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COMBINING ABILITY AND HETEROSIS FOR POD BORER DAMAGE IN SESAME

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ABSTRACT

An investigation was carried out with three sesame genotypes resistant to pod borer (*Antigastra catalaunalis* Dup.). The genotypes were crossed with ruling varieties to evaluate their combining ability and heterosis performance for the pod borer resistance. The parents Si 3315/11 and Co 1 could be utilised as donors in the hybridisation programme to infuse pod borer resistance. The immense valuable heterotic Si 3315/11 x Co 1 hybrid could be exploited in heterosis breeding programme to get desirable segregants with pod borer resistance since it registered high *per se* performance. SCA effect, high heterosis and involved parents of good combiners.

KEY WORDS: Sesame, Combining ability, Heterosis, Resistance, Pod borer

Sesame (*Sesamum indicum* L.) is attacked by many insect pests at various stages of its growth. Of these, shoot webber and pod borer (*Antigastra catalaunalis* Dup.), gall fly (*Asphondylia sesami*), sphingid moth (*Acherontia styx*) and hairy caterpillars (*Diacrisia obliqua* and *Amsacta morei*) are the most serious pests throughout India (Harvir Singh, 1985). Among these pests, shoot webber and pod borer were observed to cause 10-70 per cent damage of pods and 27-40 per cent yield loss (Singh, *et al.*, 1985). Use of plant protection measures by the farmers for the control of shoot webber and pod borer is very meagre, since the crop is predominantly raised as a rainfed crop. Hence, it is necessary to identify resistant/tolerant varieties or hybrids with appreciable yield. Identification of high yielding variety/hybrid with resistance/tolerance to insect pest in sesame will also improve the quality of oil. Hence, an attempt was made with seven sesame parents to study the nature of gene action involved in showing resistance to pod borer.

MATERIALS AND METHODS

The experimental materials comprised of three pod borer resistant lines *viz.*, Si 250, ES 22 and Si 3315/11 and four testers *viz.*, TMV 3, TMV 4, Co 1 and SVPR 1. Seven parents were raised during kharif 1994 and produced 12 hybrids after mating in a Line x Tester system. Seven parents and 12 hybrids were raised in randomised block design with three replications during Rabi 1994-95 to study the combining ability effects and heterosis for pod borer damage. Each genotypes was raised in five rows of three metre length per replication by adopting the recommended spacing of 30 x 30 cm. In each genotype, 10 plants were selected at random for recording observation on pest infestation. Since the pod borer larvae feed the internal content of the capsule, damaged capsules

Table 1. Phenotypic mean performance and general combining ability effects (GCA) of parents for pod borer damage

Parents	Mean	GCA
Si 250	7.94**	2.20**
Es 22	11.79*	-0.40
Si. 3315/11	9.00*	-1.81*
TMV 3	25.41	-0.76
TMV 4	25.78	2.46**
Co 1	23.82	-3.30**
SVPR 1	29.77	1.60

Grand mean = 15.03

S.E. = 3.23

S.E. (gi) lines = 0.75

S.E. (gi) testers = 0.87

* Significant at P = 5%

** Significant at P = 1%

to the total number of capsules were recorded on 60 DAS. The combining ability analysis was carried out according to the method of Kempthrone (1957). The test of significance was carried out for the estimates of heterosis by adopting 't' test as per the formulae suggested by Wynee *et al.* (1970).

RESULTS AND DISCUSSION

Analysis of variance for pod borer damage indicated significant genotypic differences. The combining ability variances due to lines, testers and line x tester interactions were highly significant for the trait. For developing resistant varieties/ hybrids by hybridisation through whatever breeding method, the common basic idea is the choice of parents. For choosing the parents, the phenotypic mean performance is taken as the criterian by breeders from time immemorial. The mean phenotypic performance of parents and their combining ability effects for pod borer damage are presented in Table 1. It is evident that the favourable traits for breeding pod borer resistance in sesame were observed in three lines *viz.*, Si 250, Es 22 and Si 3315/11. But none of the testers showed superior mean performance. Since, combining ability is a useful biometric tool to plant breeders, the general combining ability effects of seven parents were also studied. The study revealed that only two parents *viz.*, Si 3315/11 and

Table 2. Phenotypic mean performance, specific combining ability effects (SCA) and heterosis for pod borer damage.

