setting, PH: Plant height (cm), NPB: Number of primary branches per plant, NCPP: Number of clusters per plant, DM: Days to maturity, NPPP: Number of pods per plant, PL: Pod length NSP: Number of seedsper pod, BY: Biological Yield (g), SI: Seed Index (g), HI: Harvest index (%), SYPP: Seed yield per plant (g)

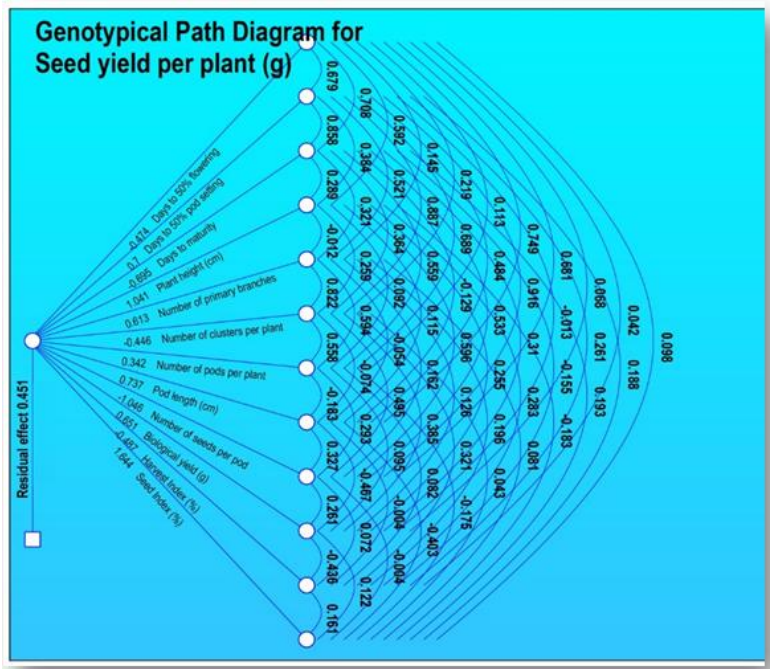

Fig. 2. Genotypical path Diagram for seed yield per plant

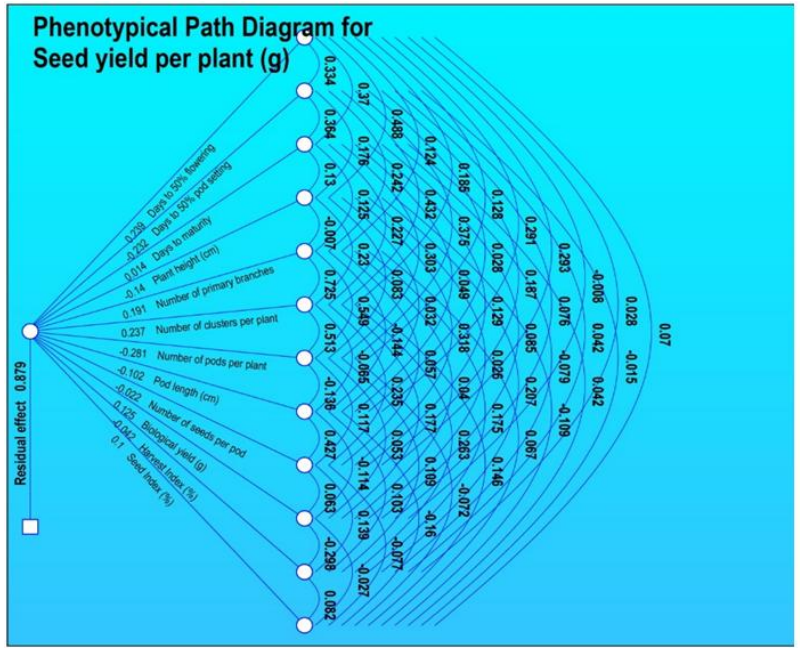

Fig. 3. Phenotypical Path Diagram for Seed yield per plant

In the present study ,13 quantitative characters viz., Days to 50% flowering, Days to 50% pod setting, Days to maturity, Plant height (cm), Number of clusters per plant, Number of pods per plant, Pod length, Number of primary branches, Number of seeds per pod, Seed index (g), Harvest index (%), Biological yield (g), Seed yield per plant (g) were selected for partitioning their genotypic and phenotypic correlation coefficients with seed yield into direct and indirect effects. The seed yield was considered as the dependent variable while the above mentioned thirteen components' characters as the independent variables. The genotypic and phenotypic correlation coefficients worked out between seed yield per plant and each of these twelve causal variables and among themselves are given in Table-4 &5. The direct and indirect effects of these causal variables on seed yield are given in Table 6, Table.7, Fig 2 and Fig .3. The genotypic path coefficient analysis matrix for all the characters was given in table.6 and Fig .2 .Among all the characters under study, Plant height exhibited highest effect on seed yield per plant followed by plant height, Seed Index, Pod length and days to 50 percent pod setting while the highest negative effect was shown by Number of clusters per plant followedby Days to 50 percent flowering and Harvest Index.

4. CONCLUSION

The correlation and path analysis studies in the present investigation revealed that 100 seed weight recorded both positive and significant association with seed yield per plant and also exhibited high positive direct effects on seed yield per plant. Thus it is the major yield attributing character among the other characters studied in 50 green gram genotypes. Hence, selection for this character should be done for yield improvement in green gram and thus this character should be included in the comprehensive selection programme for yield improvement in green gram.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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