International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 11, Issue 13, 2019, pp.-8747-8749.
Available online at https://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

ESTIMATION OF CORRELATION AND PATH COEFFICIENT ANALYSIS ON YIELD COMPONENTS OF BLACKGRAM (*VIGNA MUNGO* (L.) HEPPER)

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Received: June 30, 2019; Revised: July 11, 2019; Accepted: July 12, 2019; Published: July 15, 2019

Abstract: The present investigation was carried out on correlation and path analysis for 13 characters of Blackgram on 29 genotypes including one check (T-9) and evaluated during kharif, 2018 in Randomized Block Design. The correlation studies exhibited highly significant and positive association for the quantitative characters with that of harvest index , biological yield, days to 50% pod setting and number of primary branches per plant. Path Coefficient analysis revealed that biological yield, harvest index, number of pods per plant. is the most important yield component character at both genotypic and phenotypic levels that can be used as selection indices for the yield improvement in black gram.

Keywords: *Blackgram, Correlation, Path analysis*

Citation: Abhilash D., *et al*., (2019) Estimation of Correlation and Path Coefficient Analysis on Yield Components of Blackgram (*Vigna mungo* (L.) Hepper). International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 11, Issue 13, pp.- 8747-8749.

Introduction

Blackgram (*Vigna mungo* (L.) Hepper), 2n=22), known as urd bean, is an important grain legume for its nutritional quality and the suitability to any cropping system. Blackgram has the potential of supplying a major portion of protein demand and restoring the soil health at the same time. Blackgram is the cheapest source of protein for the poor and has long been known as the poor men's meat [1]. Pulses contain a remarkable amount of proteins, minerals, vitamins and carbohydrates. Among the various pulses, blackgram is an important one which contains approximately 25-28% protein, 4.5-5.5% ash, 0.5-1.5% oil, 3.5-4.5% fibre and 6265% carbohydrate on dry weight basis [2]. The knowledge on inter relationship of plant characters with seed yield and among themselves is of paramount importance to the breeder for making importance in complex character like seed yield, for which direct selection is not much effective. Correlation measures the degree and direction of association between two or more variables. Path coefficient analysis is simply a standardized partial regression which splits the correlation coefficient into the measures of direct and indirect effects. In other words, it measures the direct and indirect contribution of various independent characters on a dependent character. The correlation and path coefficient analysis provide information about the relative importance of various yield components in the expression of yield and thus, help in formation of appropriate selection strategy.

Materials and Methods

The experiment has been conducted in the experimentation centre of Sam Higginbottom University of Agriculture and Technological sciences, Prayagraj in *kharif* 2018. Thirty blackgram genotypes were taken as materials with one nationally released variety which is used as check T-9. With a spacing of 10cm between the plants and 30 cm between two rows was maintained. The observations were recorded on days to 50% flowering, days to 50% pod setting, days to 50% maturity, plant height (cm), number of primary branches per plant, number clusters per plant, number pods per plant, pod length (cm), number seeds per pod, number seeds per pod, seed index (g), biological index (g), seed yield per plant (g) and harvest index (%) at harvest stage.

The statistical analysis and variance due to different sources was worked out according to Panse and Sukhatme (1967), Genotypic and phenotypic correlation [3], path coefficient analysis [4].

Results and discussion

Analysis of variance

The mean sum of square values for thirteen quantitative characters is presented in [Table-1]. The mean sum of square due to the genotypes were significant (α = 0.01) for all the characters studied, except days to maturity, number of primary branches per plant and seed index showed significant differences at (α = 0.05), suggesting the existence of high genetic variability among the genotypes for all the traits.

