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Assessment of correlation and path analysis in greengram (*Vigna radiata* (L.) Wilczek)

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Abstract
The present investigation entitled "Genetic Diversity studies in Greengram (*Vigna radiata* (L.) Wilczek)" was undertaken to study the extent of genetic diversity, correlation and path analysis in 40 genotypes of greengram. The genotypes were evaluated in Randomize Block Design with three replications during kharif 2020-21, at farm of Agril Botany, College Agriculture Badnapur. Observations were recorded for 10 characters *viz*, days to 50% flowering, days to maturity, plant height, number of primary branches, number of secondary branches, number of pods per plant, number of seeds per pod, 100 seed weight, seed yield per plant and harvest index.
The traits number of pods per plant, number of primary branches per plant, number of secondary branches per plant, 100 seed weight and harvest index exhibited significantly positive association with seed yield. This indicates the simultaneous improvement of these characters through selection.
Path coefficient analysis indicated that the characters *viz*., number of pods per plant, number of primary branches per plant, number of secondary branches per plant, 100 seed weight, number of seeds per pod, days to maturity and harvest index exhibited highest direct effect on seed yield. The selection of genotypes based on these characters as selection criterion would be useful in improving the seed yield potential in greengram.

Keywords: Greengram, correlation, path coefficient analysis, seed yield per plant

Introduction
Pulses are the principle source of dietary protein among vegetarian. It is an integral part of human's daily diet because of its high protein content and good amino acid balance. Hence, the pulses are often called lifeline of human being. *Vigna radiata* (L.) Wilczek, commonly known as greengram or mungbean, is well known leguminous crop that belongs to the subgenus Ceratotropis (2n = 2x=22). At global scenario, India is contributing about 25 to 28 percent of total production in pulses. India is primary producer of green gram contribute about 75 percent of the world production (Nagda *et al.* 2020) [11].
It is short duration crop and it is grown mainly in arid and semi-arid condition across the country during kharif or summer season and contribute nearly 15 percent to total pulse production. Greengram consider as a source of protein (Engel *et al.* 1978) [3]. Nutritionally, mungbean is a protein rich staple food containing about 20 to 25 percent protein content along with rich in amino acid. Particularly lysine, minerals and vitamins. Thus, helps to fulfill the dietary needs of the vegetarian's population of the country. On dry weight basis it contains 22 - 28 percent protein, 1.0 -1.5 percent fat, 3.5 - 4.5 percent fiber, 4.5 - 5.5 percent ash and 60-65 percent carbohydrates.
In India during 2020-21, about 35.79 lakh ha area was observed under greengram as against 30.75 lakh ha area during the same period in 2019-20. The state Rajasthan (20.89 lakh ha), Karnataka (4.40 lakh ha), Maharashtra (3.94 lakh ha), Madhya Pradesh (1.57 lakh ha) and Orissa (1.48 lakh ha). The total greengram production in 2020-21 is 2.60 million tons. (Anon 2020-21).
Correlation analysis provided the information of inter relationship of important plant character leading a directional model for direct or indirect improvement in grain yield (Perera U.I.P *et al.* 2017) [12]. Path coefficient divided the correlation between coefficient into direct and indirect effects contributed by various independent character on the dependent character i.e., Seed yield. By conducting path analysis, the causal relationship between variables can be understood better.

Materials and Methods

The present investigation on "Genetic diversity studies in greengram" with 40 germplasm lines including four check (BPMR 145, BM 2002-1, BM-4 and BM 2003-2) was conducted during Kharif 2020-21 at Agricultural Research Station, Badnapur**.** The material used in the present study consisted of 40 genotypes including four check BPMR 145, BM 2002-1, BM-4 and BM 2003-2 received from Agricultural Research Station, Badnapur. The list of Genotypes is given in table 1.

