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RESEARCH ARTICLE :

Diallel analysis in greengram [*Vigna radiata* (L.) Wilczek]

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SUMMARY : Nine diverse greengram parents were selected and crossed in half diallel fashion in order to determine combining ability to identify promising hybrids for twelve traits including yield and its components. Analysis of variance for general and specific combining ability revealed that *gca* and *sca* variances were significant for all the characters. Whereas, comparison of the estimates of variances due to specific combining ability were higher than general combining ability for all the traits except plant height and pods per plant pointed out to be the preponderance of non-additive gene effects in the expression of these characters. Among the parents MGG-347 was proved to be a good general combiner for five characters *viz.*, number of primary branches per plant,number of clusters/plant, number of pods per plant, number of seeds/pod and seed yield per plant and WGG-42 showed best *gca* effect for days to 50 % flowering, days to maturity, 100 seed weight and seed yield per plant.While, K-851 was good general combiner for number of primary branches per plant, number of clusters/plant, number of pods per plant, seed yield per plant and protein content followed by KM 11-564 for number of clusters/plant, number of pods per plant, pod length, number of seed per pod and harvest index. Among the crosses MGG-347 X KM 11-564 was best specific combination for seed yield per plant as well as number of pods per plant, number of branches per plant, 100 seed weight, harvest index and protein content.It is evident from present investigation that the hybrid combinations WGG-42 × RM 12-13, MGG-347× RM12-13, LGG-543 × KM 11-564and MGG-347 × LGG-543 exhibited the high *per se* performance and *sca* effect for seed yield per plant and highly promising even in respect of other characters could be advanced by selecting desirable segregants and recombinants in each generation for funneling the new genotype or for using further advanced breeding programme.

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BACKGROUND AND OBJECTIVES

The growing knowledge on the importance of pulses in our diet has driven us to make numerous efforts for increase in production of pulses in the country where much concentration and efforts was given on improvement of cereals which so long dominated the agricultural sector. Pulses, which are best known as "poor man's meat", constitute the major source of dietary protein of the large section of vegetarian population of the world. Green gram also known as Mungbean is the third most important pulse crop in India. Important green gram growing states in India are Orissa, Andhra Pradesh, Maharashtra, Karnataka and Bihar. Its seeds contain on dry weight basis approximately 22%-25% proteins, 1-1.5 per cent oil, 3.5-4.5 per cent ash and 52-65 per cent carbohydrates. Among all the pulses, green gram [*Vigna radiate* (L.), Wilczek] is found most suitable crop grown during summer months and with the development of early maturing varieties, it has proved to be an ideal crop for spring and summer seasons. Though greengram is an important pulse crop of India the average yield of greengram is low owing to low genetic yield potentiality, indeterminate growth habit, canopy architecture, low partitioning efficiency, cultivation in marginal land and due to many other biotic and abiotic stresses. In the present investigation attempts have been made to estimate the general combining ability (*gca*) effects of parents and specific combining ability (*sca*) of crosses for important morphological, seed yield and its component traits.

RESOURCES AND METHODS

The experimental material comprised of nine diverse genotypes of green gram, to generate 36 F_1's using diallel mating design excluding reciprocals. MGG-371, MGG-347, MGG-351, WGG-42, LGG-543, K-851, RM-12-11, RM-12-13and KM-11-564 were considered for the experiment which was conducted at college farm, College of agriculture, PJTSAU, Rajendranagar, Hyderabad during *Rabi* 2014-15. The genotypes were planted in a Randomized Block Design with two replications. The row to row distance was 30 cm. Five plants were selected at random from each entry in each replication for recording observations on different characters, plant height (cm), days to 50% flowering, days to maturity, number of branches plant^{-1}, number of pods per plant, number of seed pod^{-1}, pod length (cm), pod width (mm), 100 seed weight (g), seed yield plant^{-1}, protein content. The parents along with hybrids were grown in *Kharif* 2015to study the inheritance and combining abilities for yield and its attributing traits. Combining ability was estimated following Model I method II (Griffing, 1956).

OBSERVATIONS AND ANALYSIS

The analysis of variance revealed highly significant differences among parents and hybrids for all the characters studied, indicating presence of considerable amount of genetic variability in the material tested. The mean square due to general and specific combining ability were highly significant for all the characters indicating importance of both additive as well as non-additive gene effects involved in the expression of characters *viz.*, days to flowering, days to maturity, plant height, branches per plant, clusters per plant, pods per plant, pod length, seeds per pod, seed yield per plant, 100-seed weight and protein content. However, the estimates of variances due to specific combining ability were higher than general combining ability for all the traits except plant height and pods per plant pointed out to be the preponderance of non-additive gene effects in the expression of these characters (Table 1). The present findings were in congruent with the reports of Kumar *et al.* (2010); Srivastava and Singh (2013) and Anbu Selvam (2012) in mungbean.