Table-1 *Analysis of variance for 13 quantitative characters in Blackgram*

S	Character	MSS Replications (d.f=2)	MSS Treatments (d.f =29)	MSS Error (d.f = 58)
1	Days to 50% flowering	8.81	8.61**	3.39
2	Days to 50% pod setting	4.9	7.15**	3.19
3	Days to maturity	3.21	3.68*	2.05
4	Plant height	6.56	48.06**	6.09
5	No. of primary branches per plant	0.17	0.19*	0.09
6	No. of clusters per plant	0.48	2.38**	0.24
7	No. of pods per plant	3.47	45.05**	1.5
8	No .of seeds per pod	0.23	0.32**	0.11
9	Pod length	0.015	0.047**	0.016
10	seed index	0.027	0.122*	0.065
11	Biological yield	0.29	22.4**	1.98
12	Harvest Index	5.58	135.4**	21.33
13	Seed yield per plant	0.32	2.19**	0.16

*-Significant at 5% level of probability, **- Significant at 1% level of probability,

This indicates that there is ample scope for selection of genotypes from the present gene pool for yield and its components.

Table-2 *Correlation coefficient between yield and its related traits in 30 Blackgram genotypes at both genotypic and phenotypic level*

S	Genotypes		Days to 50% flowering	Days to 50% pod setting	Days to maturity	Plant height	No. Of primary branches per plant	No. Of clusters per plant	No. Of pods per plant	No. Of seeds per pod	Pod length	Seed index	Biological yield	Harvest index	Seed yield per plant
1	Days to 50% flowering	r_g	1	0.9144**	0.2346*	0.6124**	0.3088**	0.3593**	0.4038**	0.6916**	-0.1388	-0.268	0.4598**	-0.379**	0.1671
		r_p	1	0.5572**	0.0277	0.5634**	0.2888**	0.2198*	0.304**	-0.375**	-0.179	-0.17	0.2984**	0.2049*	0.1306
2	Days to 50% Pod setting	r_g		1	0.2098*	0.5592**	0.999**	0.3401**	0.5022**	0.248*	0.442**	0.409**	0.6359**	-0.331**	0.2949**
		r_p		1	-0.003	0.3942**	0.5815**	0.1706	0.352**	0.0982	0.2318*	0.2213*	0.3879**	-0.111	0.251*
3	Days to Maturity	r_g			1	0.2995**	0.0331	0.5479**	0.0039	-0.2695*	-0.382**	-0.3948**	0.2205*	-0.2339*	-0.0792
		r_p			1	0.176	0.0007	0.379**	0.0174	-0.1469	-0.205	-0.260*	0.1542	-0.185	-0.0709
4	Plant Height	r_g				1	0.346**	0.3523**	-0.0427	-0.4818	0.0488	-0.4591**	0.3224**	-0.2167*	0.1528
		r_p				1	0.2593*	0.3147**	-0.0233	-0.358**	0.041	-0.370**	0.3411**	-0.206	0.1615
5	No. of primary branches per plant	r_g					1	-0.4529	0.1748	0.1008	0.497**	0.1201	0.1147	0.1034	0.21*
		r_p					1	-0.2374	0.216*	0.1182	0.4119**	-0.09	0.2173*	-0.004	0.2195*
6	No. of clusters per plant	r_g						1	0.3927**	-0.3207**	-0.3098	-0.3844	-0.0498	-0.0869	-0.0133
		r_p						1	0.3534**	-0.240*	-0.259*	-0.25	0.0249	-0.094	-0.06
7	No. of pods per plant	r_g							1	0.0267	-0.0168	-0.2134	-0.0712	0.101	0.0725
		r_p							1	-0.0072	-0.017	-0.18	-0.097	0.1205	0.0646
8	No. of seeds per pod	r_g								1	0.9999**	0.844**	-0.513**	0.467**	-0.17
		r_p								1	0.6964**	0.3894**	-0.446	0.3738**	-0.1546
9	Pod length	r_g									1	0.464**	-0.368	0.323**	-0.1904
		r_p									1	0.16	-0.3	0.2414*	-0.1491
10	Seed index	r_g										1	0.085	0.1157	0.1199
		r_p										1	0.0149	0.076	0.0427
11	Biological Yield	r_g											1	-0.63	0.3864**
		r_p											1	-0.657	0.3464**
12	Harvest Index	r_g												1	0.4904**
		r_p												1	0.4954**