Table 1: List of genotypes of greengram

Sr. No.	Genotypes	Sr. No.	Genotypes
1.	BPMR- 145	21.	IC 338850
2.	BM-2002-1	22.	EC 251806
3.	BM-4	23.	IC 249566
4.	BM-2003-2	24.	EC 272459
5.	EC 520019	25.	IC 600694
6.	EC 398931	26.	IC 548265
7.	EC 520032	27.	IC 607373
8.	IC 607147	28.	IC 607178
9.	EC 396138	29.	IC 607177
10.	EC 623193	30.	IC 623694
11.	EC 538112	31.	EC 245966-01
12.	EC 520032	32.	EC 396129
13.	EC 396141	33.	EC 398883
14.	IC 520019	34.	EC 396525
15.	IC 607158	35.	EC 255953
16.	IC 607382	36.	EC 397143
17.	IC 607167	37.	IC 338904
18.	EC 425946	38.	EC 338882
19.	IC 617782	39.	EC 249668
20.	IC 76521	40.	IC 417832

The data were recorded from five randomly selected plants for each genotype from each replication leaving the first two border plants from both sides of row, to avoid sampling error. Whereas, the traits plant stand, days to 50% flowering, days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of pods per plant, number of seeds per pod, 100 seed weight, seed yield per plant and harvest index were recorded on plot basis. Average value of the genotype for each character was computed from these plants for the 11 different characters.

Results and Discussion

Knowledge of the relationship among the plant characters is useful for selecting traits to combine for yield improvement. The correlation coefficient were computed among all measure quantitative traits and are shown in table 2 (phenotypic correlation) and table 3 (genotypic correlation). The correlation is measure of the degree to which variables vary together or a measure of intensity of association. Significant positive correlation of grain yield with other yield contributing characters (Raje & Rao 2000) [13].

Interrelationship among yield components (Phenotypic correlation): Seed yield per plant showed a significant and positive strong relation with number of pods per plant, plant height, seeds per pod, 100 seed weight, number of seeds per pod. These results were conformity with earlier finding of Singh *et al*. (1977) [5] for number of pods per plant, Sandhu *et al*. (1980) [14] for lant height, Gupta *et al.* (1977) [4] for number of seed per pods, Deore *et al*. (1983) [2] for 100 seed weight and Nataranjan *et al.* (1988) [17] for number of seed per pod. Seed yield per plant was highly significant and positively associated with plant height, number of branches per plant, number of pods per plant, which was close agreement with early finding of A. Muthuswamy *et al.* (2019) [10]. Highly significant and positively association of seed yield per plant was observed with number of pods per plant. Kumar *et al.* (2004) [9]. Seed yield per plant showed a positive genotypic and phenotypic correlation with number of branches per plant. Garje *et al*. (2014) [4] similar result also found by Khan and Wani (2006) [7]. Seed yield per plant showed positive significant association with number of primary branches. Singh *et al.* (1977) [5].

Interrelationship among yield component (genotypic correlation)

The number of pods per plant had high significant positive correlation with seed yield per plant. Number of pods per plant was positively correlated through number of seed per pod. Similar result was reported by Rathnaswamy *et al.* (1978) [3]. Number of seed per pod was positively correlated with plant height and number of primary & secondary branches both at genotypic and phenotypic level. Close result was found by Reddy *et al*. (2005) [18]. It was exhibited positive phenotypic correlation with number of pods per plant, number of branches per plant and negative non- significant phenotypic correlation with days to 50% flowering. Similar result was made by Ahamad *et al*. (2015) [1] and Garje *et al*. (2014) [4] in greengram. Days to 50% flowering showed positive genotypic correlation with days to maturity, plant height and non-significant genotypic correlation with number of branches per plant, number of seed per pod and seed yield per plant. Similar result was found by Kritika and Yadav (2017) [8].

Path coefficient analysis of seed yield and its component (Phenotypic Path)

In the investigation path coefficient analysis revealed that Number of pod per plant recorded magnitudinally the highest positive direct effect on seed yield per plant followed by Harvest index, days to 50% flowering. The character harvest index had a direct positive effect on yield per plant followed by number of primary and secondary branches on yield per plant. Similar result was founded by Mishra and Yadav (1992) [6]. The character 100 seed weight had positive direct effect on seed yield. Result similar with finding of Satyan *et al.* (1980) [15]. Number of pods per plant exhibited positive direct effect on seed yield per plant responsible for significant positive association with seed yield and recorded days to 50% flowering exhibited negative direct effect on seed yield per plant. Thanga Hemavathy *et al.* (2015) [16].

