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Screening of sesame genotypes/cultivars against major insect pests

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Abstract
The investigations on the screening of sesame genotypes/cultivars against major insect pests was carried out at the College farm, College of Agriculture, N.A.U., Bharuch during 2020-21. Out of 10 genotypes/cultivars of sesame screened for their relative resistance against major insect pests, the genotype/cultivar GTil 6 and GTil 10 were found resistant against jassid, *Orosius albicinctus* Distant and whitefly, *Bemisia tabaci Gennadius*. Cultivar GTil 10 were found resistant against leaf webber, *Antigastra catalaunalis* Duponchel and *Bemisia tabaci* while, AT 413 and G Til 4 were found moderately resistant against *Orosius albicinctus* and *Bemisia tabaci*. Genotypes AT 413 and AT 437 were found moderately resistant against *Antigastra catalaunalis*. Significant maximum yield was recorded in cultivars G Til 10 (488.30 kg/ha) whereas, minimum yield was observed from genotype AT 409 (151.07 kg/ha).

Keywords: sesame, genotype/cultivars, *Orosius albicinctus*, *Bemisia tabaci*, *Antigastra catalaunalis*, resistant

Introduction
Sesame is cultivated for its seeds which contain 48 to 55 per cent oil of very high quality and 25 to 28 per cent protein. In India, seed is eaten fried or mixed with sugar. The oil is used for cooking and medicinal purpose. The protein is highly digestible with amino acid composition almost identical to that of meat [1]. The productivity of sesame is very low as compared to other oilseeds hence, it is necessary to raise the productivity and there by total oilseeds production in order to meet edible oil requirement of the country. Sesame has played a major role in the rich and diverse health and cosmetic traditions of India. Sesame is highly nutritive (oil 50% and protein 25%) and its oil is an excellent vegetable oil because of its high contents of antioxidants such as sesamin, sesamol and sesamolin and its fatty acid composition [9]. Several insect pests have been reported to infest the sesame crop causing about 25-30% yield losses [6]. The crop is attacked by more than 38 species of insect pest of various stages of growth [7]. Among these sesame leaf webber and capsule borer (*Antigastra catalaunalis* Duponchel), gall fly (*Asphondylia sesame* Felt), sphinx moth (*Acherontia styx* Westwood), Bihar hairy caterpillar (*Spilarctia oblique* Walker), sesame blossom midge (*Dasineura sesame* Gennadius) leaf hopper (*Orosius albicinctus* Distant) and white fly (*Bemisia tabaci* Gennadius) are the most important pests throughout India [2].

Materials and Methods
The experiment was carried out during semi *rabi*-2020-21 at the College farm, College of Agriculture, Navsari Agricultural University Bharuch (Gujarat) for the screening different genotypes/varieties of sesame for their susceptibility/resistant against major insect pest of sesame. Ten varieties/genotypes viz., AT 409, AT 413, AT 437, AT 482, AT 496, AT 497, G Til- 3, G Til- 10, G Til- 6 were sown in a plot size 1.8 m × 4.0 m with a spacing 45 cm × 10 cm in a Randomized Block Design (RBD) with three replications. Five plants from net plot from each genotypes/cultivar were selected randomly and tagged to recording the observation. The observations were recorded at weekly interval starting from one week after germination till to the harvesting of crop. For recording the population of *O. albicinctus* and *B. tabaci*, three leaves (from top middle and bottom) of each selected plant was observed Number of leaf webber *A. catalaunalis* larval present on selected plants were recorded For recording observation on pod damage leaf webber, total and damage pod were counted at 80 day after sowing, from the five selected plants per replication. The data obtain were converted into percent pod damage.

The grain yields of matured pods were harvested and seed yield was recorded plot wise. Then the plot wise yield obtained was converted into kg ha^{-1}.

Categorization of Genotypes/Cultivars

The sesame genotypes/cultivars were grouped into six categories of resistance to pests *viz*., highly resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible based on the population of pests per plant. For the purpose mean value of individual genotype ($\bar{X}_i$) was compared with mean value of all genotypes ($\bar{X}$) and standard deviation (SD) following the modified scale adopted by Patel *et al*., (2002) [5]. The retransform data were used for computation of $\bar{X}$, $\bar{X}_i$, and SD in case of this parameter (Table 1). The scale used for categorizing different genotypes.