Table-3 *Direct and indirect effects between yield and its related traits in 30 Black gram genotypes at genotypic and phenotypic level*

S	Character		Days to 50% flowering	Days to 50% pod setting	Days to maturity	Plant height	No. Of primary branches per plant	No. Of clusters per plant	No. Of pods per plant	No. Of seeds per pod	Pod length	Seed index	Biological yield	Harvest index	Seed yield per plant
1	Days to 50% flowering	G	-0.0044	-0.0457	-0.0184	0.0898	0.0094	-0.0004	0.0392	0.127	0.019	-0.052	0.4421	-0.4379	0.1671
		P	0.0185	-0.0166	0.0011	0.0007	-0.0012	-0.0006	0.0104	0.0068	0.0022	0.0006	0.2315	-0.1234	0.13
2	Days to 50% Pod setting	G	-0.004	-0.05	-0.0165	0.082	0.0322	-0.0003	0.0487	-0.0455	-0.059	0.0795	0.6114	-0.3832	0.295
		P	0.0062	-0.0492	0.0013	0.0004	-0.0031	-0.0002	0.0097	-0.0003	-0.0014	-0.001	0.221	0.0677	0.251
3	Days to Maturity	G	-0.001	-0.0105	-0.0785	0.0439	0.001	-0.0005	0.0004	0.0495	0.051	-0.077	0.212	-0.2703	-0.0792
		P	-0.0017	0.0054	-0.0118	0.0002	0	-0.0011	0.001	0.0052	0.0015	0.0016	0.1051	-0.1763	-0.0709
4	Plant Height	G	-0.0027	-0.028	-0.0235	0.1467	0.0106	-0.0004	-0.0041	0.0903	-0.007	-0.089	0.31	-0.2504	0.1528
		P	0.0087	-0.0122	-0.0011	0.0016	-0.0036	-0.0009	-0.0008	0.0289	-0.0002	0.0025	0.3286	-0.1902	0.1613
5	No. of primary branches per plant	G	-0.0014	-0.0527	-0.0026	0.0508	0.0305	0.0005	0.017	-0.0185	-0.067	0.0233	0.1104	0.1196	0.2101
		P	0.0014	-0.009	0	0.0003	-0.0168	0.0006	0.1092	-0.0042	-0.003	0.1018	0.0237	0.0154	0.2194
6	No. of clusters per plant	G	-0.0016	-0.017	-0.043	0.0517	-0.0138	-0.001	0.0381	0.0589	0.042	-0.075	0.0479	-0.1005	-0.0133
		P	0.0025	-0.0019	-0.0031	0.0004	0.0023	-0.0041	0.0131	0.0087	0.0024	0.001	0.0769	-0.1583	-0.0601
7	No. of pods per plant	G	-0.0018	-0.0251	-0.0003	0.0063	0.0053	-0.0004	0.097	-0.0049	0.002	-0.041	-0.0685	0.1041	0.0726
		P	0.0047	-0.0118	-0.0003	0	-0.0017	-0.0013	0.0406	0.0018	-0.0001	0.001	-0.0458	0.0769	0.064
8	No. of seeds per pod	G	0.0031	-0.0124	0.0212	-0.0721	0.0031	0.0003	0.0026	-0.1836	-0.142	0.1637	-0.494	0.5404	-0.17
		P	-0.0019	-0.0002	0.0009	-0.0004	-0.0011	0.0006	-0.003	-0.0643	-0.0355	-0.001	-0.3577	0.309	-0.1546
9	Pod length	G	0.0006	-0.0221	0.03	0.0072	0.0152	0.0003	-0.0016	-0.1947	-0.134	0.09	-0.3547	0.3735	-0.1905
		P	-0.0031	-0.005	0.0013	0	-0.0038	0.0007	0.0004	-0.0294	-0.0133	0	-0.2499	0.1531	-0.149
10	Seed index	G	0.0012	-0.0205	0.031	-0.0674	0.0037	0.0004	-0.0207	-0.155	-0.062	0.194	0.0818	0.1337	0.1199
		P	-0.0014	-0.0066	0.0124	-0.0005	0.0039	0.0302	-0.0054	-0.0083	0.0001	-0.0076	0.0025	0.0234	0.0427
11	Biological Yield	G	-0.002	-0.0318	-0.0173	0.0473	0.0035	0	-0.0069	0.0943	0.05	0.0165	0.9614	-0.7281	0.3864
		P	0.0037	-0.0092	-0.0012	0.0005	-0.001	-0.0003	-0.0017	0.0406	0.0022	0	1.1147	-0.8019	0.3464
12	Harvest Index	G	0.0017	0.0166	0.0184	-0.0318	0.033	0.0001	0.0094	-0.0859	-0.043	0.0225	-0.6059	1.1553	0.4904
		P	-0.0019	-0.0027	0.0039	-0.0002	-0.0017	0.0006	0.0236	-0.0163	-0.0017	-0.0001	-0.731	1.2229	0.4954

