Screening of sesame genotypes against major insect-pests

ABSTRACT

An investigation was carried out at research farm, college of agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior to evaluate sesame genotypes for susceptible/resistance to major insect pests. Out of ten sesame genotypes, TKG-501 and SCS-551 showed lowest plant damage, flower damage and capsule damage against sucking insect pests namely; white fly (*Bemisia tabaci* Genn.), jassid (*Amrasca devastans* Ishida) and til hawk moth (*Acherontia styx* Westwood) while, the highest per cent of infestation showed in TKG-55. For leaf roller and capsule borer (*Anigastra catalaunalis*), TKG-501 and TKG-518 genotypes showed lowest infestation; whereas JTS-8 and SCS-551 showed highest plant damage, flower damage and capsule damage respectively. TKG-501, TKG-518 and TKG-55 showed lowest plant damage, flower damage (%) and capsule damage against gall fly (*Asphondylia sesame* Felt) and mirid bug (*Nesidiocoris* sp.) while, the highest per cent of infestation showed in JTS-8 and TKG-308 genotypes.

Key words: - sesame, plant damage (%), flower damage (%), capsule damage (%), host plant 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 purposes. The protein is highly digestible with amino acid composition almost identical to that of meat [Ahmed et al., 2004]. The productivity of sesame is very low as compared to other oilseeds hence, it is necessary to raise the productivity and thereby total oilseeds production in order to meet edible oil requirements of the country. Sesame has played a major role in the rich and diverse health and cosmetic traditions of India because of its high nutritive oil (50%) and protein (25%) respectively. Its oil is an excellent vegetable oil because of its high antioxidants contents such as sesamin, sesamol and sesamolin and its fatty acid composition [Suja et al., 2004]. Several insect pests have been reported to infest the sesame crop causing about 25-30% yield losses [Rai et al., 1976]. This crop is attacked by more than 38 species of insect pest at various stages of its growth [Singh et al., 1989]. Among these; sesame leaf webber, 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 found throughout India [Chaudhary et al., 1987].

Sesame crop is ravaged by 29 insect pests which belong to defoliators, borers and sucking pest complex that causes dwindling effects on its yield. Among them, leaf webber and capsule borer, (Crambidae: Lepidoptera) attacking the crop right from seedling stage till maturity of capsule [Mishra et al., 2016]. The pest infestation is high at capsule formation stage which in turn causes seed yield loss up to 90% [Ahuja et al., 2002]. In order to subdue the intensity of these damages, farmers primarily rely on synthetic insecticides which had led to several problems viz., destruction of natural enemies, development of resistance in different pests, insecticide residues, resurgence of major insect pests and environmental disharmony. Development of the resistant cultivars is one of the eco-friendly approach to mitigate the yield loss caused by these pests. Keeping in this view, the present investigation was undertaken to evaluate the sesame germplasm lines for their relative resistance against *A. catalaunalis*. The resistant lines would be exploited as donors in hybridization programme to develop resistant cultivars.

Material and Methods

This experiment was carried out during kharif 2018-19 at the research farm, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior for the evaluation of different genotypes of sesame for their susceptibility/resistant against major insect pests of sesame. Ten genotypes viz., TKG-501, TKG-518, TKG-506, TKG-529, TKG-306, TKG-22, TKG-308, TKG-55, JTS-8 and SCS-551 were sown in a plot of size 2.4 m × 3.0 m with a spacing 30 cm × 10 cm in a Randomized Block Design (RBD) with three replications. Ten plants from net plot from each genotypes/cultivar were selected randomly and tagged to recording the observation. Genotypes were evaluated on the basis of damage at vegetative, flowering and capsule formation stages and seed yield were recorded, with the assessment of different genotypes of sesame on the basis of damage. In each replication, the observation on percentage plant, flower and capsule damages by major insect pests were recorded at different stages of plant growths *viz*., vegetative (30 DAS), flowering (45 DAS) and Capsule maturity stage (70 DAS). The healthy and damaged plant, flower and capsules were counted and finally percentage plant, flower and capsule damage were calculated as using:

$$\text{Plant damage (\%)} = \frac{\text{Number of damaged plants}}{\text{Total number of plants}} \times 100$$

$$\text{Flower damage (\%)} = \frac{\text{Number of damaged flower}}{\text{Total number of flower}} \times 100$$

$$\text{Capsule damage (\%)} = \frac{\text{Number of damaged capsule}}{\text{Total number of capsule}} \times 100$$

The resistance/susceptibility for individual line was judged on the basis of percentage plant, flower and capsule damage. A rating system for percent plant, flower and capsule damage developed by sesame was followed for estimating relative resistance/susceptibility.

