marked yield response was observed to the different row spacings.

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COMBINING ABILITY STUDIES IN BLACKGRAM (VIGNA MUNGO (L.) HEPPER)

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ABSTRACT

A line x tester analysis was made in blackgram with five ovule parents and four pollinator parents so as to identify suitable general and specific combiners for breeding programme. Additive type of gene action was observed for plant height, number of clusters, number of pods and seed yield per plant. Parents T 9 and DU 1 were good general combiners for seed yield, number of clusters and number of pods per plant. The cross combinations Co 5 x NPRB 1 and TMV 1 x NPRB 2 were the best specific combiners for seed yield per plant. Co 5 x NPRB 1 was the best combination for number of clusters, number of pods, pod length and seed yield per plant. Since both additive and non additive gene actions were responsible for different characters, breeding systems involving intermating of F_2 or delayed selection in later generation may help to harness all the desirable genes.

KEY WORDS : Blackgram, Combining ability.

Blackgram (*Vigna mungo* (L.) Hepper) is one of the important grain legumes grown in India. India being primarily a vegetarian country, most of the protein in diet is being substituted by grain legumes and among them, the blackgram is one of the important crops. The information on combining ability elucidates the genetic behaviour of the parental material. It is desirable to select the parents for hybridization on the basis of their combining ability *per se*. Therefore, the present study was carried out with five lines and four testers to derive information on general and specific combining ability for eight quantitative characters.

MATERIALS AND METHODS

Five ovule parents KM 1, TMV 1, RU 2, ADT 3 and Co 5 and four pollen parents T 9, NPRB 1, NPRB 2 and DU 1 were crossed in Line x Tester model at the National Pulses Research Centre, Pudukkottai during Kharif 1985. The twenty hybrids along with their parents were sown in a randomised block design replicated thrice by adopting 30 x 10 cm spacing during summer 1986. Each parent and hybrid was accommodated in a single row of 4 m length. Data were recorded on five randomly taken plants for plant height, number of primary branches, number of clusters, number of pods, pod length, number of seeds per pod, hundred grain weight and seed yield per plant. The data were analysed for combining ability and their variances were calculated as per the model suggested by Kempthorne (1957).

RESULTS AND DISCUSSION

The results indicated significant differences among the hybrids for plant height, number of primary branches, number of clusters, number of pods and single plant yield (Table 1). The mean squares due to testers for six characters were larger when compared to lines indicating greater variability among the pollinator (tester) parents. The interaction effects between lines and testers were significant for yield per plant, plant height, number of clusters and number of pods. The variances due to *SCA* were of greater magnitude than *GCA* for seed yield per plant, plant height, number of primary branches, number of clusters and number of pods indicating the preponderance of non additive gene action for these characters. Basaeeruddin and Nagur (1981) reported non additive gene action for seed yield in greengram.

There was close association between the *gca* effects and mean performance of the parents (Table 2). Similar result was reported by Lal and Waldia (1980) in blackgram. The *gca* effects revealed that, among the female parents, ADT 3 was the best general combiner for plant height and number of seeds per pod, while TMV 1 offered scope for number of primary branches, number of clusters, number of pods and yield per plant. RU 2 had negative *gca* effects for plant height and hence this

Table 1. Analysis of variance for different characters

Source	d.f	Plant height	Number of primary branches	Number of clusters	Number of pods	Pod length	Number of seeds per pod	Hundred grain weight	Seed yield per plant
Replications	2	9.85**	0.86	6.74**	11.18**	0.06	0.20	0.01	2.99
Treatments	28	320.01**	1.80*	144.04**	757.27**	0.39	0.72	0.07	47.71**
Parents	8	627.60**	1.48	179.46**	652.82**	0.45	0.40	0.08	78.36**
Parents Vs Crosses	1	1067.68**	2.00	0.10	196.12**	1.67	0.07	0.06	6.34*
Crosses	19	151.15**	1.93*	136.70**	830.79**	0.30	0.89	0.06	36.98**
Lines	4	140.57**	1.48	98.72**	347.82**	0.13	0.79	0.07	16.81**
Testers	3	334.82**	6.44**	513.99**	3542.85**	0.08	0.89	0.07	157.06**
Lines x Testers	12	108.76**	0.95	55.04**	313.77**	0.40	0.92	0.06	13.68**
Error	56	14.95	0.40	13.52	41.44	0.15	0.39	0.01	3.36
GCA		1.24	0.03	2.38	15.09	-3.17	-9.28	3.46	0.68
SCA		31.27	0.18	13.84	90.78	0.09	0.18	0.02	3.44