Residual effect: 0.101, Residual effect: 0.22

The presence of high variability might be due to diverse source of materials as well as environmental influence affecting the phenotypic characters. Genotypic Correlation coefficient analysis revealed that seed yield per plant exhibited positive and significant correlation associated with harvest index (0.4904**), biological yield (0.386**), days to 50% podsetting (0.294**) and number of primary branches per plant (0.21*). The positive non-significant association with days to 50%flowering (0.167), plant height (0.152), seed index (0.119), number of pods per plant (0.072) Negative non-significant correlation exhibited by pod length (-0.190), number of seeds per pod (-0.170), days to maturity (-0.0792) and number of clusters per plant(-0.0133).These findings were in accordance with Lad *et al*. (2011) [5], Rajasekhar *et al*. (2018) [6], Konda *et al*. (2008) [7], Mehra *et al*. (2018) [8], Kumar *et al*. (2015) [9], Punia *et al*. (2014) [10], Bharti *et al*. (2014) [11]. Phenotypic Correlation coefficient analysis revealed that seed yield per plant exhibited positive and significant correlation associated with harvest index (0.495**), biological yield (0.346**), days to 50% pod setting (0.251*) and number of primary branches per plant (0.219*).The positive non-significant association with plant height (0.161), days to 50% flowering (0.130), number of pods per plant (0.064) and seed index (0.0427). Negative non-significant correlation exhibited by number of seeds per pod (-0.154) pod length (-0.149), days to maturity (-0.070) and number of clusters per plant (-0.060) with seed yield per plant in [Table-2]. The estimates of correlation revealed only the relationship yield components, but did not show the direct and indirect effects of different traits on yield are presented in [Table-2]. This is because; the attributes which are in association do not exit themselves, but linked to each other components. In order to get yield, yield components and quality traits were investigated through path coefficient analysis [Table-3] revealed that characters harvest index (1.155), biological yield (0.961), seed index (0.194), plant height (0.146), number of primary branches per plant (0.0305), number of pods per plant (0.097) have positive direct effect on seed yield per plant. While the characters number of seeds per pod (-0.1836), pod length (-0.1342), days to maturity (-0.0785), days to 50% pod setting (-0.050), days to 50 % flowering (-0.0044), number of clusters per plant (-0.0010) have negative direct effect on the seed yield per plant at genotypic level. These results are in agreement with the findings of Reni *et al*. (2013) [12] and Singh *et al*. (2009) [13]. priti *et al.,* (2003) [14] reported harvest index followed by biological yield per plant and number of primary branches per plant, plant height, number of pods per plant showed positive direct effect on seed yield per plant in Blackgram. Phenotypic path in [Table-3]. Revealed that character harvest index (1.22), biological yield (1.11), number of pods per plant (0.0406), days to 50% flowering (0.0185) and plant height (0.0016) have positive direct effect on seed yield per plant. While the characters number of seeds per pod (-0.0643), pod length (-0.0133), days to 50% pod setting (-0.0492), days to maturity (-0.0188), number of primary branches per plant (-0.0168) and number of clusters per plant (-0.0041) have negative direct effect on seed yield per plant at phenotypic level. In plant breeding it is very difficult to have complete knowledge of all component characters on yield. The residual effect observed in present study (0.228) for phenotypic path coefficient analysis other remaining characters can be further studied. In present study harvest index, biological yield per plant and number of pods per plant have direct effect on seed yield per plant. Hence it is suggested that more emphasis on harvest index, biological yield, plant height and number pods per plant while executing the selection for genetic enhancement of seed yield in Blackgram.