It is indicated that the seed yield per plant has the positive direct effect on number of pods per plant, harvest index, 100 seed weight, number of primary branches per plant, number of seed per pod and Days to maturity. These finding where agreement with Singh *et al.* (1977) [5], sandhu *et al.* (1980) [14] for number of pods per plant, Holkar and Raut (1992) [6] for harvest index, Satyan *et al.* (1980) [15] for 100 seed weight, for number of seed per pod, Days to 50% flowering for days to maturity.

Path coefficient analysis of seed yield and its component (genotypic Path)

In the present investigation path coefficient revealed that

Number of branches per plant recorded highest positive direct effect on seed yield per plant followed by number of pod per plant, harvest index, 100 seed weight. These direct effect are mainly responsible for significant positive association of these characters with seed yield per plant. These result are similar with finding of Mishra and Yadav (1992) [6], Kalpande *et al.* (1997) for number of primary branches, Deore *et al.* (1983) [2] and Nataranjan *et al.* (1988) [17] for number of pod per plant & harvest index, Satyan et al. (1980) [15] for 100 seed weight. Days to 50% flowering had positive direct effect on seed yield per plant. Similar result was found by Reddy *et al.* (2005) [18].

Table 2: Estimation of correlation coefficient of different characters in greengram. (Phenotypic Correlation)

Character Number		Days to 50% flowering	Days to maturity	Plant height	No. of primary branches per plant	No. of secondary branches per plant	No. of pods per plant	No. of seeds per pod	100 seed weight	Harvest index	Seed yield per plant
Days to 50% flowering	P	1.0000	0.5415**	0.0271	-0.0351	-0.0599	-0.0630	-0.1016	0.0938	-0.2009	-0.0655
Days to maturity	P		1.0000	0.3473**	0.4114**	0.3384**	0.3821**	-0.0196	0.3784**	0.2173*	0.4038**
Plant height	P			1.0000	0.8452**	0.6772**	0.8301**	0.0771	0.4374**	0.6772**	0.8066**
No of primary branches	P				1.0000	0.8518**	0.8901**	0.1926	0.4841**	0.7555**	0.8631**
No of secondary branches	P					1.0000	0.7189**	0.2436*	0.3023**	0.5643**	0.6894**
No of pods per plant	P						1.0000	0.1250	0.5323**	0.7697**	0.9138**
No of seeds per plant	P							1.0000	-0.2225*	0.2716*	0.0905
100 seed weight	P								1.0000	0.3283**	0.6144**
Harvest index	P									1.0000	0.7768**
Seed yield/plant	P										1.0000

*, ** indicates significant and 5 and 1% level of probability respectively P= Phenotypic

Table 3: Estimation of correlation coefficient of different characters in greengram (genotypic correlation)

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height	No. of primary branches per plant	No. of secondary branches per plant	No. of pods per plant	No. of seeds per pod	100 seed weight	Harvest index	Seed yield per plant
1.	Days to 50% flowering	1.0000	0.5674**	0.0260	-0.0329	-0.0530	-0.0631	-0.1609	0.1073	-0.2048	-0.0256
2.	Days to maturity		1.0000	0.3529**	0.4264**	0.3573**	0.3895**	-0.0176	0.3935**	0.2218	0.4499**
3.	Plant height			1.0000	0.8588**	0.6976**	0.8475**	0.1118	0.4478**	0.6808**	0.8883**
4.	No. of primary branches per plant				1.0000	0.8730**	0.9088**	0.2804*	0.4887**	0.7677**	0.9504**
5.	No. of secondary branches per plant					1.0000	0.7371**	0.3328*	0.3092**	0.5794**	0.7390**
6.	No. of pods per plant						1.0000	0.1703	0.5431**	0.7865**	0.9946**
7.	No. of seed per pod							1.0000	-0.2743*	0.3776*	0.1168
8.	100 seed weight								1.0000	0.3374**	0.6637**
9.	Harvest index									1.0000	0.8512**
10.	Seed yield/plant										1.0000

*, ** indicates significant and 5 and 1% level of probability respectively

Table 4: Estimate of direct and indirect effect of yield and its component on seed yield at phenotypic level.