The success of any plant breeding programme largely depends on the appropriate choice of parents. The knowledge of general combining ability coupled with high *per se* performance would helps in the selection of potential parents with good reservoir of superior genes (Narasimhullu *et al.*, 2014). The estimation of *gca* effects of nine parents for tweleve characters were presented

Table 1 : Analysis of variance for combining ability for eleven characters in mungbean

	DF	Days to flowering	Days to maturity	Primary branches	Plant height	No. of clusters / plant	No. of pods/ plant	Pod length	No. of seeds/ pod	100 seed wt	Seed yield /plant (g)	Protein content (%)	Harvest index (%)
GCA	8	32.68 **	25.96**	1.13 **	94.09 ***	0.53* *	27.87***	5.52***	10.62**	3.10 ***	3.72 ***	4.68 *	4.93**
SCA	36	12.45**	12.47**	0.62 ***	8.90	0.39***	2.46 ***	1.00 ***	1.52 ***	0.43 ***	0.70 ***	0.82**	2.30**
Error	88	1.85	3.13	0.09	3.30	0.03	0.31	0.11	0.13	0.01	0.07	0.17	0.55
σ^2 g		3.08	2.28	0.10	9.07	0.05	2.75	0.54	1.04	0.30	0.36	0.45	0.49
σ^2 s		10.60	9.34	0.53	5.60	0.36	2.15	0.89	1.39	0.42	0.63	0.65	1.75
σ^2 g /σ^2 s ratio		0.29	0.24	0.19	1.62	0.13	1.28	0.61	0.75	0.73	0.58	0.70	0.28

*, ** and *** indicate significance of values at P=0.05, 0.01 and 0.10, respectively

Table 2 : Estimation of general combining ability effects of parents for yield contributing characters in mungbean

	Days to 50 % flowering	Days to maturity	Primary branches	Plant height	No. of clusters/ plant	No. of pods/ plant	Pod length	No. of seeds/ pod	100 seed wt	Seed yield /plant (g)	Protein content (%)	Harvest index (%)
MGG-351	-0.08	0.43	-0.16*	1.13	-0.02	-0.07	-0.20***	-0.18	-0.14 **	-0.81 *	0.44 **	1.25*
MGG-347	-0.04	0.13	0.26**	4.84**	0.94**	4.50**	0.06	0.25*	0.02	1.29 ***	0.16	0.34
WGG-42	-2.33**	-2.58**	0.12	-0.69	-3.05**	-0.89	-0.01	0.02	0.12 **	0.51 *	-0.01	0.58
MGG-371	2.17	1.92**	-0.38**	-0.91	0.93**	2.12**	-0.03	-0.20	0.03	-0.69 ***	-0.03	2.19**
LGG-543	-1.08	-0.45	0.14*	1.07	0.15	2.58**	0.07	0.27	0.15 ***	-0.06	-0.20	-0.49*
K-851	0.80*	1.02**	0.20*	-1.08	-1.08**	3.15**	-0.12*	0.14	-0.04	0.58 **	0.48**	-2.55**
RM 12-11	1.30**	0.68*	0.17	-6.13**	0.29	2.30**	0.06	-0.09	-0.08 *	-1.04 ***	-0.32*	0.05
RM12-13	-0.70	0.98**	0.18*	2.45*	0.65**	-4.57**	0.16 *	-0.13	0.05	0.16	0.08	0.18
KM11-564	-0.10	0.22	0.82**	-0.68	1.20**	5.12**	0.18***	0.324*	-0.01	0.31	0.15	1.12**
S.E (gi) +	0.38	0.30	0.07	0.97	0.23	0.76	0.05	0.25	0.10	0.34	0.14	0.46
S.E (gi-gj) +	0.34	0.27	0.06	0.87	0.20	0.68	0.07	0.22	0.09	0.30	0.12	0.41

*, ** and *** indicate significance of values at P=0.05, 0.01 and 0.10, respectively

in Table 2. In the present investigation, based on *per se* performance and *gca* effects, MGG-347 was found to be the best parent for number of primary branches per plant,number of clusters/plant, number of pods per plant, number of seeds/pod and seed yield per plant and WGG-42 showed best *gca* effect for days to 50 % flowering, days to maturity, 100 seed weight and seed yield per plant; LGG-543 for number of branches/plant, number of pod/plant and 100 seed weight. K-851 was good general combiner for number of primary branches per plant, number of clusters/plant, number of pods per plant, seed yield per plant and protein content followed by KM 11-564 had desirable performance for number of clusters/ plant, number of pods per plant, pod length, number of seed per pod and harvest index, whileRM12-11 for number of primary branches and number of pods/plant; RM12-13 for pod length and 100 seed weight. The above mentioned parents for *gca* effects have good potential for respective characters and may be used in a multiple crossing programme to synthesize a dynamic population with most of the favourable genes accumulated (Matzinger *et al.,* 1962).

