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CORRELATION AND PATH-COEFFICIENT ANALYSIS IN BENGAL GRAM (*Cicer arietinum* L.)

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In twenty one diverse varieties of Bengal gram grown in wintet (*rabi*) under two different planting dates, the correlation coefficient indicated that grain yield had significant positive association with number of pods per plant at genotypic and phenotypic levels under both the planting dates while grain yield exhibited positive association with number of primary branches per plant and 100-grain weight at both the levels in first planting. Further, path analysis indicated that number of pods per plant had tha maximum direct effect in both the plantings followed by number of primary branches per plant and days to flower.

Association studies provide information on nature, extent and direction of selection. Path coefficient analysis is a standardised tool for spliting the total correlation into direct and indirect causes of the yield components on yield. Therefore, the present study was initiated to study the correlation and path-coefficient analysis in Bengal gram (*Cicer arietinum* L.).

MATERIAL AND MATHODS

The present investigation was conducted during *rabi*, 1983-84 at the experimental field of Rajasthan College of Agriculture. Udaipur. Twenty one genetically diverse varieties of Bengal grem were raised in a randomised block desion with three replications under two different planting dates. First planting (E_1) was done on 28th November and second planting (E_2) was done on 14th December. Each plot had one entry with a spacing of 30 x 15 cm. Observations were recorded on five randomly chosen plants for days to flower, days to maturity, plant height, number of primary branches per plant, number of pods per plant, number of grains per pod, 100-grain weight and grain yield per plant.

Plot means were used to compute the correlation coefficients following the formula suggested by Fisher (1954) and At jibouri *et al.* (1958). The path coefficient analysis was conducted as described by Deway and Lu (1959).

RESULTS AND DISCUSSION

The varieties showed significant differences for all the characters studied. In general, almost all characters exhibited slightly higher genotypic correlations with yield and among themselves in comparison with their respective phenotypic correlations.

Grain yield per plant at genotypic and phenotypic levels (Table 1) was strongly correlated with number of pods

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per plant under both the planting dates, but with number of primary branches per plant and 100-grain weight in case of early planting only. Similar results were also reported by Kheder *et al.* (1984) on number of pods, number of primary branches and 100-grain weight and Islam and Khaleda (1985) on number of pods and number of primary branches per plant.

Variable results were obtained with regard to mutual correlations between different characters in both the plantings. Days to flower showed strong positive association with days to maturity at both the levels in two sets. Days to maturity exhibited negative and significant correlation with 100-grain weight in case of second sowing at both genotypic and phenotypic levels. Positive and significant correlation was observed between plant height and number of primary branches per plant Significant positive association was observed between number of pods per plant and 100-grain weight in first sowing at both levels.

The path-coefficient analysis furnishing the cause and effect of different yield components would provide a better index for selection rather than mere correlation coefficients Number of pods per plant had the maximum direct effect in both the experiments on grain yield followed by number of primary branches per plant and days to flower (Table 2). These results are in agreement with Khedar *et al.* (1984) for pods per plant and number of primary branches per plant Low magnitude of direct effects was observed for other characters.

Maximum positive indirect effect for days to maturity on grain yield was observed *via* number of pods per plant in first planting and days to flower in second planting. Plant height contributed on grain yield indirectly through number of primary branches in both the experiments. Number of primary branches exhibited larger indirect effect on grain yield *via* number of pods per plant. Number of grain per pod exhibited negative and non-significant association with grain yield due to negative indirect contribution *via* number of pods per plant in both the plantings. Lower values of residual path ways in both plantings indicated that the traits included in the present study playedan appreciable role.

From path analysis studies over two plantings, it may be concluded that, maximum direct effects were exhibited by number of bods per plant followed by number of primary branches and days to flower. Of these, number of pods per plant and number of primary branches per plant exhibited positive and significant correlation with grain yield and were considered to be the most important yield contributing characters. Therefore, due emphasis should be placed on these characters while breeding for high grain yield in Bengal gram.