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height	No. of primary branches per plant	No. of secondary branches per plant	No. of pods per plant	No. of seed per pod	100 seed weight	Harvest index	Seed yield per plant
1.	Days to 50% flowering	-0.0272	-0.0147	-0.0007	0.0010	0.0016	0.0017	0.0028	-0.0026	0.0055	-0.0655
2.	Days to maturity	0.0164	0.0302	0.0105	0.0124	0.0102	0.0115	-0.0006	0.0114	0.0066	0.4038
3.	Plant height	0.0016	0.0210	0.0604	0.0511	0.0409	0.0502	0.0047	0.0264	0.0409	0.8086
4.	No. of primary branches per plant	-0.0022	0.0256	0.0526	0.0622	0.0530	0.0554	0.0120	0.0301	0.0470	0.8631
5.	No. of Secondary branches per plant	-0.0029	0.0162	0.0324	0.0407	0.0478	0.0344	0.0116	0.0145	0.0270	0.6894
6.	No. of pods per plant	-0.0247	0.1496	0.3249	0.3484	0.2814	0.3915	0.0489	0.2084	0.3013	0.9138
7.	No. of seeds per pod	0.0017	0.0003	-0.0013	-0.0033	-0.0041	-0.0021	-0.0170	0.0038	-0.0046	0.0905
8.	100 seed weight	0.0154	0.0621	0.0717	0.0794	0.0496	0.0873	-0.0365	0.1640	0.0539	0.6144
9.	Harvest index	-0.0351	0.0379	0.1182	0.1319	0.0985	0.1344	0.0474	0.0573	0.1746	0.7768

Residual effect = 0.3309 R SQUARE = 0.8905 Bold and Underlined figures = Direct effect.

Table 5: Estimate of direct and indirect effect of yield and its component on seed yield at genotypic level

Sr. No.	Characters	Days to 50% flowering	Days to maturity	Plant height	No. of primary branches per plant	No. of secondary branches per plant	No. of pods per plant	No. of seed per pod	100 seed weight	Harvest index	Seed yield per plant
1.	Days to 50% flowering	0.0564	0.0320	0.0015	-0.0019	-0.0030	-0.0036	-0.0091	0.0061	-0.0115	-0.0256
2.	Days to maturity	-0.0225	-0.0397	-0.0140	-0.0169	-0.0142	-0.0155	0.0007	-0.0156	-0.0088	0.4499
3.	Plant height	-0.0010	-0.0130	-0.0368	-0.0316	-0.0257	-0.0312	-0.0041	-0.0165	-0.0250	0.8883
4.	No. of primary branches per plant	-0.0124	0.1610	0.3244	0.3777	0.3297	0.3432	0.1059	0.1846	0.2900	0.9504
5.	No. of secondary branches per plant	0.0044	-0.0296	-0.0578	-0.0723	-0.0828	- 0.0610	-0.0276	-0.0256	-0.0480	0.7390
6.	No. of pod per plant	-0.0169	0.1043	0.2270	0.2434	0.1974	0.2678	0.0456	0.1454	0.2106	0.9946
7.	No. of seed per pod	0.0169	0.0019	-0.0118	-0.0295	-0.0350	-0.0179	-0.1051	0.0288	-0.0397	0.1168
8.	100 seed weight	0.0084	0.0307	0.0349	0.0381	0.0241	0.0424	-0.0214	0.0780	0.0263	0.6637
9.	Harvest index	-0.0405	0.0438	0.1345	0.1517	0.1145	0.1554	0.746	0.667	0.1976	0.8512

Residual effect = 1.0542 R SQUARE = 1.0542 Bold and Underlined figures = Direct effect.