WGG-42 was found to be early maturing genotype for number of days to 50% flowering and K-851 as late maturing. The genotype WGG-42 was identified as early maturing with 63.5 days and K-851 as late maturing with 74.5 days for maturity. The maximum plant height was recorded in MGG-347 (44.30 cm) followed by LGG-543 (40.09 cm) and minimum in RM12-11 (31.04 cm) followed by RM12-13 (28.94 cm). The highest number of primary branches plant^{-1} was found in KM 11-564 (2.550) and lowest in MGG-351and MGG-371 (0.80). The number of pods plant^{-1} ranged from (13.20- 32.90) with MGG-347 being the genotype with highest and RM12-13 with lowest number respectively.KM11-564 contributed the highest number of seeds pod-1 followed by MGG-347 and lowest was recorded in RM 12-11.The genotype KM11-564 scored the longest pod length (8.35 cm) while, MGG- 351 scored the shortest (6.60 cm).The maximum 100 seed weight was observed in WGG-42 (4.16) and minimum in RM 12-11 (3.27).The protein content among the genotype was ranged from 21.94 to 25.08 % and K-851 scored the highest and RM12-11 with the lowest score. MGG-347 yielded highest with 11.63 g plant^{-1} and RM12-11 showed the lowest yield (4.29 g plant^{-1}).

The *sca* effects are the index to determine the usefulness of a particular cross combination for exploitation of hybrid vigour. The results of specific combining ability effects (Table 3) of different cross revealed that none of the crosses showed consistently significant and desirable specific combining ability effects for all the characters. However, the cross combinations *viz.,* MGG-347 × KM11-564, WGG-42 × RM 12-13, MGG-347× RM12-13, LGG-543 × KM 11-564and MGG-347 × LGG-543were adjudged as the best crosses for majority of the yield components (Table 3). The *sca* effects signify the role of non-additive gene effects mainly dominance gene effects (Narasimhulu *et al.,* 2014 and Patil *et al.,* 2011). Cross combinations which exhibited high *sca* which derived from parents having high *gca* effects can also be used for recombination breeding. However, the selection of superior genotypes for cultivar development must be delayed to later generations to allow fixation of maximum homozygosity

Table 4 : Parents showing significant and high general combining ability for seed yield and its components traits in greengram

Parent	No. of characters	Per se performance	Characters
MGG-351	2	22.57	Protein content
		31.17	Harvest index
		3.30	Primary branches
MGG-347	5	9.13	No. of clusters / plant
		26.40	No. of pods / plant
		10.6	No. of seeds/pod
		11.63	Seed yield /plant (g)
WGG-42	4	34.43	Days to 50 % flowering
		66.90	Days to maturity
		3.17	100 seed wt
		8.63	Seed yield /plant (g)
MGG-371	3	8.43	No. of clusters / plant
		24.63	No. of pods / plant
		29.80	Harvest index
LGG-543	3	3.10	Primary branches
		23.07	No. of pods / plant
		3.23	100 seed wt
K-851	4	2.81	Primary branches
		25.95	No. of pods / plant
		9.43	Seed yield /plant (g)
		23.45	Protein content
RM 12-11	1	27.00	No. of pods / plant
RM12-13	3	3.14	Primary branches
		9.38	No. of clusters / plant
		8.12	Pod length
KM11-564	6	3.23	Primary branches
		9.90	No. of clusters / plant
		28.47	No. of pods / plant
		8.72	Pod length
		12.00	No. of seeds/pod
		29.85	Harvest index

(Muhammad *et al.*, 2007).

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REFERENCES

Anbu Selvam, Y. (2012). Diallel analysis in greengram [*Vigna radiata* (L.)Wilczek]. *Internat. J. Recent Scientific Res.,* **3** (5) : 297 – 299.

Griffing, B. (1956). Concept of general and specific combining ability in relation to diallel crossing system. *Australian J. Biol. Sci.*, **9** : 465-493.

Kumar, B.S., Prakash, M. and Golulakrishnan, J. (2010). Combining ability analysis in mungbean (*Vigna radiata* L. Wilczeck). *Crop Improve.*, **37**(2) : 165-167.

Matzinger, D.F., Mann, T.J. and Cockerham, C.C. (1962). Diallel crosses in *Nicotiana tabacum*. *Crop Sci.*, **2** : 383-386.

Muhammad, Zubair, Saif, Ullah Ajmal, Muhammad, Munir and Muhammad, Anwar (2007). Mode of Inheritance and Genetic Variability of some of the Traits in Mungbean Vigna Radiata (L.) Wilczek. *Pakistan J. Bot.*, **39**(4): 1237-1244.

Narasimhulu,R., Naidu, N.V., Reddy, K.H.P. and Mohan Naidu, G. (2014). Combining ability for yield attributes in greengram [*Vigna radiata* (L.) Wilczek]. *Bioscan*, **9**(4): 1667-1671.

Patil, A.B., Desai, N.C., Mule,P. N. and Khandelwal, V. (2011). Combining ability for yield and component characters in mungbean [*Vigna radiata* (L.) Wilczek.]. *Legume Res.*, **34** (3): 190 – 195.

Srivastava,R.L. and Singh, G. (2013). Heterosis for yield and its contributing characters in mungbean [*Vigna radiata* (L.) Wilczek]. *Indian J. Scientific Res.*, **4**(1): 131-134.