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RESEARCH ARTICLE

Identification of specific cross combinations in sesame, (*Sesamum indicum* L.)

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SUMMARY

The combining ability was studied to identify the best specific cross combinations in sesame(*Sesame Indicum* L.) through diallel analysis with seven parents. Eight characters *viz.*, days to maturity, plant height, number of branches per plant, number of capsules per plant, number of seeds per capsule, 1000 seed weight and seed yield per plant and oil yield per plants were studied. Based on the general combining ability effects of parents DSS-9 was found to be good general combiner for days to maturity, plant height and number of capsules per plant, 1000 seed weight, seed yield per plant and oil yield per plant, number of branches per plant followed by Dhauri Local. The cross combination Gowry x JCT-7 showed negative significant *sca* for days to maturity. Dhauri Local x DSS-9 showed positive and significant *sca* effect for the traits, number of capsules per plant and seed yield and oil yield per plant followed by DSS-9 X RT-54 and hence recommended for yield improvement.

Key Words : Sesame, General combining ability, Specific combining ability

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Sesame, *Sesamum indicum* L. is an ancient oil crop grown throughout India having tremendous potential for export. It offers several advantages by virtue of its faster growth and short duration. However, it has not contributed enormously to the total oil seed production mainly because of average low yield level (421 kg/ha) in comparison with some other countries like China (705 kg/ha), Japan (700 kg/ha),Korea (635 kg/ha) and Thailand(575 kg/ha). Therefore, there is an urgent need to augment its productivity through the incorporation of wide adaptability and high yield potential. The performance and adaptation of parents are not always a true indicator of superior combining ability as it depends upon complex interaction system among genes. Thus, critical choice of parents is the most crucial step in any breeding programme. Particularly in heterosis breeding. Hence, the present investigation was carried out to identify the best general combiners and specific cross combinations for seed yield and its components in sesame.

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MATERIALS AND METHODS

The present investigation was conducted at Plant breeding Farm , College of agriculture , UAS Raichur. The experimental material for this study consisted of seven parents (JCT-7,DSS-9,CO-1,RT-54,Dhauri Local, Gowry-173,MT-75) were selected. the selected seven parents were planted in crossing block during *Kharif* season and crossed in all possible combinations including reciprocals. The parents along with their 21 straight and 21 reciprocal $F1^{'}$s were grown in randomised complete block design with two replications during summer season. Each entry was sown in single row of 5m length having 30 x 15 cm crop geometry. A single non experimental row was grown all around the experimental area to neutralise the border effect. Recommended agronomic practises were adopted to raise good crop of sesame. Data were recorded on five randomly selected plants in each row for seven yield and yield attributes. Combining ability analysis

Table 1: Estimates of general combining ability (GCA) effects of parents for 8 traits in sesame

Parents	Days to maturity	Plant height(cm)	No.of branches/plant	No.of capsule/ plant	No.of seeds /capsule	1000 S.W (g)	Seed yield/plant (g)	Oil yield/ (g/plant)
JCT -7	5.41 **	3.03 **	-0.03	-1.15 **	0.35	-0.35 **	-0.98 **	-0.54 **
DSS -9	-4.18 **	4.53 **	0.54 **	3.12**	2.82 **	0.17 **	1.32 **	0.69 **
CO- 1	0.06	4.49 **	-0.30**	-0.69**	-0.21	0.11 **	0.01	-0.02
RT -54	-2.18 **	-5.11 **	0.31 **	0.48	-0.25	-0.05	0.14	0.07
Dhauri Local	0.56	-2.54 **	0.00	2.52 **	0.39	0.02	0.41***	0.22**
Gowri- 173	0.29	-2.43 **	-0.22 **	-3.08 **	-2.28**	0.05	-0.60 ***	-0.26 **
MT-75	0.03	-1.96 **	-0.30 **	-1.19**	-0.82 **	0.03	-0.31 **	-0.15 *
S.E.(gi)	0.36	0.39	0.03	0.24	0.27	0.03	0.10	0.05
C.D. at 5%	0.73	0.79	0.07	0.48	0.55	0.06	0.21	0.11