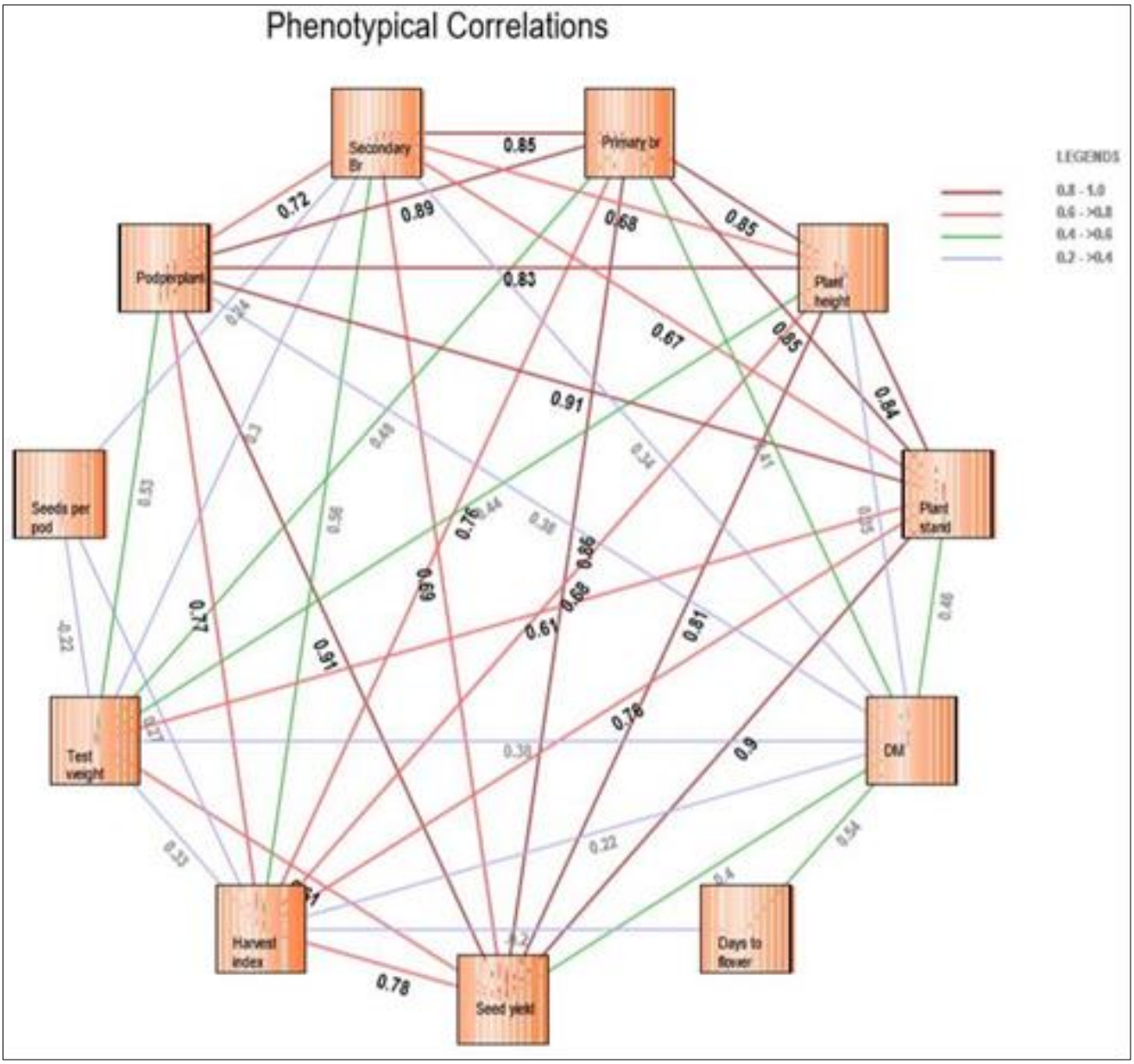

Fig 1: Diagram showing the phenotypic correlation of yield and its component in greengram

