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Combining Ability Analysis For Grain Yield And Its Attributes In Sesame

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ABSTRACT

The 6x6 diallel analysis in sesame revealed that the variances due to *GCA* and *SCA* were highly significant denoting the importance of additive and non-additive gene actions for all the traits studied. The *GCA/SCA* ratio was more than unity for all the traits except thousand seed weight thus, indicating the predominance of additive gene action. The parents VNP local and VRI-1 were good general combiners for majority of the traits. Three crosses Danbakkae x Koteche, VNP local x VRI-1 and PTDL-1 x Koteche, which found to be promising for seed yield per plant and most of the yield attributing traits which may yield transgressive segregants in later generations. The significance of mean squares due to RCA effects for days to first flower, number of branches per plant, number of capsules per plant, thousand seed weight and seed yield per plant indicated the importance of maternal effects in governing the expression of these traits.

Key words : Additive gene action, , Combining ability, Dominant gene action, Sesame.

Sesame (*Sesamum indicum* L.) is one of the important ancient oilseed crop cultivated in India. The exploitation of heterosis in this crop is limited by the non availability of a suitable pollination control method to facilitate out-crossing for standard hybrid seed production. A knowledge of the nature of combining ability effects and their resulting variances has paramount significance in deciding the selection procedure for exploiting either heterosis or obtaining new recombinants of desirable types in sesame. It has been commonly experienced that lines with adequate *gca* effects coupled with reasonably high means tend to result in superior hybrids. In sesame, although several workers investigated combining ability effects (Sajjanar *et al*., 1995 and Das and Das Gupta, 1999) more information is needed. Therefore, the present investigation with 30 F_1s of a 6 x 6 diallel set was studied to obtain more information on combining ability.

MATERIAL AND METHODS

The experimental material consisted of six genotypes of sesame (VNP local, VRI-1, Danbakkae, Jinjukkae, PTDL-1 and Koteche) crossed in a full diallel mating system. The resultant 30 hybrids along with their parents were grown in a randomized block design with three replications. Each entry was raised in a plot consisting of single row of four meter long, with a spacing of 30x30 cm. Observations were made on 15 randomly selected plants in each replication for days to first flower, plant height, number of branches per plant, number of capsules per plant, capsule length, number of seeds per capsule, thousand seed weight and seed yield per plant. The data were subjected to statistical analysis of Griffings (1956) method 1, model I.

RESULTS AND DISCUSSIONS

Analysis of variance revealed significant differences for all the traits indicating wider genetic variability among genotypes. The mean squares due to general and specific combining ability effects (*gca, sca*) were highly significant (Table 1) for all the traits studied. This indicated the importance of both additive and non-additive gene actions in governing the expression of these traits (Banerjee and Kole, 2009). The *GCA* variances were higher than *SCA* variances for all the traits signifying predominant role of additive gene action in inheritance of these triats. Similar findings were earlier reported by Sharma and Chaudhan (1985) and Narkhede and Sudhirkumar (1991).

The *gca* effects presented in Table 2 showed that the parents, VNP local and VRI-1 were good general combiners for most of the traits, whereas Danbakkae and Jinjukkae were best combiners for days to first flower, capsule length, thousand seed

Table 1. ANOVA for combining ability variances for seed yield and component traits in sesame.

Source	d.f.	Mean sum of squares							
		Days to first flower	Plant height	Number of branches per plant	Number of capsules per plant	Capsule length	Number of seeds per capsule	Thousand seed weight	Seed yield per plant
GCA	5	78.49**	206.14**	7.84**	1342.56**	25.00**	0.08**	0.04**	21.49**
SCA	14	1.05**	54.59**	0.44**	256.67**	9.26**	0.03**	0.05*	3.82**
RCA	14	22.62**	15.63	0.17**	116.26**	3.44	0.01	0.05**	2.73**
GCA/SCA		74.69	3.78	17.72	5.23	2.70	2.93	0.88	5.63

* Significant at 5% level ** Significant at 1% level

Table 2. General combining ability (gca) effects of parents for different traits in sesame

Paremts	Days to first flower	Plant height	Number of branches per plant	Number of capsules per plant	Capsule length	Number of seeds per capsule	Thousand seed weight	Seed yield per plant
VNP local	-0.56**	2.85**	0.75**	9.44*	0.10**	-0.94**	-0.06	1.25*
VRI-1	-0.58**	1.64*	0.73**	10.12**	-0.09**	-1.39**	-0.07*	1.28**
Danbakkae	-2.33**	-3.80**	0.89**	-7.13**	0.04*	1.77**	0.02	-1.06**
Jinjukkae	-2.19**	-4.87**	-1.04**	-15.75**	0.05**	1.89**	0.07*	-1.88**
PTDL-1	4.53**	5.84**	0.55**	7.29**	0.11**	-0.52	0.04	0.91**
Koteche	1.14**	-1.66*	-0.10*	-3.98**	-0.01	-0.82*	0.01	-0.50**

