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COMBINING ABILITY FOR YIELD AND ITS COMPONENTS IN MUNGBEAN (*Vigna radiata* L. Wilczek)

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ABSTRACT

Combining ability studies were carried out through a 8 x 8 half diallel set for seed yield and its components. Variance due to general and specific combining ability was significant for all the characters. Additive gene effect was observed for all the characters except seed yield per plant E-65 and TARM-18 for earliness and days to maturity, WGG-37 for clusters plant,BM-4 for pods in plants and pods in cluster, KDM-1 for 100 seed weight and Kopergaon and JLM-5 for seed yield in plant were found as best combiners. The cross, Kopergaon x E-65 showed highly significant positive SCA effects for plants height,pods in cluster and seed yield per plant.

KEY WORDS : Combining ability, GCA, SCA

Mungbean has received very little attention of the breeders and geneticists for its improvement. Selection of parents in any breeding programme depends on their ability to combine well and also on the potentiality to throw transgressive segregants. The knowledge of combining ability provides a useful criterion for selection of desirable parents and hybrids for further exploitation in breeding programme. By considering the usefulness of combining ability and little work done in mungbean, investigation was made to-gather information on these aspects in mungbean.

MATERIALS AND METHODS

Eight diverse mungbean genotypes *viz;* Kopergaon, BM-4, Phule M-2, JLM-5, KDM-1, E-65, TARM-18 and WCG-37 were crossed in a diallel set excluding reciprocals. An experiment involving 28 F_1s and 8 parental lines was conducted in randomised block design with three replications at Post Graduate Research Farm, MPKV, Rahuri. Each parent and F1 was represented by a single row of 3 m length spaced at 30 cm distance. A spacing of 10 cm between plants within a row was maintained. Observation were recorded on five randomly selected competitive plants for nine characters (Table 1). Data was subjected to analysis of variance for mean performance and combining ability analysis by adopting method-2 and model-1 of Griffing (1956).

RESULTS AND DISCUSSION

The mean sum of squares for general combining ability (GCA) and specific combining ability (SCA) were hightly significant for all the characters,indicating that both additive and non-additive types of gene effects were involved in the inheritance of these traits (Table 1). Similiar results were reported by Ahuja (1980) and Halkude *et.al.* (1996). The magnitude of GCA variance was generally higher than SCA variance indicating the predominance of additive gene action for all the

Table 1. Analysis of variance for combining ability for 9 characters in mungbean

Sources of variation	DF	Mean sum of squares								
		Days for 50% flowering	Days to maturity	Plant height	Clusters / plant	Pods / cluster	Pods / plant	Seeds / pod	100 seed weight	Seed yield / plant
GCA	7	6.49**	14.71**	57.31**	0.27**	0.45**	28.81**	0.59**	1.17**.	2.54**
SCA	28	0.78**	2.67**	11.37**	0.23**	0.29**	17.07**	0.27**	0.12**	2.83**
Error	70	0.20	0.16	1.22	0.11	0.05	0.56	0.10	0.04	0.37

*, ** = Significant at 5% and 1% level, respectively.

Table 2. Estimates of general combining ability effects.

Parents	Days for 50% flowering	Days to maturity	Plant height	Clusters / plant	Pods / cluster	Pods / plant	Seeds / pod	100 seed weight	Seed yield / plant
Kopergaon	-0.55	0.01	-2.52**	0.00	0.08	0.27	0.33**	0.15*	0.93**
	(36.7)	(66.0)	(73.3)	(5.9)	(3.2)	(18.8)	(14.0)	(4.2)	(8.94)
BM-4	0.35*	0.91**	-0.08	0.13	0.25**	1.99**	-0.18	-0.23**	-0.05
	(38.0)	(67.3)	(83.3)	(5.6)	(3.5)	(19.3)	(12.3)	(3.0)	(5.99)
Phule M-2	0.62**	0.51**	0.52	0.03	0.05	0.28	-0.03	-0.08	-0.26
	(38.0)	(65.3)	(82.5)	(5.3)	(3.7)	(19.5)	(13.0)	(3.7)	(6.89)
JLM-5	0.78**	0.91**	2.56**	-0.16	-0.42**	-2.81**	0.25**	0.38**	0.47*
	(39.0)	(65.3)	(84.2)	(4.6)	(2.6)	(12.0)	(13.5)	(4.4)	(9.13)
KDM-1	1.05**	1.58**	3.78**	0.15	-0.16*	-0.37	0.19*	0.56**	0.14
	(39.0)	(67.7)	(88.5)	(5.5)	(2.7)	(14.7)	(12.4)	(5.1)	(7.45)
E-65	-1.22**	-1.83**	-2.99**	-0.17	-0.02	-0.75**	-0.07	-0.35**	-0.64**
	(35.3)	(60.7)	(73.7)	(5.2)	(3.0)	(15.5)	(12.9)	(3.0)	(5.15)
TARM-18	-0.58**	-0.93**	-1.83**	-0.20*	-0.02	-0.53*	-0.12	-0.03	-0.36
	(36.3)	(65.0)	(79.5)	(5.0)	(3.3)	(16.7)	(11.7)	(3.6)	(6.71)
WGG-37	-0.45**	-1.16**	0.56	0.23*	0.21**	1.91**	-0.39**	-0.40**	-0.25
	(37.3)	(65.3)	(83.2)	(5.9)	(3.8)	(22.5)	(12.3)	(2.6)	(7.11)
S.E. (gi.)	0.13	0.12	0.33	0.10	0.06	0.22	0.09	0.059	0.18

*, ** = Significant at 5% and 1% levels respectively.