Table 1: Categorization of resistance attributes

Category of resistance	Scale for resistance
Highly Resistant	$\bar{X}_i < (\bar{X} - 2SD)$
Resistant	$\bar{X}_i > (\bar{X} - 2SD) < (\bar{X} - SD)$
Moderately Resistant	$\bar{X}_i > (\bar{X} - SD) < \bar{X}$
Moderately Susceptible	$\bar{X}_i > \bar{X} < (\bar{X} + SD)$
Susceptible	$\bar{X}_i > (\bar{X} + SD) < (\bar{X} + 2SD)$
Highly Susceptible	$\bar{X}_i > (\bar{X} + 2SD)$

Results and Discussion

Among different ten genotypes/cultivar, significant minimum population of jassids , *O. albicinctus* was noticed on the genotype G Til 10 (1.78 jassids/3 leaves), while maximum population was noticed on AT 409 (4.17jassids/3 leaves) and it was at par with AT 482, AT 496 and AT 497 registered 3.98, 3.78 and 3.67 jassids/3 leaves, respectively. Significant minimum population of whitefly was noticed on the genotype G Til 10 (2.81 whitefly/3 leaves) and it was remained at par with G Til 6 (3.36 whitefly/3 leaves). The maximum population was noticed on AT 409 (5.92 whitefly/3 leaves). Significant minimum larval population of *A. catalaunalis* was noticed on the genotype G Til 10 (1.59 larvae/plant) while, maximum population was noticed on AT 409 (4.70 larvae/plant) followed by AT 482 (3.67 larvae/plant), AT 496 (3.30 larvae/plant), AT497 (2.97 larvae/plant) and G Til 3(2.68 larvae/plant). The significant lowest pod damage in variety G Til 10 (6.90%) and it was at par with genotype AT 413 (8.75%), G Til 6 (8.84%), G Til 4 (10.84%) and G Til 3 (11.63%).

Table 2: Varietal screening of sesame against major insect pests

Sr. No	Genotypes/ Cultivars	Mean no. of insect pest (Pooled over periods)			Per cent pod damage by *A. catalaunalis*	Yield (Kg/ha)
		Jassid per 3 leaves	Whitefly per 3 leaves	*A. catalaunalis* per plant		
1	AT 409	2.04(4.17)	2.43(5.92)	2.02(4.07)	27.16(20.84)	151.07
2	AT 413	1.59(2.52)	2.09(4.38)	1.39(1.93)	17.20(8.75)	308.97
3	AT 437	1.79(3.20)	2.16(4.67)	1.59(2.53)	19.88(11.57)	273.88
4	AT 482	1.99(3.98)	2.36(5.57)	1.91(3.67)	24.88(17.70)	181.29
5	AT 496	1.94(3.78)	2.34(5.48)	1.82(3.30)	24.49(17.19)	200.78
6	AT 497	1.92(3.67)	2.32(5.40)	1.72(2.97)	22.61(14.78)	231.97
7	G Til 3	1.87(3.49)	2.25(5.07)	1.64(2.68)	19.94(11.63)	251.46
8	G Til 4	1.70(2.90)	1.94(3.78)	1.52(2.31)	19.23(10.84)	290.45
9	G Til 6	1.52(2.30)	1.83(3.36)	1.39(1.92)	17.29(8.84)	297.27
10	G Til 10	1.33(1.78)	1.68(2.81)	1.26(1.59)	15.23(6.90)	488.30
Mean		3.18	4.64	2.70	12.90	-
S.E.m ±		0.06	0.05	0.033	1.61	24.03
S.E.m ± (P×T)		0.07	0.07	0.073	-	-
C.D at 5 %		0.17	0.15	0.09	4.77	71.39
C.D at 5 % (P×T)		0.19	0.20	NS	-	-
C.V %		10.10	8.39	11.09	13.37	15.55

Figure in parentheses are retransform value whereas, those outside are √x + 0.5 transformed values.

Table 3: Categorization of different genotypes/cultivars of sesame for their susceptibility to major insect pests

Category of resistance	Scale	Varieties
Population of jassid/ 3 leaves $\bar{X}$= 3.18 SD = 0.0.79		
Highly Resistant (HR)	$\bar{X}_i < 1.61$	-
Resistant (R)	$1.61 < \bar{X}_i < 2.39$	G Til 6(2.30)
		G Til 10(1.78)
Moderately Resistant (MR)	$2.39 < \bar{X}_i < 3.18$	AT 413(2.52)
		G Til 4(2.90
Moderately Susceptible (MS)	$3.18 < \bar{X}_i < 3.97$	AT 437(3.20)
		AT 496(3.78)
		AT 497(3.67)
		G Til 3(3.49)
Susceptible (S)	$3.97 < \bar{X}_i < 4.75$	AT 482(3.98)
		AT 409(4.17)