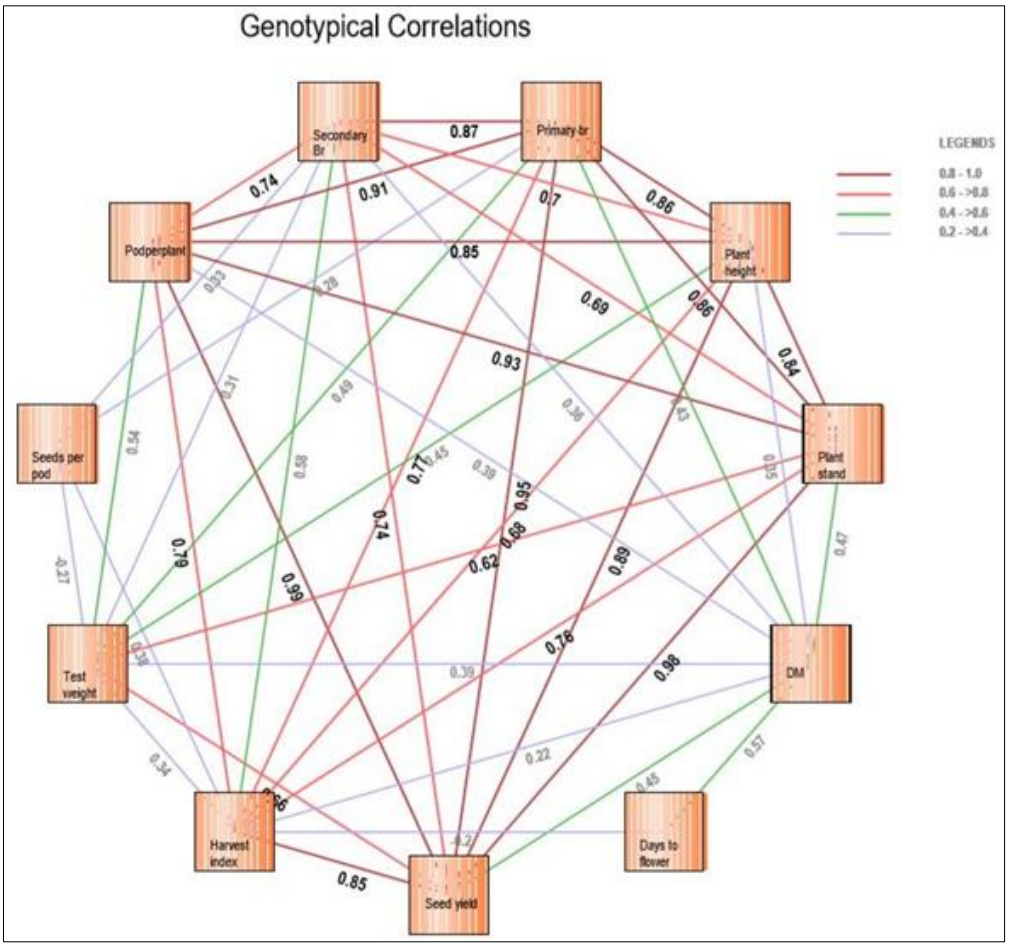

Fig 2: Diagram showing the genotypic correlation of yield and its component in greengram

