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Comparison of Association and Path Analysis over Two Seasons in Black gram (*Vigna mungo* (L.) Hepper)[1]

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Abstract : A character association study involving 225 genotypes was conducted in two seasons. Seed yield was found to be positively associated with pod length, branches per plant, seeds per pod, 100-seed weight, biological yield per plant and harvest index in both the seasons, and was negatively associated with days to 50 per cent flowering, first podding and maturity in kharif season. A clear difference was observed in respect of intensity and direction of association for some traits with yield. Path analysis indicated that days to 50 per cent flowering and plant height had maximum positive direct effect on yield in summer and kharif seasons, respectively. Days to first podding and number of pod clusters per plant had a high negative direct effect in kharif season.

Introduction

The importance of character association and path analysis has been well recognised by plant breeders. In blackgram, most of the studies made so far in this aspect are based on a single environment only. Since, the inter-relationships are known to vary from season to season from different characters, it is essential to study association analysis under different environmental conditions. Therefore, the present study was undertaken to estimate the genotypic correlation and path analysis in two seasons for yield improvement in blackgram.

Material and Methods

Two hundred and twenty five cultivars of blackgram were grown in a randomised block design with three replications at the Agricultural Research Station, Dharwad during kharif in 1987 and at the Main Research Station, Dharwad during summer, 1988. Each cultivar was represented by a single row of three meter length with the plant spacing of 30x10cm. Recommended plant protection measures and fertiliser doses were applied to ensure healthy crop growth. Five plants from each cultivar in each replication were randomly selected for recording observations on different quantitative characters. The mean

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values of these five plants were used to estimate coefficient of correlation using standard statistical procedures. The path analysis was done as per the procedure outlined by Dewey and Lu (1959).

Results and Discussion

The analysis of variance revealed that the treatment under study differed significantly for 12 characters during summer and for 14 characters during Kharif season. Genotypic correlations between different pairs of characters estimated in summer and kharif seasons are presented in Table 1. In the present study, seed yield showed positive significant genotypic correlations with pod length, seeds per pod, 100-seed weight, biological yield and harest index and significant negative correlation with number of pods per pod cluster in both the seasons. This suggests that irrespective of growing season, selection for these traits can be useful considering consistency of relationship. A similar positive relationship of yield atributes with seed yield was also reported in blackgram by Singh *et al.*(1972) and Patil and Narkhede (1987).

However, it is interesting to note that days to 50 per cent flowering and first podding showed significant negative association with seed yield in kharif season whereas the same showed positive significant association in summer. It was also observed that days to maturity which had significant negative association with seed yield in kharif showed no association with seed yield in summer. Number of pods per plant and plant height showed no association with seed yield in kharif whereas the same characters showed positive significant association with seed yield in summer. This kind of varying associations, across the environments have been reported by Mehrotra and Chaudhary (1983) in Soybean. A positive association at genotypic level among the characters, pods per plant, seeds per pod, pod length and biological yield per plant indicated that these are the major yield attributes in blackgram. Similar finding have been reported by Dasgupta and Das (1984) and Patil and Narkhede (1987).

Path analysis was used to partition observed correlation coefficient into direct and indirect effects of yield components on seed yield per plant (Table 2). It revealed that days to 50 percent flowering and plant height had maximum positive direct effect on seed yield in summer and kharif season, respectively.Soundrapandian *et al.*(1976) Das (1978) and Patil and Narkhede (1987) have also reported positive direct effect of plant height on seed yield in blackgram. However, days to first podding had maximum negative direct effect on seed yield in both the seasons. Highly significant negative association was observed between number of pods per cluster and seed yield, which was mostly composed of high negative indirect effects via biological yield and days to 50 percent flowering in summer. Number of pod clusters per plant and days to maturity showed highly significant negative association with seed yield mostly composed of high negative indirect effects via days to first podding in kharif season. The pattern of association among characters and their direct and indirect contribution to yield varied considerably in two diferent environments studied. Foregoing evidences indicate that days to 50 percent flowering, days to maturity, plant height, biological yield and harvest index in summer; primary branches per plant, pod clusters per plant, pod length and harvest index in kharif may serve as selection criteria for yield improvement.

In the present study, the residual effect was of low magnitude in both the seasons suggesting that most of the important components contributing to yield have been utilised in this analysis. Since the study was based on a large collection of 225 genotypes of the germplasm collection in blackgram, the inferences drawn on character association are of wider practical utility.