* Significant at 5% level ** Significant at 1% level

Table 3. Specific combining ability of hybrids for different traits in sesame

Cross	Days to first flower	Plant height	Number of branches per plant	Number of capsules per plant	Capsule length	Number of seeds per capsule	Thousand seed weight	Seed yield per plant
VNP local x VRI-1	0.47	3.15	0.4**	14.83**	-0.03	0.45	0.01	2.01**
VNP local x PTDL-1	0.86**	4.09*	-0.30**	9.89**	-0.06	-1.27	-0.05	1.66
VRI-1 x VNP local	0.33	3.42	0.20	11.17**	0.04	0.50	-0.12	1.52**
VRI-1 x Jinjukkae	0.28	3.62*	0.51**	-5.16**	0.03	1.49	0.03	-0.77**
Danbakkae x Koteche	-1.14**	2.12	0.34**	18.49**	0.04	-3.86**	-0.22**	2.11**
Danbakkae x PTDL-1	-0.03	3.17	0.31**	3.81**	0.12**	-1.08	0.13	0.06
Jinjukkae x Danbakkae	0.17	2.20	1.02**	3.00	0.01	-0.37	0.07	0.52*
Jinjukkae x VRI-1	2.17**	2.13	-0.02	3.47**	0.04	-0.95	0.33**	-0.07
PTDL-1 x VNP local	-4.83**	4.33*	0.08	-21.42**	0.01	0.90	0.13	-2.73**
PTDL-1 x Koteche	0.33	2.07	0.25*	11.30**	0.15**	2.42*	-0.04	0.79**
PTDL-1 x Danbakkae	-6.50**	0.52	0.02	7.53**	0.03	-2.00	-0.10	1.58**
Koteche x PTDL-1	2.33**	5.17**	0.02	5.60**	-0.02	-2.38*	0.17	1.42**
Jinjukkae x PTDL-1	-0.50	1.35	0.39**	-1.85	0.09*	-2.25*	-0.05	-0.21
Koteche x Jinjukkae	-3.00**	-4.58*	-0.08	2.32	0.07	-3.32**	0.22*	0.88**
VNP local x Koteche	-0.25	1.21	-0.29**	-10.32**	-0.02	0.73	0.29**	-1.54**

* Significant at 1% level
** Significant at 5% level

weight and number of seeds per capsule. The parents Jinjukkae and Koteche were desirable general combiners for dwarf plant type.

The *sca* effects of fifteen most heterotic crosses for yield and its components indicated (Table 3) that most of the specific cross combinations for different traits involved either one or both the good *gca* parents. The crosses, Danbakkae x Koteche, VNP local x VRI-1 and their reciprocals showed significantly positive *sca* effects for seed yield and number of capsules per plant. For dwarfness, negative estimates of *sca* are considered. The cross, Koteche x Jinjukkae was found to be good for reduced plant height. The best specific combiner for number of seeds per capsule was PTDL-1 x Koteche.

Two crosses VRI-1 x Jinjukkae and Jinjukkae x Danbakkae exhibited significant and positive *sca* effects for number of branches per plant. For thousand seed weight the cross VNP local x Koteche and Jinjukkae x VRI-1 recorded maximum positive *sca* effects. As such, these crosses would be of specific significance, as besides being highly heterotic, they also showed high *per se* performance with good *gca* effects. Therefore, these parents could be exploited for yield improvement as such crosses are likely to throw transgressive segregates in advanced generations. Further, low x high or low x low crosses also showed higher heterosis for various attributes than high x high cross combinations depicting the importance of additive x dominant or dominance x dominance gene interactions. For improvement of the crop, adoption of suitable methods exploiting additive and non-additive gene effects was suggested (Goyal and Sudhir Kumar, 1991).

Since the importance of additive as well as non-additive genetic components is highlighted by the present study, the improvement in yield and its attributes would be possible by resorting to biparental mating, reciprocal recurrent selection or by diallel selective mating system.

LITERATURE CITED

Backiyarini S, Amirtha Devarathinam A and Shanthi S 1997. Combining ability studies on economic traits in sesame (*Sesamum indicum* L.). *Crop Research*, 13: 121-125.

Banerjee P P and Kole P C 2009. Combining ability analysis for seed yield and some of its component characters in sesame (*Sesamum indicum* L.) *International Journal of Plant Breeding and Genetics*, 3 (1): 11-21.

Das S and Das Gupta T 1999. Combining ability in sesame. *Indian Journal of Genetics*, 59(1):69-75.

Griffings B 1956. Concept of general and specific combining ability in relation to diallel crossing systems. *Australian Journal of Biological Sciences*, 9: 463-493.

Goyal S M and Sudhir Kumar 1991. Combining ability for yield components and oil content in sesame. *Indian Journal of Genetics*, 51:311-314

Narkhede B H and Sudhir Kumar 1991. Combining ability in sesame. *Journal of Maharastra Agricultural Universities* 16(2): 190-192.

Sajjanar G M Giriraj K and Nadaf H L 1995. Combining ability in sesame. *Crop Improvement*, 22:250-254.

Sharma R L and Chaudhan B P S 1985. Combining ability in sesame. *Indian Journal of Genetics*, 45 (1):45-49.

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