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Table 1. Genotypic and phenotypic correlation coefficient between different characters in Bengal gram

Characters	Environment	Days to maturity	Plant height	No. of primary branches per plant	No. of pods per plant	No. of grains per pod	100-grain weight	Grain yield per plant
1	2	3	4	5	6	7	8	9
Days to flower	E_1	0.73** (0.64**)	−0.02 (−0.02)	−0.38 (0.37)	−0.06 (−0.05)	0.13 (0.13)	0.07 (0.07)	−0.14 (−0.19)
	E_2	0.65** (0.57**)	−0.10 (−0.10)	0.01 (0.10)	−0.44* (−0.43*)	0.03 (0.04)	0.02 (0.02)	−0.29 (−0.25)
Days to maturity	E_1		0.00 (0.01)	−0.25 (−0.31)	0.14 (0.14)	−0.01 (0.01)	0.09 (0.08)	−0.05 (−0.04)
	E_2		−0.00 (0.00)	0.13 (0.13)	−0.15 (−0.12)	0.18 (0.17)	−0.50* (−0.44*)	−0.17 (−0.10)
Plant height	E_1			0.41 (0.40)	−0.19 (−0.19)	0.21 (0.20)	−0.39 (−0.38)	−0.37 (−0.36)
	E_2			−0.09 (0.50*)	0.09 (0.02)	0.14 (0.07)	0.10 (0.03)	0.09 (0.10)
Number of primary branches per plant	E_1				0.34 (0.33)	−0.27 (−0.26)	0.27 (0.26)	0.45* (0.46*)
	E_2				0.13 (0.13)	−0.23 (−0.20)	−0.08 (−0.07)	0.36 (0.34)
Number pods per plant	E_1					−0.45* (−0.44*)	0.77** (0.76**)	0.73** (0.77**
	E_2					−0.16 (−0.16)	0.04 (0.04)	0.93** (0.90)**
Number of grains	E_1						−0.38 (−0.37)	−0.37 (−0.39)
	E_2						−0.26 0.25)	−0.28 (−0.24)
100- weight	E_1							0.67** (0.69**)
	E_2							0.14 (0.12)

Figures within parentheses are phenotypic correlations

* Significant at 5 per cent level

** Significant at 1 per cent level

Table 2 Path analysis showing direct and indirect of seven characters on grain yield in Bengal gram

Characters	Environment	Days to flower	Days to maturity	Plant height	No. of primary branches per plant	No. of pods per plant	No of grains per pod	100-grain weight	Genotypic correlation with grain yield
Days to flower	E_1	(0.0733)	-0.0023	0.0118	-0.1988	-0.0311	0.0109	-0.0031	0.1393
	E_2	(0.2893)	-0 1579	0.0041	0 014	-0 4276	-0.0010	-0.0001	-0.2918
Days to maturity	E_1	0.0537	(-0.0031)	-0.0004	-0.1659	0,0729	-0.0005	-0.0039	-0.0472
	E_2	0.1878	(-0.2432)	-0.0001	0.0375	0.1460	-0.0051	0.0029	-0.1660
Plant height	E_1	-0.0018	-0.0000	(-0.4838)	0.2167	-0.1025	0.0172	0.0163	-0.3668
	E_2	-0.0288	0.0003	(-0.0410)	0.1488	0.0140	-0.0020	-0.0001	0.0912
Number of primary	E_1	-0.0277	0.0010	(-0.1983)	(0.5260)	0.1791	-0.0216	-0.0113	0.4462**
branches per plant	E_2	0 0015-	0.0330	-0.0220	(0.2767)	0.1287	0.0065	0.0004	0.3588
Number of pods	E_1	-0.0043	-0.0004	0.0932	0.1770	(0.5323)	-0.0361	-0.324	0.7293**
per plant	E_2	-0.1265	0 0363	-0.0006	0.0364	(0.9784)	0.0046	-0.0002	0.9284**
Number of grains	E_1	0.0099	0.0000	-0.1031	-0.1407	-0.2377	(0.0809)	0.0158	-0.3749
per pod	E_2	0.0099	-0 0430	-0.0029	-0.0629	-0.1556	(-0.0288)	0.0012	-0.2821
100-grain weight	E_1	0.0054	-0.0003	-0.1874	0.1417	0.4111	-0.305	(-0.0420)	0.6728**
	E_2	0.0065	0.1212	-0.0011	-0.0223	0.0365	0.0076	(-0.0045)	0.1438

Figures within parenthesis are direct effects
Residual affects: E_1 = 0.1907 and E_2 = 0.0708
*Significant at 5 per cent level
**Significant at 1 per cenr level

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