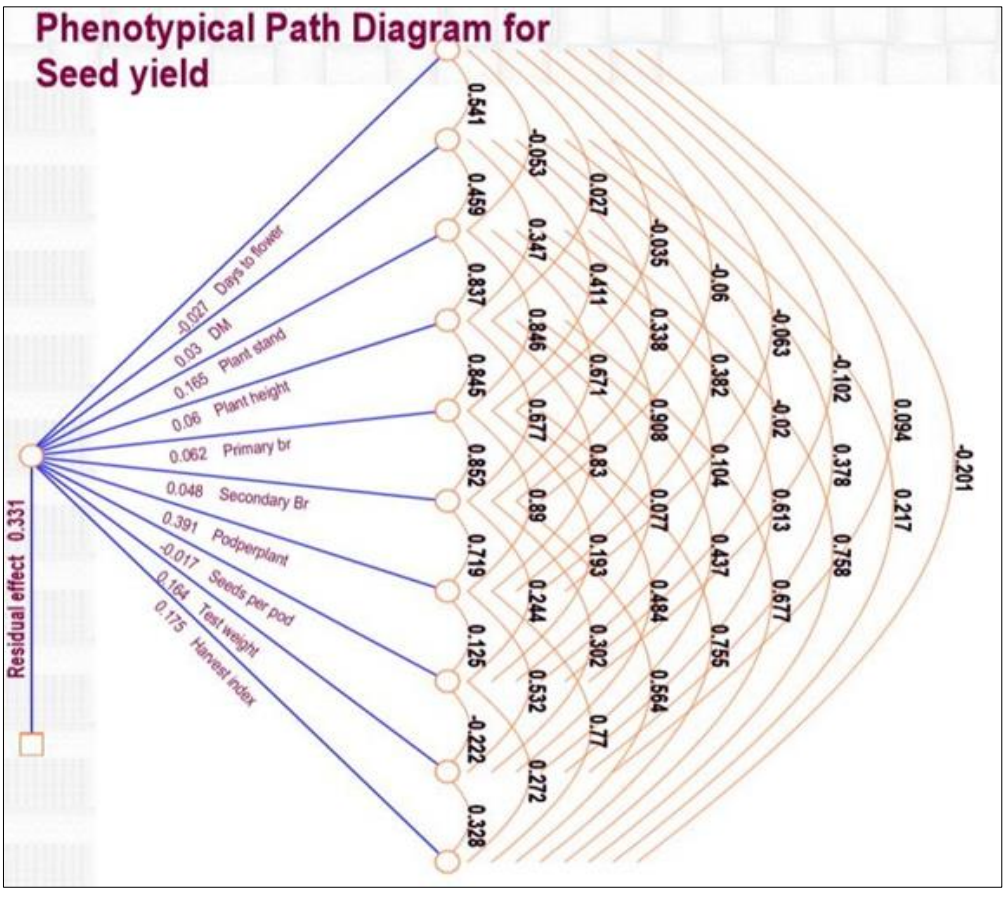

Fig 3: Diagram showing the phenotypic path correlation of yield and its component characters in greengram

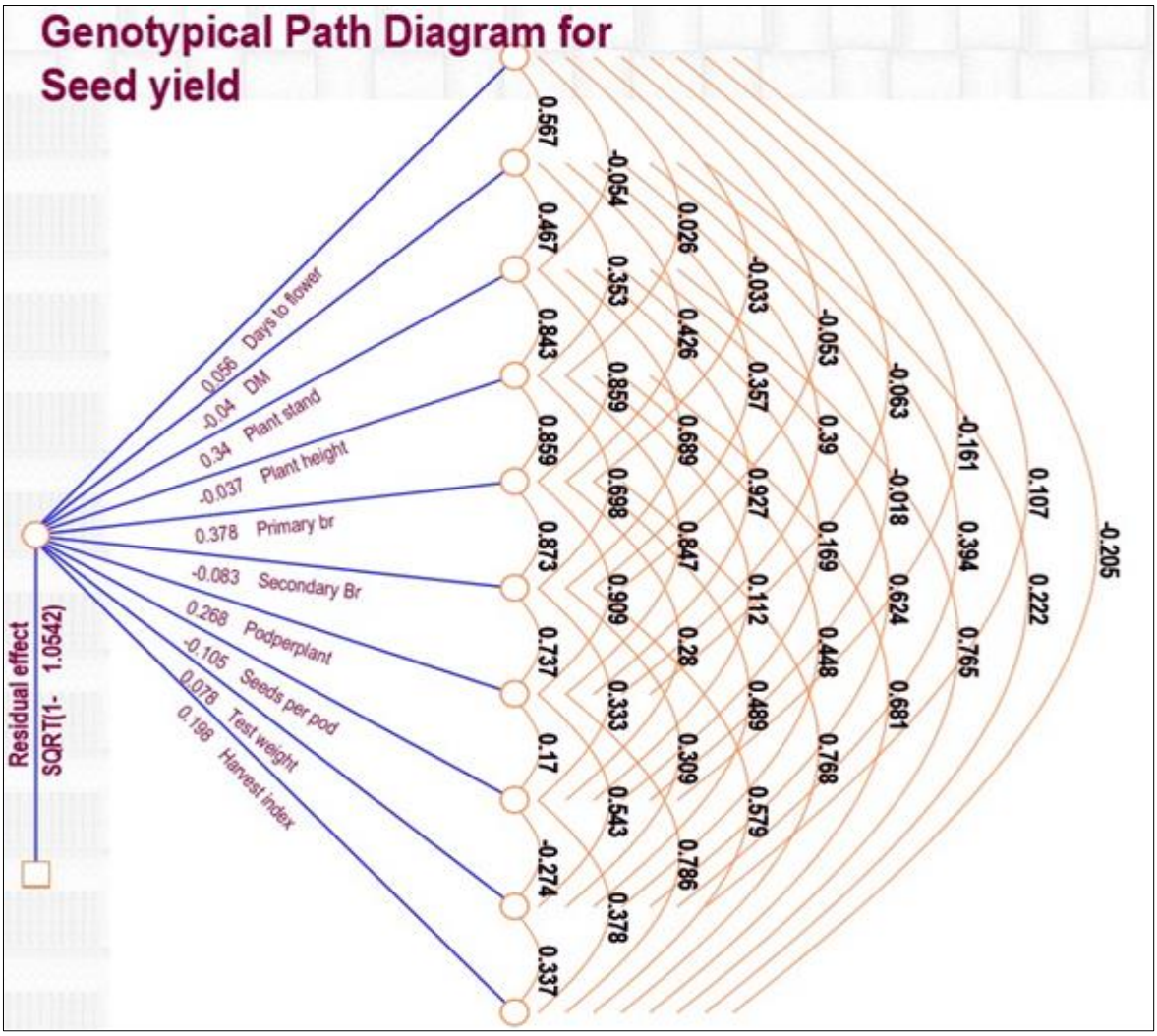

Fig 4: Diagram showing the genotypic path correlation of yield and its component characters in greengram