Table 1. Estimates of genotypic correlation coefficients, among different traits in blackgram during summer (above diagonal) and Kharif (below diagonal) seasons

Characters	DFF	DFP	DM	PH	PB	SB	PCP	PPP	PC	PL	SP	G	SY	BY	HI
DFF	-	0.99**	0.99**	0.61**	-@	1.05**	-	-	-0.52**	0.27**	0.30**	-0.13	0.52**	0.79**	-0.19
DFP	0.99**	-	0.97	0.61**	-	0.90**	-	-	-0.49**	0.28**	0.28*	-0.16	0.38	0.63**	-0.17
DM	0.97	0.98	-	0.51	-	0.55**	-	-	-0.60**	0.30**	0.20**	-0.17	0.16**	0.34	-0.19
PH	0.15**	0.15**	0.12**	-	-	0.78	-	-	-0.41	0.76	0.51	0.07	0.92	1.20	-0.16
PB	0.43	0.46	0.47	-0.16	-	-	-	-	-	-	-	-**	-**	-**	-**
SB	-**	-**	-**	-**	-**	-	-	-	-0.16	1.44	1.96	-0.78	0.80	0.52	0.45
PCP	0.34**	0.44	0.59	0.55	0.29**	-	-**	-	-	-	-	-	-	-	-
PPP	-0.32**	-0.16**	0.18**	0.16**	0.53	-	0.52**	-	-	-	-**	-	-**	-	-**
PC	-0.58**	-0.62**	-0.59**	-0.46	0.13**	-	-0.68**	0.01**	-**	0.17	0.39**	-0.06*	-0.89	-1.44*	0.33
PL	-0.54**	-0.52**	-0.53**	-0.10**	-0.63**	-	-0.27**	0.42	0.54**	-**	0.87	0.21	1.36	1.50	0.06*
SP	-0.41	-0.41	-0.41	-0.33**	-0.25	+	0.25**	1.24**	0.77	0.86**	-	-0.06	1.62**	1.60**	0.21
GW	0.18**	0.18**	0.20**	0.58	-0.11**	-	0.37**	0.53**	-0.09	0.35**	-0.04	-**	0.30	0.33**	-0.02**
SY	-0.79**	-0.66	-0.45	-0.04**	0.24	-	-0.48**	-0.29**	0.06**	0.69	1.20**	0.48**	-**	0.60	0.77
BY	-0.26**	-0.16**	0.01**	0.78**	0.13	-	0.31**	0.30**	-0.31**	0.19**	0.29	0.82**	0.41**	-**	-0.17
HI	-0.63	-0.58	-0.47	-0.94	-0.09	-	-0.70	-0.44	0.52	0.67	0.91	-0.27	0.35	-0.75	-

* ** Significant at five and one per cent level, respectively
@ Not estimated due to the non-significance of the characters in ANOVA.

DFF - Days to 50 percent flowering ; DFP - Days to first poding ; DM - Days to maturity ;
PH - Plant height ; PB - No. of primary branches per plant ; SB - No. of secondary branches per plant
PCP - No. of pdo clusters per plant ; PPP - No. of pods per plant ; PC - No. of pods per cluster ;
PL - Pod length ; SP - No. of seeds per pod ' GW - 100 seed weight ;
SY - Seed yield per plant ; BY - Biological yield per plant ; HI - Harvest Index.

