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COMBINING ABILITY FOR RESISTANCE TO CHARCOAL ROT [*MACROPHOMINA PHASEOLINA* TASSI (GOID)] IN SESAME

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ABSTRACT

Combining ability analysis of a 9 x 9 diallel set of sesame genotypes grown in a sick plot infested with *Macrophomina phaseolina* Tassi (Goid) revealed that the dominance component played a major role in controlling resistance to charcoal rot. Only two genotypes showed significant gca effects one having resistance and the other having susceptible reaction.

Key words: Sesame, charcoal rot, combining ability.

Charcoal rot caused by *Macrophomina phaseolina* Tassi (Goid) is one of the serious diseases of sesame. Differences in resistance to charcoal rot under natural conditions have been observed among a wide spectrum of sesame germplasm. Although reports on incidence and screening of this disease have been published [1–4], not much work on the inheritance of this disease has so far been done. Salim [5] found susceptibility to charcoal rot to be dominant over tolerance in four crosses of sesame. In view of the dearth of information on this disease, attempt has been made to study the same.

MATERIALS AND METHODS

Five varieties, namely, H. T. - 1, Khasla, Vinayak, B-9 and B-14, and four hybrid derivatives, S-27, S-38, S-12 and S-18, were involved in diallel cross. The parents and F_1 hybrids without reciprocals were grown in single-row plots, each of 2 m long, having 20 plants in randomized block design with two replications at the District Seed Farm, Kalyani. The experiment was carried out in a sick plot infested with charcoal rot. The plot was made highly sick of *Macrophomina phaseolina* Tassi (Goid) by continuous cultivation of either jute or sesame for several years without any application of fungicide. The seeds were sown in middle of March and flowering initiation took place during the first week of May, when the disease started appearing and continued till harvest with varying degree of severity. The temperature during post-flowering stage varied from 35°C to 39°C. It was coupled with frequent rain and high humidity which were very conducive for infection and disease spread to epidemic level. The intensity of infection was scored on 0–5 scale. All plants in each treatment were scored and the scores were analysed for combining ability of resistance to this disease following Method 2 Model 1 of Griffing [6]. The analysis of variance was done on plot basis.

RESULTS AND DISCUSSION

The initial test of significance showed that mean indices of resistance of 45 treatments were significantly different. Mean scores of resistance (Table 2) showed that the hybrids H.T.-1 x B-9, Khasla x B-14, H.T.-1 x S-38, S-38 x S-12, H.T.-1 x S-27, Vinayak x B-9, B-9 x B-14, HT-1 x B-14, S-18 x B-14, B-9 x S-12, Khasla x Vinayak, Vinayak x B-14, and S- 38 x Vinayak were more resistant to charcoal rot than others.

The analysis of variance for combining ability is presented in Table 1. Although mean sum of squares for general combining ability (gca) was significant when tested against error mean square, it was insignificant when tested against that of specific combining ability (sca) according to the random model used. The gca effects revealed that only one parent (S-18) had significant resistance and another (H.T.-1) had significant susceptible reaction against charcoal rot.

Table 1. ANOVA of combining ability for resistance to charcoal rot

Source	d.f.	S.S.	M.S.	F
Gca	8	4.27	0.533	2.62*
Sca	36	15.22	0.422**	2.07**
Error	44	9.17	0.203	

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

Additive variance = 0.020. Dominance variance = 0.219.

$$\sigma^2_D/\sigma^2_A = \frac{0.219}{0.020} = 10.95$$

The mean square for sca was highly significant. Hence, it may be inferred that sca or generally the dominance component played an important role in controlling resistance to charcoal rot.

Among the crosses, Khasla x B-14, S-38 x S-12, S-18 x B-14, H.T.-1 x B-9, H.T.-1 x S-38, and Khasla x Vinayak exhibited significant sca effects for resistance in descending order of magnitude. The crosses, H.T.-1 x S-27, H.T.-1 x B-14, Vinayak x B-9, B-9 x S-12, B-9 x B-14, Vinayak x B-14 and S-38 x Vinayak though exhibited resistance reaction at phenotypic level, their sca values were nonsignificant.

A number of crosses exhibited highly susceptible reaction towards this disease. However, there is a good agreement between phenotypic expression of disease resistance and sca effect of some of the crosses.

Table 2. Mean disease indices of parents (in bold) and their hybrids (upper diagonal), sca effects (lower diagonal), and gca effects for charcoal rot in sesame

Parents	H.T.-1	S-27	S-38	Khasla	Vinayak	B-9	S-12	S-18	B-14	Gca
H.T.-1	**1.25**	0.75	0.50	1.50	2.00	0.35	1.80	1.30	1.25	–0.285**
S-27	0.50	**0.95**	1.75	1.65	1.65	1.75	2.25	2.40	2.25	0.015
S-38	–0.78**	0.10	**1.35**	3.00	1.25	2.25	0.50	2.50	2.25	0.046
Khasla	0.08	–0.16	1.15**	**2.20**	1.00	2.05	1.85	2.30	0.40	0.178
Vinayak	0.85**	0.10	–0.35	–0.73**	**1.70**	0.75	1.75	2.65	1.00	–0.067
B-9	–0.78**	0.23	0.70	0.36	–0.69	**1.70**	0.95	2.55	0.90	–0.113
S-12	0.57	0.61	–1.16**	0.05	0.20	–0.56	**1.90**	1.75	1.50	–0.004
S-18	–0.36	0.35	0.41	0.10	0.70	0.62	–0.29	**2.25**	0.90	0.424**
B-14	0.11	0.71	0.68	–1.30**	–0.44	–0.51	–0.02	–1.05**	**2.35**	–0.094

S.E. (gi) = 0.128, S.E. (si) = 0.365. **Significant at 1% level.

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