* and ** Indicate significance of value at P=0.05 and 0.01, respectively

Table 2 : Best specific cross combinations for eight characters in sesame

characters	cross	mean	Sca effect	Gca status of the parent	
				P_1	P_2
Days to maturity#	Gowri-173 x JCT-7	91.3	-9.62	High	high
Plant height#	MT-75 x RT-54	106.0	-11.5**	Low	high
No. of branches / plant	DSS-9 x Dhauri Local	5.80	1.08**	High	high
No. of capsule /plant	Dhauri Local x DSS-9	71	12.50**	High	high
No. of seeds / capsules	Gowri-173 x Dhuri Local	52	8.00**	High	low
1000 seed weight	DSS-9 x JCT-7	3.1	0.70**	High	high
Seed yield/plant	Dhauri Local x DSS-9	15.7	3.50**	High	high
Oil yield/plant	Dhauri Local x DSS-9	8.1	1.77**	High	high

*and** Indicate significance of value at P=0.05 and 0.01, respectively, # Sca effects in negative direction was considered
Low : Non significant gca ; High : Significant gca

Table 3: Top ranking four specific cross combinations for seed yield in sesame

characters	Mean seed yield/ plant(g)	*sca*	Gca status of the parent	
			P_1	P_2
Dhauri Local x DSS-9	15.7	3.50**	High	high
DSS-9 x RT-54	7.5	3.45**	High	low
DSS -9 x Dhauri Local	14.5	2.55	High	high
Dhauri Local x Gowri-173	10	2.50	High	low

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

was done following Griffing(1956) method 1 model 1.

RESULTS AND DISCUSSION

The analysis of variance for combining ability showed that variance due to general (*gca)* and specific combining ability (*sca*) were highly significant for all the traits. sca variance was higher than the *gca* for all the seven characters indicating preponderance of non-additive gene effects in the expression of these traits. Similar results were reported by Manivan and Ganeshan (2001) and Vidyavathi *et al.* (2005). The result clearly reflected that heterosis breeding would be rewarding for the commercial exploitation of yield heterosis in the present set of material.

A perusal of *gca* effects (Table 1) indicated that the parents DSS-9 and Dhauri Local was a good general combiner for seed yield, oil yield, number of capsules per plant, number of branches per plant . Whereas, DSS-9 was good gca for days to maturity in desirable direction followed by RT-54. Another parent CO-1 for 1000 seed weight, RT-54 for plant height. The *per se* performance of the parents was good indication of gca effects were related to additive and/or additive x additive gene effects which are the only fixable part. Hence, DSS-9 and Dhauri Local may be extensively used in the hybridisation programme for the improvement of these traits.

The best specific cross combinations for the seven trait revealed that none of them was desirable for all the characters (Table 2). The best specific cross combination for seed yield/ plant was Dhauri Local x DSS-9 coupled with the highest *per se* performance and significant *sca* effects for oil yield per plant, plant height, number of branches per plant, number of capsules per plant. Similarly, the best specific cross combinations for the other traits have been presented in Table 3. It was also observed that most crosses with high significant specific combining ability effects involved parents either with high x low or low x low combiners with few exceptions of high x high combiners. The significant *sca* cross combinations involving high x low or low x high general combiners with significant *sca* effects it may shows immense interest to the sesame breeder, because such specific crosses may result in to desirable transgressive segregants, if the additive effects of one parent and complementary epistatic effects in the other act unidirectionally to maximise the expression of the character under selections as also observed by Goyal and Kumar(1991) and Ramesh *et al*. (1998).

The best specific combiner for seed yield (Dhauri Local x DSS-9) involved the parents having high x high *gca* effects indicating dominance x dominance type of interaction (Table 3). The other specific combinations for seed yield were having high x low, low x high and low x low general combiners produced high *sca* effects, suggesting the prevalence of over dominance and epistatic gene action arised due to genetic diversity in the form of heterozygous loci. The present investigation suggested that three *i.e.*, Dhauri Local x DSS-9 , DSS-9 x RT-54 and DSS-9x Dhauri Local may be selected both for the commercial exploitation of heterosis and obtaining transgressive segregants in later generations whereas RT-54 x MT-75 exclusively for the commercial exploitation of heterosis in sesame.

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