Conclusion

As per correlation studies, indicates strong inherent association between various characters studied and genotypic expression of correlation was comparatively less influence by environmental condition. Path analysis exist a true and perfect association between seed yield and number f pods per plant , 100 seed weight suggesting direct selection will effective for all these characters.

References

1. Ahmed HF, Raif F, Hussain I, Rafiq CM, Rehman A, Aulakh AM, *et al*. Genetic Variability, association and path analysis in mungbean (*Vigna radiata* (L.) Wilczek) International Journal of Agronomy and Agricultural Research. 2015;6(6):75-81.
2. Deore AJ. Genetic variability, character association and path analysis studies of yield and its component in mungbean. M.Sc. (Agri); c1983.
3. Engel RH. The importance of legume as a protein source in Asian diet. Proc. First Intern. Mungbean Symposium, AVRDC, Taiwan; c1978. p. 25-29.
4. Garje, UA, Bhailume MS, Nagawade DR. Genetic Diversity Analysis of Greengram (*Vigna radiata* (L.) Wilczek.). The Bioscan. 2014;8(4):1477-1480.
5. Gupta SK, Singh K, Rathore P. Genetic diversity estimation in Greengram. J Res. 1977;41(3):306-309.
6. Holkar S, Raut NO. Character association and path analysis in greengram. J Mah. Agric. Univ. 1992;17(2):335-336.
7. Khan S, Wani MR. Induced mutation for yield contributing traits in greengram. Int. J Agri. Biol. 2006;8(4):25-29.
8. Kritika, Yadav R. Correlation and path coefficient analysis for seed yield and micronutrient in mungbean (*Vigna radiata* (L.). Int. J Pure App. Biosci. 2017;5(1):908-917.
9. Kumar R, Ravikant, Ojha CB. Character association and cause effect analysis for spring season genotypes of mungbean (*Vigna radiata* (L.) Wilczek). Legume Res. J Kerala. 2004;27(1):32-36.
10. Muthuswamy A., Jamunarani M, Ramakrishnan P. Genetic variability, character association and path analysis studies in green gram (*Vigna radiata* (L.) Wilczek). Int. J Curr. Microbiol. App. Sci. 2019;8(4):1136- 1146.
11. Nagda R, Gopal K, Kumar B. Genetic Diversity Estimation among the cultivated Green gram Genotypes (*Vigna radiata* (L.) Wilczek). Int. J Curr. Microbiol. App. Sci. 2020;11:2540-2547.
12. Perera UIP, Chandrika KKJ, Ratnasekera D. Genetic

variation, characters association and evaluation of mungbean genotypes for agronomic yield and yield component. J Natn. Sci. 2017;45(4):347-353.
13. Raje RS, Rao SK. Association analysis for yield and its component in mungbean (*Vigna radiata* (L.) Wilczek). Legume Res. 2000;23(1):42-48.
14. Sandhu TS, Bhullar BS, Cheema HS. Path coefficient analysis for seed yield and its attributes in greengram. Indian J Agric. Sci. 1980;10(3):171-173.
15. Satyan BA, Amarnath KCN, Siddharaju I. Phenotypic and genotypic correlation coefficient of some quantitative characters in greengram. Curr. Res. 1980;18(2):170-172.
16. Thanga HA, Shumugavali N, Anand G. Genetic variability, Correlation and path coefficient studies on yield and its component in mungbean. Legume Res. 2015;38(4):442-446.
17. Carrano AV, Natarajan AT. Considerations for population monitoring using cytogenetic techniques. Mutation Research/Genetic Toxicology. 1988;204(3):379-406.
18. Reddy MS, Boucher O, Balkanski Y, Schulz M. Aerosol optical depths and direct radiative perturbations by species and source type. Geophysical research letters. 2005 Jun;32(12):01-04.