Note : The figures in the parenthesis indicate the mean performance of the parents.

characters except seed yield per plant. This is in confirmity with the earlier findings of Thimmappa *et.al* (1989) and Halkude *et.al.* (1996).

The estimates of GCA effects of parents are given in Table 2. It revealed that the best general combiners were Kopergaon for seeds per pod, 100 seed weight and seed yield per plant, BM-4 for pods per cluster and pods per plant, JLM-5 for plant height, seeds per pod, 100 grains weight and seed yield per plant, KDM-1 for plant height, seeds per pod and 100 seed weight, E-65 and TARM-18 for day to 50 per cent flowering and maturity and WGG-37 for days to 50 per cent flowering, maturity, clusters per plant, pods per clusters and pods per plant. The parentes showing high *per se* performance generally proved to be good general combiners for respective characters (table 2). Therefore, mean performance can be used as one of the criteria for selection of superior general combiners. Since GCA effects are related to additive effect or additive X additive interaction (Sprague,1966) and it represents the fixable genetic variance. Similar observation were reported by Tiwari *et.al*(1993) and Halkude *et al* (1996). The parents Kopergaon, JLM-5 and WGG-37 which showed good combining ability, should be used in hybridzation programme for developing early maturing bold seeded high yielding varities in mungbean.

The best general combiners and specific F1 combinations with higher SCA effects for different characters are given in Table 3. It is difficult to pick up a single best or a few F1 combinations giving higher SCA effects for all the desirable charcters. The cross TARM-18 x WGG-37 gave significant negative SCA effects for days to 50 percent flowering and maturity, while JLM-5 x KDM-1 for and clusters per plant, Kopergaon x E-65 was the best combination followed by BM-4 x phule M-2 for seed yield per plant, the former cross

Table 3. Best general combiners and specific combinations for 9 characters in mungbean

Characters	Best general combiners	gca effects	Best specific combiners	sca effects
Days for 50%	E-65	-1.22	TARM-18 x WGG-37	-2.10
flowering	TARM-18	-0.58	Kopergaon x KDM-1	-1.63
Days to	E-65	-1.83	TARM-18 x WGG-37	-3.24
maturity	WGG-37	-1.16	E-65 x TARM-18	-2.91
Plant height	KDM-1	3.78	JLM-5 x KDM-1	4.84
	JLM-5	2.56	Kopergaon x E-65	4.70
Clusters/	WGG-37	0.23	JLM-5 x WGG-37	0.76
plant			JLM-5 x KDM-1	0.71
Pods/cluster	BM-4	0.25	Kopergaon x E-65	1.33
	WGG-37	0.21	KDM-1 x TARM-18	0.81
Pods/plant	BM-4	1.99	KDM-1 x TARM-18	7.06
	WGG-37	1.91	JLM-5 x WGG-37	6.53
Seeds/pod	Kopergaon	0.33	BM-4 x KDM-1	1.08
	JLM-5	0.25	Phule M-2 x KDM-1	0.60
100 seed weight	KDM-1	0.56	JLM-5 x TARM-18	0.94
	JLM-5	0.38	KDM-1 x WGG-37	0.67
Seed yield/plant	Kopergaon	0.93	Kopergaon x E-65	3.73
	JLM-5	0.47	BM-4 x Phule M-2	2.60

also showed significant positive SCA effects for plant height and pods per cluster. The parent combiner for seeds per pod, 100 seed weight and seed yield per plant; while E-65 was the good general combiner for seeds per pod, 100 seed weight and seed yield per plant; while E-65 was the good general combiner for days to 50 per cent flowering and maturity. Regarding the association between SCA and GCA effects for seed yield, generally involved for parents with high x low GCA effects which are in cofirmity with earlier findings of Singh and Singh (1972), and Tiwari *et al* (1993).

It is clear that the parents having high or average GCA effects for late flowering produced early flowering F1 hybrids. To produce a tall F1, it is desirable to have both the parents with high GCA effects, while for seed yield and most of the yield components a combination of one good general combiner and one poor general combiner produces the best specific F1 hybrids. Top high yield hybrids may be handled by specific breeding procedures like diallel selective mating or biparental matings suggested by Jansen (1970) to release the latent genetic variability.

REFERENCES

AHUJA, S.L. (1980). Diallel analysis in F2 generation of green gram. Thesis Abst. HAU, Hissar. 6(2) : 110-111.

GRIFFING, B. (1956). concepts of general and specific combining ability in relation to diallel crossing system. **Aust.J.Biol. Sci.** 9: 463-493.

HALKUDE, I.S. AHER,R.P., DESHMUKH,R.B. AND KUTE, N.S. (1996). Combining ability analysis in green gram. **J.Maharastra agric. Univ., 21(2)** : 235-238.

JENSEN, N.F.(1970). A diallel selective mating systems for cereal breeding. **Crop sci., 10** : 629-635.

SINGH, T.P. AND SINGH, K.B.(1972). Combining ability in mungbean. **Indian J. Genet. 32(1)** : 67-72.

SPRAGUE, C.F.(1966). Quantitative genetics in plant improvement. In: Plant breeding (ed.K.J.Frey). IOWA State Univ. Press.Ames.USA : 315-352.

THIMMAPPA, A.S., CHANDRAPPA, H.M., PATIL, S.S and GOUD, J.V. (1989). Studies on combining ability in greengram. **J.Maharashtra Agric. Univ. 14(1)** : 26-27.

TIWARI, D.S.SINGH, V. AND SHUKLA, P.S.(1993). Combining ability studies in mungbean (*Vigna radiata* (L.) Wilczek). **Indian J.Genet. 53(4)** : 395-398.

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