Hybrids	Mean	SCA	GCA/SCA ratio	Estimates of heterosis		
				d_i	d_{ii}	d_{iii}
Si 250 x TMV 3	16.44	1.41	1:21.69	-1.44	107.05**	-30.98**
Si 250 x TMV 4	29.14	10.09**		72.84**	267.00**	22.33*
Si 250 x Co 1	11.72**	-2.58		-26.20	47.61	-50.80**
Si 250 x SVPR1	14.56	-0.07		-22.80*	83.38**	-38.87**
Es. 22 x TMV 3	15.35	0.38		17.47	30.20	-35.56**
Es. 22 x TMV 4	15.42	0.63		-17.94	30.79	-35.26**
Es. 22 x Co 1	11.37**	-2.86		-36.16**	-3.56	-52.27**
Es. 22 x SVPR 1	14.91	0.25		-28.25**	26.46	-37.41**
Si 3315/11 x TMV 3	10.06**	-4.07*		-41.55**	11.78	-57.77**
Si 3315/11 x TMV 4	10.96**	-3.34*		-36.98**	21.78	-53.99**
Si 3315/11 x Co 1	9.66**	-4.47**		-41.13**	7.33	-59.45**
Si 3315/11 x SVPR 1	20.75	4.63**		7.01	130.56**	-12.89

S.E. (Sij) hybrids = 1.50

Standard check : Co 1

* Significant at P = 5%

** Significant at P = 1%

Co 1 were found to be good combiners for pod borer resistance since they recorded statistically significant negative GCA effects. They could be utilised as donors in the hybridisation programme for infusing pod borer resistance.

Phenotypic mean performance, SCA effects and estimates of heterosis of hybrids for pod borer damage was presented in Table 2. Among 12 hybrids evaluated, only five hybrids *viz.*, Si 250 x Co 1, Es 22 x Co 1, Si 3315/11 x TMV 3, Si 3315/11 x TMV 4 and Si 3315/11 x Co 1 recorded statistically low incidence of pod borer. Significant negative SCA effects and favourable standard heterosis values were recorded only in three hybrids *viz* Si 3315/11 x TMV 3 and Si 3315/11 x TMV 4 and Si 3315/11 x Co 1. Among the three hybrids, the hybrid Si 3315/11 x Co 1 could be of immense value to plant breeders since it registered high *per se* performance, *SCA* effect besides heterosis and the hybrid derived from parents of good combiners. Since the inheritance is predominantly a non-additive type of gene action, the hybrid vigour for pod borer damage could be exploited through heterosis breeding. It is evidenced by the high magnitude of SCA variance when compared to GCA variance. But, the parents involved in other two hybrids *viz.* Si 3315/11 x TMV 3 and Si 3315/11 x TMV 4 were either with one good and one poor combiner. In the hybrids, the role of non additive gene action might be high. For harnessing the non-additive gene action, cyclic method of breeding involving selected recombinants and intercrossing would be desirable for obtaining pod borer resistant sesame varieties.

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INTER RELATIONSHIP AND PATH ANALYSIS OF CERTAIN COOKING QUALITY CHARACTERS IN HETEROGENOUS POPULATIONS OF RICE (*Oryza sativa L.*)

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ABSTRACT

The grain yield showed no correlation with most of the quality characters. Kernel length had a significant positive correlation with kernel L/B ratio in both corsses and both generations. LER and BER had relationship with EI in positive and negative direction respectively. Path analysis also indicated that LER and BER are prime grain quality characters for improvement of genotypes.

KEY WORDS: Rice, Quality Characters, BER, LER, EI, Correlation

Cooking quality is an important character that determines consumer preference. Consumer prefernce of rice is dependent on physical dimension of polished kernels, wholeness, transluscency etc. Moreover, high volume expansion and length-wise expansion of kernel during cooking are more desirable traits of good quality rice like Basmati rice. Hence an attempt was