Indian J. Genet., **51** (3): 311–14 (1991)

COMBINING ABILITY FOR YIELD COMPONENTS AND OIL CONTENT IN SESAME

S. N. GOYAL* AND SUDHIR KUMAR

Department of Genetics and Plant Breeding, Rajasthan Agricultural University Udaipur 313001

(Received: June 5, 1989; accepted: August 25, 1990)

ABSTRACT

The 8 x 8 diallel analysis in F_1 generation without reciprocals in sesame revealed that the variances due to gca and sca were highly significant denoting importance of additive and nonadditive gene actions for all the eight traits. The estimated components of sca variances were higher in magnitude for all the traits, indicating the predominance of nonadditive or dominant gene action for the traits. The parents Vinayak and SP 1162 were good general combiners for most of the characters, Type 12 for seeds/capsule, oil content and number of branches, and Pratap for number of capsules, plant height, oil content, days to flower/maturity, and number of branches, which could be utilized in hybridization programme. The specific crosses Pratap x Vinayak, Pratap x TC 25, Type 12 x N 32, Vinayak x SP 1162, Type 12 x SP 1162, and N 32 x ES 22 appeared to be good for seed yield and most of the contributing characters. For improvement of the crop, adoption of suitable methods exploiting additive and nonadditive gene effects is suggested.

Key words: Combining ability, oil content, sesame.

Combining ability studies are more reliable as they provide useful information for the selection of parents in terms of performance of the hybrids and elucidate the nature and magnitude of various types of gene actions involved in the expression of quantitative traits. The main objective of the study reported was to identify good general combiners for yield and its attributes so as to use them in hybridization programme for improving seed yield based on 8 x 8 diallel cross of sesame.

MATERIALS AND METHODS

A half-diallel set (excluding reciprocals) was made involving eight parents: Gujarat Til-1, Pratap, TC-25, Type-12, N 32, Vinayak, SP 1162 and ES 22. The resultant 28 F_1 hybrids

---

*Present address: Gujarat Agricultural University, Maktampur, Navsari 396450.

along with parents were planted in randomized block design with three replications in kharif 1981. The row and plant spacings were maintained at 45 and 15 cm, respectively. Observations on five random plants were recorded for yield, oil content, seeds/pod, capsules/plant, number of branches, plant height, days to flower, and maturity. The combining ability analysis was done as per Griffing Model 1, Method 2 [1].

RESULTS AND DISCUSSION

Analysis of variance revealed significant difference for all the characters, indicating wider genetic variability among genotypes. The mean squares due to general and specific combining ability (gca, sca) were highly significant (Table 1) for all the traits except oil content, where only gca mean squares were significant. This indicated that both additive as well as nonadditive types of gene actions were involved in the control of these traits, however, for oil content, only additive effect was involved. The estimated components of sca variance were higher than gca variance for all the characters signifying a predominant role of nonadditive gene action in the inheritance of these attributes. The present results confirm the earlier findings [2–5] of predominance of nonadditive gene action for seed yield, oil content, seeds/capsule, capsules/plant, branches, and number of days to flower. However, Kotecha and Yermanos [6] and Chaudhary et al. [7] found yield to be under the influence of additive genes, while Murty and Hashim [8] and Chavan et al. [9] reported both additive and dominant gene actions for yield and its attributes in sesame.

Table 1. ANOVA for combining ability

Character	Mean squares for different parameters				
	gca (7)	sca (28)	error (70)	σ^2 gca	σ^2 sca
Seed yield	14.6**	5.2**	0.2	0.94	5.02
Oil content	0.3**	0.4	0.1	0.00	0.23
Seeds/capsule	94.7**	96.6**	0.6	0.00	95.97
Capsules/plant	763.4**	439.7**	20.9	32.38	418.70
No. of branches	4.4**	1.3**	0.3	0.32	0.99
Plant height	318.0**	147.4**	15.2	17.06	132.20
Days to flower	27.8**	5.7**	0.2	2.22	5.43
Days to maturity	89.3**	4.2**	0.6	8.50	3.66

**Significant at 1% level.

Note. Degrees of freedom given in parentheses in column heads.

The gca effects presented in Table 2 show that the parent cvs. Vinayak and SP 1162 are good general combiners for all the traits except oil content, whereas Pratap, TC-25, ES-22 and Type-12 are good for oil content and Gujarat Til-1 and Type-12 for seeds/capsule. For plant height, days to flower and maturity, cvs. Pratap and N 32 are notable general combiners.