Highly Susceptible (HS)	$\bar{X}_i > 4.75$	-
Population of whitefly/3 leaves X= 4.64 SD = 1.04		
Highly Resistant (HR)	$\bar{X}_i < 2.56$	-
Resistant (R)	$2.56 < \bar{X}_i < 3.60$	G Til 6(3.36)
		G Til 10(2.81)
Moderately Resistant (MR)	$3.60 < \bar{X}_i < 4.64$	G Til 4(3.78)
		AT 413(4.38)
Moderately Susceptible (MS)	$4.64 < \bar{X}_i < 5.69$	AT 437(4.67)
		AT 482(5.57)
		AT 496(5.48)
		AT 497(5.40)
		G Til 3(5.07)
Susceptible (S)	$5.69 < \bar{X}_i < 6.73$	AT 409
Population of *A. catalaunali*/ plant $\bar{X}$ = 2.70 SD = 0.81		
Highly Resistant (HR)	$\bar{X}_i < 1.08$	-
Resistant (R)	$1.08 < \bar{X}_i < 1.89$	G Til 10(1.59)
Moderately Resistant (MR)	$1.89 < \bar{X}_i < 2.70$	AT 413(1.93)
		AT 437(2.53)
		G Til 3(2.68)
		G Til 4(2.31)
		G Til 6(1.92)
		AT 437(2.53)
		G Til 3(2.68)
		G Til 4(2.31)
		G Til 6(1.92)
Moderately Susceptible (MS)	$2.70 < \bar{X}_i < 3.50$	AT 496(3.30)
		AT 497(2.97)
Susceptible (S)	$3.50 < \bar{X}_i < 4.31$	AT 409(4.07)
		AT 482(3.67)
Highly Susceptible (HS)	$\bar{X}_i > 4.31$	-

Notes: $\bar{X}$ = Mean value of all varieties, X_i = Mean value of individual varieties, SD = Standard Deviation

Categorization of Genotypes/Cultivars for Susceptibility

The genotype G Til 6 and G Til 10 were founded resistant as it was recorded less than 2.39 jassid per 3 leaves, whereas, AT 413 and G Til 4 moderately resistant with population in between 2.39 to 3.18 jassids per 3 leaves (Table 3).The genotype/cultivar, AT 482 and AT 409 showed population in between 3.97 to 4.75 jassid per 3 leaves, so considered as susceptible. Cultivars G Til 6 and G Til 10 found resistant as they recorded less than 3.60 whitefly population per 3 leaves. Where G Til 4 and AT 413 was moderately resistant with population in between 3.60 to 4.64 whitefly per 3 leaves. Genotype AT 409 had more than 4.64 whitefly per 3 leaves, so considered as susceptible. Cultivar G Til 10 found as a resistant against leaf webber as they recorded less the 1.89 larvae population where, AT 413, AT 437, G Til 3, G Til 4 and G Til 6 was moderately resistant with population in between 1.89 to 2.70 larvae per plant. Genotype, AT 409 and AT 482 had more than 3.50 larvae per plant, so considered as susceptible. Significant lowest pod damage in variety G Til 10 (6.90%) and it was at par with genotype AT 413 (8.75%), G Til 6 (8.84%), G Til 4 (10.84%) and G Til 3 (11.63%). Maximum percent pod damage was observed in genotype AT 409 (20.16%) and it was at par with AT 482 (17.70%), AT 496 (17.19%) and AT 497 (14.78%). Significant maximum yield was recorded genotype/cultivars G Til 10 (488.30 kg ha^{-1}) whereas, minimum yield was observed from genotype/cultivar AT 409 (151.07 kg ha^{-1}).

Earlier Singh (2002) [8] revealed that the genotypes ES-22, SI-250, IS-23-1, KIS-305 and ES-12 were found resistant to this *Antigastra catalaunalis* Dup. Choudhary *et al*. (2018) [3]. revealed that out of 15 varieties of sesame screened against *A. catalaunalis* the varieties, RT-358 (4.63), RT-370 (4.38) and RT-371 (4.18) were ranked as least susceptible, while LT-8(7.93), TC-25 (6.78) and RT-46 (7.88) as highly susceptible. According to Pandey *et al*. (2020) [4]f genotype SI-250 exhibited resistant reaction, RT-46, ITS-8, Hima, RT-54, N-32 and HTC-113 were observed to be moderately resistant against of *A. catalaunalis*

Conclusion

Out of 10 genotypes/cultivars G Til 4, G Til 6, G Til 10, AT 413 and AT 437 recorded significant lowest incidence of jassid, whitefly and leaf webber and also recorded highest yield. So these, genotypes/cultivars can be utilized for the further breeding programme.

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