Conclusion

The correlation analysis revealed that with harvest index, biological yield, days to 50% pod setting and number of primary branches per plant displayed significant positive association, with seed yield per plant at phenotypic and genotypic level. Path analysis revealed that the characters harvest index, biological yield, number of pods per plant, plant height exhibited positive direct effect on seed yield at phenotypic and genotypic level. Hence utmost importance should be given to these characters during selection for seed yield per plant.

Application of research: Since the population is increasing hence there is an urgent need to provide high yield varieties to meet the demand. Unavailability of cultivars with high potential. Therefore, present study has been undertaken to identify the best hybrid which can give high yield.

Research Category: Genetics and Plant Breeding

Abbreviations:
cm: Centimeter, g: Gram, kg: Kilogram, Mm: Millimeter, rg: Genotypic correlation coefficient, rp: Phenotypic correlation coefficient, % : percentage.

Acknowledgement / Funding: Authors are thankful to Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, 211007, Uttar Pradesh, India.

***Research Guide or Chairperson of research: Dr Gabrial M. Lal**
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Research project name: Estimation on Correlation and Path Analysis of Yield Components of Blackgram (*Vigna mungo*(L.) Hepper).

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Prayagraj, 211007, Uttar Pradesh

Cultivar / Variety / Breed name: Blackgram (*Vigna mungo* (L.) Hepper)

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

References

[1] Main A. (1976) Grow more pulse to keep your pulse well, an essay of Bangladesh pulse. Dept. of Agronomy. BAU, Mymensing. pp. 11-15.
[2] Kaul A. K. (1982) Bangladesh Agricultural research council (BARC). Farmgate, Dhaka. p.19
[3] Al-Jibouri H.A., Mullar P.A. and Rabinsion H.F. (1958) Agronomy, 50, 633-636.
[4] Dewey D.R. and Lu K.H. (1959) Agronomy Journal. 51,515-518.
[5] Lad D.B., Punde P.B., Jagtap P.K. (2011) Journal of Maharashtra Agricultural Universities, 36(1), 46-49.
[6] Rajasekhar D., Sapna S.L. and Gabrial M.L. (2017) Plant Archives,17(1), 467- 471.
[7] Konda, C.R., Salimath, P.M. and Mishra, M.N. (2008) Legume Research, 31(3),202-205.
[8] Mehra R., Tikle A.N., Saxena A., Munjal A., Rekhakhandia and Singh M. (2017) International Research Journal of Plant Science, 7(1), 001-011.
[9] Kumar G.V., Vanaja M., Sathish P., Vagheera P. and Lakhsmi (2015) International Journal of Scientific and Research Publications 5(4),14.
[10] Punia S.S., Gautam and Verma B.R.N.K. (2014) Agricultural Research Communication Center, 580-584.
[11] Bharti Singh S. and Kumar P. (2014) Legume Research, 18 (2), 25-28.
[12] Reni Y.P. Rao Y.K., Satish and babu J.S. (2013) International journal of Plant, Animal, and Environmental sciences, 3(4),231-234.
[13] Singh S.K., Singh I.P., B.B. and Singh O. (2009) Legume Research 32 (3), 180-185
[14] Priti, G. Semwal, B.D. Gupta, D. (2003) Progressive Agriculture, Rawatpur, India. 3(12), 63- 65.