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

Parent	Yield per plant	Oil content	Seeds per pod	Capsules per plant	No. of branches	Plant height	Days to flower	Days to maturity
Gujarat Til-1	–0.21	0.10	0.71*	–2.92	–0.29	–5.60**	–2.10**	–0.22
Pratap	–0.19	1.27**	–4.92**	0.67	–0.88**	7.15**	2.13**	5.08**
TC 25	–0.80	2.06**	–0.27	–5.10**	–0.23	–6.03**	–1.50**	–2.86**
Type 12	–0.01	0.67**	2.84**	–2.95*	0.41*	–3.27*	–0.60**	0.34
N 32	–0.86*	–3.19**	–3.75**	–6.84**	–0.53**	8.81**	2.23**	1.91**
Vinayak	2.79**	–1.82**	3.94**	18.95**	1.24**	1.47	0.73**	1.31**
SP 1162	0.23	–0.32*	1.91**	5.53**	0.44*	1.00	0.53**	–4.73**
ES 22	–0.96*	1.28**	–0.46*	–7.36**	–0.16	–3.52**	–1.43**	–0.83**

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

The sca of nine most heterotic crosses for yield and its attributes (Table 3) indicated that most of the specific cross combinations for different characters involved either one or both the good gca parents, e.g. out of nine crosses, five each for seed yield and number of capsules, six each for oil content and days to flower/maturity, and four each for seeds/capsule and plant height involved such promising general combiners. As such, these crosses are of specific significance, as besides being highly heterotic, they also gave good per se performance and involve good gca parents. Therefore, they can be exploited further for yield improvement. 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

Table 3. Specific combining ability of best crosses for different characters in sesame

Cross	Yield per plant	Oil content	Seeds per pod	Capsules per plant	No. of branches	Plant height	Days to flower	Days to maturity
Pratap x TC-25	3.31**	–0.60	4.8**	34.7**	1.8**	7.2**	–1.8**	0.7
Pratap x Vinayak	4.49**	0.10	–9.0**	39.5**	1.2**	6.9*	–0.0	–1.5*
TC-25 x SP 1162	1.65**	–0.96*	1.5*	–16.1**	–1.2**	–8.1*	–0.2	–0.2
Type 12 x N 32	3.76**	–0.81*	1.5*	12.6**	0.1	–9.8*	0.6	0.7
Type 12 x Vinayak	1.42**	0.10	–4.0**	11.2**	1.7**	–2.8	–1.0*	–0.4
Type 12 x SP 1162	1.77**	0.21	6.9**	–22.7	–1.0*	11.5**	0.8**	–1.0
N 32 x ES 22	2.71**	0.27	11.9**	0.4	–0.2	–9.1*	–4.3**	–3.2**
Vinayak x SP 1162	1.89**	0.60	–7.4**	23.0**	2.1**	2.6	1.4**	0.0
Pratap x Type 12	1.23**	0.02	4.7**	35.1**	1.3**	18.7**	–3.0**	–1.5**

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

various attributes than even high x high cross combinations, depicting the importance of additive x dominance or dominance x dominance gene interactions.

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

REFERENCES

1. B. Griffing. 1956. Concept of general and specific combining ability in relation to diallel crosses system. Aust. J. Biol. Sci., **9**: 463–493.

2. R. K. Dixit. 1976. Inheritance of yield and yield components in sesame. Indian J. agric. Sci., **46**(11): 514–517.

3. Tilakraj Gupta. 1981. Combining ability of yield components in sesame (*Sesamum indicum* L.). Madras Agric. J., **68**: 281–288.

4. V. K. Singh., H. G. Singh and Y. S. Chauhan. 1983. Combining ability in sesame. Indian J. agric. Sci., **53**(59): 305–310.

5. D. Krishnadoss, M. Kadambavan Sundaram, R. Sethupathi Ramlingam and S. Rajasekaran. 1987. Combining ability in *Sesamum*. Indian J. agric. Sci., **57**(2): 85–88.

6. Ashok Kotecha and D. M. Yermanos. 1978. Combining ability of seed yield, plant height, capsule number and capsule length in a 8 x 8 diallel cross of sesame. Agron. Abstr., **68**.

7. P. N. Chaudhary, R. E. Zope, A. B. Deoker and N. Y. Patil. 1979. Heterosis in sesame. J. Maharashtra Agril. Univ., **4**: 125–126.

8. D. S. Murty and M. Hashim. 1974. Diallel analysis in sesame. Indian J. Genet., **34**: 703–712.

9. A. A. Chavan, V. G. Makne and P. R. Chopde. 1981. Gene action in sesame. Indian J. Genet., **41**: 417–422.