Table 2. General combining ability effects of parents for different characters

Parents	Plant height	Number of primary branches	Number of clusters	Number of pods	Pod length	Number of seeds per pod	Hundred grain weight	Seed yield per plant
Females								
KM 1	-1.24 (36.48)	-0.38* (3.24)	-3.88** (18.87)	-7.50** (41.61)	-0.10 (4.55)	-0.01 (6.79)	0.01 (4.09)	-1.90** (10.1)
TMV 1	0.33 (38.05)	0.44* (4.06)	4.12** (26.86)	6.71** (55.82)	-0.06 (4.58)	-0.17 (6.63)	0.01 (4.09)	1.32' (13.32)
RU 2	-4.52** (33.20)	-0.08 (3.53)	0.64 (23.38)	3.34 (52.45)	-0.07 (4.57)	0.02 (6.82)	-0.12** (3.98)	0.49 (12.49)
ADT 3	4.96** (42.68)	0.28 (3.90)	-0.79 (22.03)	-0.91 (48.20)	0.14 (4.78)	0.42* (7.22)	0.03 (4.13)	0.13 (12.13)
Co 5	0.47 (38.18)	-0.27 (3.35)	-0.18 (22.57)	-1.64 (47.47)	0.09 (4.73)	-0.25 (6.55)	0.08 (4.18)	-0.04 (11.87)
SE (GCA for female)	1.12	0.18	1.06	1.86	0.12	0.18	0.03	0.53
Males								
T 9	5.96** (43.67)	0.58** (4.20)	5.43** (28.17)	19.04** (68.15)	0.05 (4.69)	-0.09 (6.71)	-0.05 (4.04)	3.94** (15.94)
NPRB 1	-5.06** (32.65)-	-0.94** (2.68)	-7.72** (15.02)	-15.64** (33.47)	0.06 (4.70)	0.25 (7.05)	-0.07* (4.03)	-3.40* (8.60)
NPRB 2	-2.10** (35.62)	0.12 (3.73)	-1.21 (21.53)	-8.62** (40.49)	-0.01 (4.64)	-0.30 (6.51)	0.05 (4.15)	-1.72** (10.29)
DU 1	1.20 (38.92)	0.24 (3.85)	3.51** (26.25)	5.22** (54.33)	-0.09 (4.55)	0.14 (6.94)	0.06* (4.15)	1.18* (13.18)
SE (GCA for male)	0.99	0.16	0.95	1.66	0.10	0.16	0.03	0.47

The mean performance is given in parenthesis.

parent may be utilised in the breeding programme for developing short stature plant.

Among the pollen parents, T9 and DU 1 were very good general combiners for seed yield per plant, number of clusters and number of pods. T 9 was a good combiner for plant height while NPRB 1 and NPRB 2 were good general combiners for reduced plant height. Mani and Rao (1977) indicated that more emphasis should be given on *gca* effects rather than *sca* effects in self pollinated crops.

The specific combining effects were high for seed yield in Co 5 x NPRB 1 and TMV 1 x NPRB 2 (Table 3). The crosses ADT 3 x DU 1 and Co 5 x NPRB 1 were the only best specific combiners for number of clusters and number of pods. ADT 3 x NPRB 2 and Co 5 x T 9 were good specific combiners of 100 grain weight. The parents of the cross ADT 3 X T 9 were good general combiners for plant height but the specific cross exhibited low *sca* effect. This suggested epistatic interactions resulting in internal compensation of the components as suggested by Jalikop (1974).

The estimates of variances of *GCA* and *SCA* revealed that the nature of gene action was predominantly non additive and in specific combinations exhibited additive type of gene action for different characters. Thus, on the basis of these results, it may be suggested that to harness both additive and non additive type of gene action for different characters to realise better

Table 3. Specific combining ability effectrs

Crosses	Plant height	Number of primary branches	Number of clusters	Number of pod	pod length	Number of seeds per pod	Hundred grain weight	Seed yield per plant
KM 1 X T 9	-6.40**	1.08**	0.48	2.69	-0.20	0.24	0.09	0.36
KM 1 X NPRB 1	-4.15	-0.31	-1.75	0.37	0.06	0.29	0.11	1.04
KM 1 X NPRB 2	-0.25	-0.76*	2.54	2.54	-0.08	-0.43	-0.11	-0.12
KM 1 X DU 1	10.79**	-0.01	-1.27	-5.59	0.22	-0.10	-0.09	-1.28
TMV 1 X T 9	2.53	-0.28	-0.15	-0.32	0.24	-0.21	-0.07	-0.12
TMV 1 X NPRB 1	-4.65*	-0.46	-5.77**	-10.98**	-0.37	-0.42	0.04	-3.65**
TMV 1 X NPRB 2	2.91	0.36	3.68	5.27	0.16	0.99**	-0.01	2.27*
TMV 1 X DU 1	-0.79	0.37	2.24	6.03	-0.02	-0.37	0.05	1.51
RU 2 X T 9	-3.62	-0.45	0.26	8.58*	0.38	-0.39	-0.09	0.84
RU 2 X NPRB 1	6.93**	0.40	1.41	-4.41	-0.13	0.27	0.09	-1.02
RU 2 X NPRB 2	-4.84*	0.35	3.23	3.70	-0.47*	-0.66	-0.10	-0.71
RU 2 X DU 1	1.53	-0.30	-4.89*	-7.87*	0.22	0.78*	0.10	0.89
ADT 3 X T 9	3.10	-0.08	-2.46	-14.97**	1.67**	0.35	-0.07	-2.31*
ADT 3 X NPRB 1	-2.35	-0.28	0.82	6.98	-0.21	-0.40	-0.23**	0.64
ADT 3 X NPRB 2	3.12	-0.08	-4.16*	-9.52*	0.22	0.41	0.29**	0.15
ADT 3 X DU 1	-3.88	0.40	5.80**	17.52**	-0.02	-0.36	0.01	1.52
Co 5 X T 9	4.39*	-0.27	1.88	4.03	-0.42	0.01	0.14*	1.23
Co 5 X NPRB 1	4.21	0.59	5.29*	8.04*	0.65**	0.27	-0.01	3.00**
Co 5 X NPRB 2	-0.95	0.13	-5.29*	-1.99	0.17	-0.32	-0.06	-1.59
Co 5 X DU 1	-7.65**	-0.45	-1.87	-10.09**	-0.48*	0.05	-0.07	-2.65*
	2.23	0.37	2.12	3.72	0.22	0.36	0.07	1.06

recombinants with high yielding ability, intermating of F2 or delayed selections in ater generation is suggested in blackgram.

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