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Research Article

Studies on combining ability studies in sesame (*Sesamum indicum* L.)

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Abstract
Combining ability analysis in sesame through L x T design with 9 lines and five testers were evaluated for yield and yield contributing characters *viz.,* days to maturity, plant height, number of branches per plant, number of capsules per plant, capsule length, number of seeds per capsule, 1000 seed weight, oil content and seed yield per plant. Non additive gene action was predominant for all the traits studied. Combining ability analysis revealed that the following three parents *viz.,* RT 125, VS 9701 and CO 1 were the best combiners for five traits including seed yield per plant. Considering both *per se* performance and *gca* effects the parents VS 9701, Ajit 131 and SVPR 1 were found to be best. Better segregants can be obtained from the hybrid combinations RT 125 x CO 1, VS 9701 x CO 1 and Uma x CO 1 for seed yield and yield contributing characters.
Key words: combining ability, heterosis, sesame

Introduction

Sesame is an important ancient and traditional oil seed crop cultivated in India, with an area of 15 lakh hectares. Selection of parents in the hybridization programme is very important for getting the desirable recombinants for selection and to serve as parents for hybrids. Hence, the present investigation was undertaken to assess the nature of gene action involved in yield and its contributing characters and to identify the best general combiners.

Materials and methods

The materials consisted of 45 hybrids obtained by crossing of nine lines viz., RT 125, VS 9701, Rama, Uma, Cordeborega, TVS 0011, Ajit 131, CST 2005, KS 95010 and five released varieties viz., SVPR 1, TKG 22, Co 1, VRI 1 and TMV 3 as testers. The resulting 45 F_1 hybrids were evaluated along with parents in ridges and furrows adopting a spacing of 30 x 30 cm at Agricultural College and Research Institute, Madurai. The hybrids and parents were raised in a Randomized Block Design with three replications. Recommended package of practices with need based plant protection measures were taken up to raise a good crop. Ten plants were randomly selected in all genotypes and three replications for recording biometrical observations. Observations are days to maturity, plant height, number of branches per plant, number of capsules per plant, capsule length, number of seeds per capsule, 1000 seed weight, oil content and seed yield per plant.

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Results and Discussion

The estimates of GCA and SCA variances are useful to infer the type of gene action and the relative importance of the character in breeding programme. In addition, the ratio between GCA and SCA variance help to find out the extent of additive gene action. The estimates of combining ability variances showed higher values of SCA variances for all the nine traits studied.

High mean value was the main criterion of selection among the breeders for a long time. The parents with good mean performance would result in good performing off springs (Gilbert, 1958). Among the parents the VS 9701 and SVPR 1 was significantly superior for major yield contributing characters followed by Ajit 131 (Table 1). Combining ability of parents gives useful information on the choice of parents in terms of expected performance of their hybrids and progenies (Dhillon, 1975). The estimates of combining ability indicated that RT 125 had significantly high *gca* effects for seed yield per plant and other yield contributing characters

followed by VS 9701. The next best parent was Ajit 131 which possessed desirable *gca* effects for five traits except days to maturity, number of branches per plant, number of seeds per capsule and seed yield per plant (Table 2).

The *per se* performance of parents was not always reflected in high *gca* effects. The high *gca* effect might be due to linkage in repulsion phase (Sarsar *et al.*, 1986). Chandra *et al.* (1969) who opined that parents with high mean performance may not be able to transmit their superior traits into hybrids and hence they insisted the need for combining ability of parents also. The significantly superior general combining ability effects along with high mean performance would result in the identification of parents with good reservoir of superior genes. Hence, both mean performance and *gca* effects were taken into account for parental selection.

The two parents VS 9701 and Ajit 131 had desirable performance for five traits each. Both the parents showed favourable *per se* performance and *gca* effects for plant height and number of capsules per plant. The parent VS 9701 was adjudged as the best since it possessed significant mean and *gca* including seed yield per plant. It was followed by SVPR 1 which had desirable *per se* and combining ability effects for four traits including yield. Thus, an overview of mean performance and *gca* effects of parents revealed that the line VS 9701, Ajit 131 and SVPR 1 as good parents and can be used in further breeding programme. Hence, these parents can be used in multiple crossing programme to identify superior segregants with high yield.

Nadrajan (1986) referred the segregation of the hybrid combination having non significant *sca* effects but the parents having significance and high *gca* effects may yield better recombinants with favourable additive genes from both the parents. If the parents having significant *gca* effects and hybrid combination with significant *sca* effects may through better recombinants in later generations. Among the crosses, RT 125 x Co 1, VS 9701 x Co1 and Uma x Co 1 recorded non significant sca effects for number of branches per plant and significant sca effects for seed yield. Both parents involved in these crosses are good combiners. Hence these crosses can be utilized for pedigree breeding to obtain better recombinants in later generations.

