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Combining ability for seed yield and its components in sesame (*Sesamum indicum* L.)

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SUMMARY

Hybrids were synthesized in a 10 x 10 diallel fashion excluding reciprocals and analysis of combining ability was undertaken for yield and its component traits in sesame. Non-additive genetic variance was of grater importance for plant height, length of main branch, number of capsules on main branch, number of capsules per plant, capsule length, number of seeds per capsule, seed yield per plant and harvest index. Based on general combining ability, parents C 1013, AT 123 and GT 2 were found to be good general combiners for improving yield and yield contributing traits. The cross combinations *viz*., GT 2 x GT 10, Mrug 1 x PT 64 and C 1013 x ABT 23 had highly significant sca effect for seed yield and most of the yield attributing traits.

Key words : Diallel, Combining ability, Sesame

Sesame an ancient oilseed crop of India is known as "Queen of oilseeds" by virtue of its oil quality. Rajasthan is the major sesame growing state (314.9 thousand ha. area) in India with a production of 129.9 thousand tones but the productivity (403 kg/ha) is very low (Anonymous, 2007-08).

Combining ability analysis is considered a very useful technique in classifying parental lines according to their potential to yield good hybrids and to aid in selecting parents which when crossed could give rise to better segregants in later generations. In the present study, an attempt has been made to examine the combining ability of some sesame accessions and their hybrids over environments.

MATERIALS AND METHODS

Genetic material for the present investigation comprised of 10 sesame genotypes *viz*., GT 1, GT 2, C 1013, Mrug 1, GT 10, PT 64, Tapi, ABT 23, ABT 26 and AT 123. The 10 parents and 45 hybrids were raised in randomized block design with 3 replications under 4 environments created by four different dates of sowing during *Kharif*-2005. The field experiment was conducted at the Main Castor and Mustard Research Station, S. D. Agricultural University, Sardarkrushinagar with 45 x 15 cm spacing. All the agronomic practices were followed uniformly. The observations were recorded on 5 randomly selected plants of each genotype in each replication and each environment for different characters. The data were analyzed for combining ability for single environment using Griffing (1956), Model 1 and Method II. Griffing method of combining ability was later elaborated by Daljit singh (1973, 1979) which was utilized for combining ability for pooled over environments.

RESULTS AND DISCUSSION

The pooled analysis of variance for combining ability revealed presence of significant mean squares due to gca and sca for all the characters under study (Table 1), thereby suggesting that both additive and non additive gene actions were important for the expression of these traits. The mean squares due to interaction of environments with gca and sca were also significant for all the characters under study. However, the ratio of s^2gca/s^2sca variance showed that non additive type gene effects were more important in the expression of all the characters under study except for days to 50 per cent flowering, days to maturity and number of effective branches per plant.

Three parental lines *viz*., C 1013, AT 123 and GT 2 were found to be good general combiners for seed yield along with a number of its component traits (Table 2). Among these, C 1013 was also found to be best general combiner for days to maturity, number of effective branches per plant, number of capsules per plant, capsule length and harvest index. The parent, AT 123 manifested desirable and significant gca effects for plant height, length of main branch, number of effective branches per plant, number of capsules per plant, capsule length and number

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of seeds per capsule. Similarly parent GT 2 recorded significant desirable gca effects for days to 50 per cent flowering, days to maturity, plant height, length of main branch, number of capsules per plant and harvest index. Similar results were also reported by Karuppaiyan and Sundaresan (2002), Krishnaiah *et al*. (2003) and Prajapati *et al*. (2006).

Three best crosses with significant sca effects for various traits along with *per se* performance involved in the crosses are listed in Table 2. The best cross combinations GT 2 x GT 10 and C 1013 x ABT 23 were expressed maximum sca effects along with high *per se* performance for seed yield per plant and number of capsules per plant. The crosses which exhibited significant desirable sca effects were Mrug 1 x PT 64 for length of main branch, number of effective branches per plant, number of capsules per plant and harvest index whereas, cross C 1013 x ABT 23 for length of main branch, number of effective branches per plant and number of capsules per plant. A comparative study of most of the crosses showing high sca effects for different characters which produced maximum yield, had at least one parent as good combiner for seed yield.

An over view of the results suggested that three parental lines C 1013, AT 123 and GT 2 were found to be common good general combiners for seed yield and its component traits. These lines can be utilized in future sesame hybrid breeding programme. The non additive gene action was predominantly responsible for the inheritance of all the traits, heterosis breeding could be the best breeding method for improvement of seed yield in sesame. Since both additive and non additive genetic variances are important, to take advantage of both types of gene action, reciprocal recurrent selection (Dixit, 1976) or biparental mating (Krishnadoss *et al*., 1987) followed by modified recurrent selection may be resorted for the improvement of yield and yield related traits for the development of high yielding stable genotypes of sesame.

Table: 1 Pooled analysis of variance of combining ability for different characters in diallel crosses of sesame

Source of variation	d. f	Days to 50 per cent flowering	Days to maturity	Plant height	Length of main branch	Number of capsules on main branch	Number of effective branches per plant	Number of capsules per plant	Capsule length	Number of seeds per capsule	Seed yield per plant	Harvest index
Environment	3	1657.356**	5420.064**	25372.290**	3587.631**	69.550**	58.027**	7833.106**	0.343**	111.865**	572.493**	701.351**
GCA	9	62.594**	30.416**	646.846**	186.472**	120.695**	22.558**	451.574**	0.172**	198.117**	10.309**	266.145**
SCA	45	3.468**	2.727*	192.424**	69.792**	24.848**	1.741**	93.925**	0.036**	38.773**	3.390**	60.555**
GCA x Env.	27	4.941**	4.243**	51.723**	81.193**	22.573**	1.396**	64.448**	0.025**	12.708*	2.181**	31.668**
SCA x Env.	135	1.566	1.413	38.958*	33.186	9.109**	0.910**	66.529**	0.012**	15.341**	1.703**	22.958**
Pooled error	432	1.466	1.928	29.938	27.902	1.728	0.204	13.401	0.008	7.126	0.487	11.086
σ^2gca	-	1.273	0.594	12.852	3.304	2.478	0.466	9.129	0.003	3.979	0.205	5.314
σ^2sca	-	0.501	0.200	40.621	10.472	5.780	0.384	20.131	0.007	7.912	0.726	12.367
σ^2gca/σ^2sca	-	2.544	2.969	0.316	0.315	0.429	1.211	0.453	0.484	0.503	0.282	0.430

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

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