Table 2. Direct and indiect effects of various characters on

Characters		Days to 50% flowering	Days to first poding	Days to maturity	Plant height	No. of primary branches / plant	No. of secondary branches / plant
Days to 50% flowering	S	1.89	- 2.38	0.50	0.13	-	- 0.05
	K	12.79	- 19.30	7.35	2.43	4.26	-
Days to first poding	S	1.88	- 2.39	0.49	0.13	-	- 0.04
	K	12.61	- 19.57	7.40	2.32	1.54	-
Days to maturity	S	1.87	- 2.32	0.51	0.11	-	0.02
	K	12.38	- 16.00	7.59	1.94	4.62	-
Plant height	S	1.14	- 1.46	0.26	0.22	-	- 0.04
	K	1.96	- 2.86	0.93	15.84	- 1.62	-
No. of primary branches/plant	S	-	-	-	-	-	-
	K	5.54	- 9.03	3.56	- 2.61	9.84	-
No. of secondary branches/plant	S	1.88	- 2.16	0.28	0.17	-	- 0.05
	K	-	-	-	-	-	-
No. of pod clusters / plant	S	-	-	-	-	-	-
	K	- 4.05	3.18	1.39	2.52	5.22	-
No. of pods/plant	S	-	-	-	-	-	-
	K	- 4.05	3.18	1.39	2.52	5.22	-
No. of pods/ cluster	S	- 0.99	1.17	- 0.30	- 0.09	-	0.00
	K	- 7.46	12.05	- 4.49	- 7.22	1.32	-
Pod length	S	0.51	- 0.67	0.15	0.17	-	- 0.07
	K	- 6.87	10.25	- 4.04	- 1.60	- 6.17	-
No. of seeds/	S	0.56	- 0.62	0.10	0.11	-	- 0.09
	K	- 5.24	8.00	- 3.10	- 5.18	- 2.50	-
100 Seed weight	S	- 0.24	0.38	- 0.09	0.02	-	0.04
	K	2.32	- 3.43	1.51	9.21	- 1.12	-
Biological yield/ plant	S	1.49	- 1.52	0.17	0.27	-	- 0.02
	K	- 3.29	3.15	0.07	12.32	1.30	-
Harvest index	S	- 0.35	0.40	- 0.10	- 0.03	-	- 0.02
	K	- 8.04	11.33	- 3.57	- 14.96	- 0.85	-

Noet : Figures in the bracket indicate direct effects., @ not estimated due to non significance of the
* ** Significant at five and one per cent levels, respectively.

seed yield in blackgram during summer (S) and kharif (K) seasons.

No. of pod clusters/	No. of pods / plant	No. of pods / cluster	Pod length	No. of seeds / pod	100 seed weight	Biolo-gical yield / plant	Har-vest index	rG with seed yield / plant
-	-	- 0.07	0.00	- 0.06	0.01	0.74	- 0.19	0.52 **
- 1.49	- 0.47	3.98	- 4.88	1.05	- 1.05	0.80	- 6.26	- 0.79 **
-	-	- 0.06	0.00	- 0.05	0.01	0.60	- 0.18	0.38 **
- 1.93	- 0.24	4.20	- 4.76	1.05	- 1.01	0.50	- 5.76	- 0.66 **
-	-	- 0.08	0.00	- 0.04	0.02	0.32	- 0.20	0.16
- 2.57	0.27	4.03	- 4.83	- 1.15	- 3.10	- 3.10	- 4.68	- 0.46 **
-	-	- 0.05	- 0.02	- 0.11	0.00	1.14	- 0.16	00.92**
-2.59	0.24	3.11	- 0.92	0.84	- 3.37	- 2.41	- 9.39	- 0.04
-	-	-	-	-	-	-	-	-
- 1.28	0.79	- 0.92	- 5.69	0.65	0.66	- 0.41	- 0.86	0.24 **
-	-	0.00	- 0.04	- 0.41	0.07	0.50	0.47	0.79 **
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
- 4.37	0.77	4.64	- 2.68	- 0.63	- 2.17	- 0.97	- 6.93	0.48 **
-	-	-	-	-	-	-	-	-
- 2.26	1.49	- 0.09	3.82	- 3.17	- 3.09	- 0.94	- 4.32	- 0.29 **
-	-	0.13	0.00	- 0.08	0.00	- 1.07	0.34	- 0.89 **
2.98	0.02	- 6.82	4.96	- 1.96	0.50	0.98	5.21	0.06
-	-	0.02	- 0.03	- 0.18	- 0.02	1.42	0.07	1.36
1.20	0.63	- 3.72	9.08	- 2.20	- 2.00	- 0.58	6.71	0.69**
-	-	0.05	- 0.03	- 0.21	0.00	1.51	0.22	1.62
- 1.08	1.84	- 5.22	7.82	- 2.56	0.26	- 0.90	9.08	1.20
-	-	0.00	0.00	0.01	- 0.09	0.32	- 0.02	0.30 **
1.64	- 0.79	0.59	3.14	0.11	- 5.79	- 2.55	- 2.72	0.48 **
-	-	- 0.15	- 0.04	- 0.33	- 0.03	0.94	- 0.18	0.60 **
- 1.36	0.45	2.14	1.71	- 0.74	- 4.76	- 3.10	- 7.48	0.48 **
-	-	0.04	0.00	- 0.04	0.00	- 0.16	1.03	0.77 **
3.05	- 0.65	- 3.58	6.13	- 2.34	1.58	2.34	9.95	0.38 **

Characters in ANOVA.,

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