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Table 1. Mean performance of parents for different traits in sesame

Parents	Days to maturity	Plant height (cm)	Number of branches per plant	Number of capsules per plant	Capsule length (cm)	Number of seeds per capsule	1000 seed weight (g)	Oil content (%)	Seed yield per plant (g)
RT 125	65.63*	91.17	3.67	67.10	2.37	54.16	3.01	44.08	10.90
VS 9701	89.40	126.60*	5.00	106.22*	2.80	60.56*	3.13*	46.29*	14.48*
Rama	85.67	106.68	4.87	88.32	2.73	54.92	3.09	41.04	13.92*
Uma	82.00	104.32	8.53*	97.92	3.00	66.49*	3.04	43.29	12.16
Cordeborega	60.67*	74.13	0.00	62.47	3.60*	56.70	3.02	44.42	9.81
TVS 0011	89.30	132.27*	6.40*	106.42*	2.93	55.62	2.97	46.25*	11.25
Ajit 131	82.60	135.41*	3.90	109.39*	3.77*	53.78	3.31*	41.17	14.70*
CST 2005	80.50	125.32*	3.53	94.69	3.03	56.85	2.88	42.89	11.91
KS 95010	87.68	108.15	5.47	85.92	2.93	53.44	2.88	42.95	10.58
SVPR1	75.73*	105.90	7.20	104.80*	2.87	65.76*	3.05	45.09*	15.43*
TKG 22	83.57	133.90*	5.13	84.25	3.07*	50.69	3.05	44.13	11.37
CO 1	89.41	130.42	8.67*	96.51	2.77	53.92	2.88	41.85	12.63
VRI 1	77.45*	125.71	7.50	94.11	2.80	51.44	2.93	45.06	10.28
TMV 3	83.15	131.56	8.77*	87.19	2.97	56.35	2.93	44.72	9.86
Mean	81.86	125.50	7.45	93.37	2.90	55.63	2.97	44.17	11.94
SE d	0.68	3.76	0.54	4.41	0.0	1.08	0.04	0.66	0.87
CD(0.05)	1.35	7.45	1.07	8.73	0.12	2.14	0.08	1.31	1.72

*Significant at 5 % level

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

Parents	Days to maturity	Plant height (cm)	Number of branches per plant	Number of capsules per plant	Capsule length (cm)	Number of seeds per capsule	1000 seed weight (g)	Oil content (%)	Seed yield per plant (g)
Lines									
RT 125	-8.04*	10.30*	1.57*	105.01*	-0.05	0.25	-0.075*	-5.41*	12.36*
VS 9701	5.10*	9.48*	0.50*	60.58*	0.05	-1.02*	-0.026	4.32*	5.92*
Rama	3.72*	0.95	0.60*	-5.73*	-0.01	1.83*	-0.049*	-3.14*	-9.91*
Uma	1.83*	-4.15*	0.96*	7.49*	-0.08*	-1.58*	0.002	-3.90*	2.30*
Cordeborega	-11.02*	-28.89*	-2.26*	-47.89*	0.09*	2.27*	-0.075*	2.29*	-6.55*
TVS 0011	3.14*	-4.69*	1.18*	-52.60*	0.01	1.87*	-0.022	2.26*	-1.31*
Ajit 131	0.55	6.43*	-0.67*	12.55*	0.19*	0.28	0.174*	2.49*	-1.93*
CST 2005	1.09*	9.91*	-1.32*	-17.89*	-0.11*	0.05	0.081*	1.49*	-1.38*
KS 95010	3.61*	0.64	-0.56*	-61.52*	-0.10*	-3.94*	-0.007	-0.41	-8.51*
SE	0.28	1.53	0.22	1.80	0.03	0.44	0.018	0.27	0.35
Testers									
SVPR1	-2.53*	-6.73*	-0.77*	13.63*	-0.08*	2.55*	0.034*	-0.23	0.37
TKG 22	0.52*	0.87	-0.18	-3.70*	0.06*	-0.16	-0.0001	0.37	-0.29
CO 1	3.92*	11.37*	1.02*	11.71*	0.05*	0.33	0.012	-0.76*	1.20*
VRI 1	-2.27*	0.292	0.37	-1.37	0.01	-1.90*	-0.008	0.52*	-0.95*
TMV 3	0.36	-5.81*	-0.45	-20.27*	-0.04	-0.81	-0.038*	0.10	-0.33
SE	0.21	1.14	0.17	1.35	0.02	0.33	0.014	0.20	0.26

*Significant at 5 % level