Result and Discussion

i) Percent plant damage

The significant differences among the genotypes in the recorded percentage plant damage were observed. The sesame genotypes were grouped into different categories based on their percent plant damage. None of the screened genotypes were found free from infestation. The plant damage by white fly ranged from 9.32 to 55.42% while, only one genotype TKG-501 was found that shows resistant to plant damage less than 10 percent. The moderately resistant category includes 4 genotypes showing whitefly damage in the range of 10-20 percent *viz*., TKG-518, TKG-506, TKG-306 and SCS-551 respectively. Three genotypes TKG-529, TKG-22 and TKG-308 were found moderately susceptible and showing plant damage in the range of 21-30 percent while, one genotype *namel;* TKG-55 was observed as susceptible to infestation in the range of 31-50 percent. The only one genotype *i.e.* JTS-8 was found as highly susceptible category with more than 50 percent plant damage. Our results are in conformity with the results of Kumar *et al.*, (2009); Karuppaiah and Nadarajan, (2011) and Choudhary *et al.*, (2017).

The plant damage by jassid ranged from 8.53 to 54.08% while, two genotypes TKG-501 and SCS-551 was found resistant to plant damage of less than 10 percent. The moderately resistant category includes 5 genotypes showing jassids damage in the range of 10-20 percent *viz*., TKG-518, TKG-506, TKG-529, TKG-306 and TKG-22. One genotype JTS-8 was found moderately susceptible and shows plant damage in the range of 21-30 percent. One genotype *i.e.* TKG-308 was observed as susceptible that shows infestation in the range of 31-50 percent. The only one genotype *i.e.* TKG-55 was found as highly susceptible category with more than 50 percent plant damage.

The plant damage by leaf roller/capsule borer was ranges from 9.56 to 54.43% but two genotypes TKG-501 and TKG-518 were found resistant to plant damage less than 10 percent. The moderately resistant category includes 4 genotypes showing leaf roller/capsule borer damage in the range of 10-20 percent *viz.*, TKG-506, TKG-529, TKG-306 and TKG-308. Two genotypes TKG-22 and TKG-55 were found moderately susceptible and show plant damage in the range of 21-30 percent and only one genotype *i.e*. SCS-551 was observed to be susceptible that indicate infestation in the range of 31-50 percent. The only one genotype *i.e*. JTS-8 was found to be in highly susceptible category with more than 50 percent plant damage. Our results are in conformity with those of Karuppaiah and Nadarajan, (2011) and Choudhary *et al.*, (2017).

The plant damage by Til hawk moth ranged from 5.52 to 52.43% while three genotypes TKG-501, TKG-506 and SCS-551 was found resistant to plant damage less than 10 percent. The moderately resistant category includes 3 genotypes with Til hawk moth damage in the range of 10-20 percent *viz.*, TKG-518, TKG-529 and TKG-22. Two genotypes TKG-306 and TKG-308 respectively were also found to be moderately susceptible to plant damage in the range of 21-30 percent and only one genotype *i.e*. TKG-55 was observed susceptible to infestation in the range of 31-50 percent. Genotype JTS-8 was however, found in highly susceptible category with more than 50 percent plant damage. Our results here are also in conformity with the results of Kumar *et al.*, (2009).

Those plants damaged by mirid were also found in the range of 6.68 to 55.27%. Three genotypes TKG-501, TGK-518 and TKG-55 was found resistant to plant damage less than 10 percent. The moderately resistant category includes 2 genotypes showing mirid bug damage in the range of 10-20 percent that is; TKG-506 and TKG-22. Only one genotype TKG-529 were found moderately susceptible to plant damage in the range of 21-30 percent and the three genotypes *i.e*. TKG-306, TKG-308 and SCS-551 was observed susceptible to infestation in the range of 31-50 percent. Genotype JTS-8 was the only one found in highly susceptible category with more than 50 percent plant damage.

ii) Percent flower damage

The significant differences among the genotypes recorded in the percent flower damage were also observed. The sesame genotypes were grouped into different categories based on their respective percenage flower damage. None of the screened genotypes were found free from infestation. The flower damaged by white fly range from 8.78 to 45.47% with only one genotype SCS-551 found resistant that shows flower damage less than 10 percent. The moderately resistant category includes 4 genotypes that shows whitefly damage in the range of 10-20 percent *i.e.*, TKG-501, TKG-518, TKG-506 and TKG-306. One genotype TKG-529 was found moderately susceptible and showing flower damage in the range of 21-30 percent with these four genotypes; TKG-22, TKG-308, TKG-55 and JTS-8 observed to be susceptible that indicates infestation in the range of 31-50 percent. Present findings are supported by the findings of Balaji and Selvanarayanan, (2016).

The flowers damaged by jassid was in the range of 9.47 to 46.50% and only one genotype TKG-501 was found resistant to flower damage less than 10 percent. The moderately resistant category includes 4 genotypes showing jassids damage in the range of 10-20 percent *i.e.*, TKG-518, TKG-506, TKG-22 and JTS-8. Three other genotypes TKG-529, TKG-306 and SCS-551 was found moderately susceptible to flower damage in the range of 21-30 percent and two genotypes *i.e.* TKG-308 and TKG-55 were observed susceptible to infestation in the range of 31-50 percent.

The flowers damaged by leaf roller and capsule borer were found to be in the range from 9.63 to 45.43%. Only genotype TKG-501 was found resistant to flower damage less than 10 percent while the moderately resistant category includes 4 genotypes showing leaf roller/capsule borer damage in the range of 10-20 percent *i.e*., TKG-518, TKG-506, TKG-529 and TKG-306. Two other genotypes TKG-22 and TKG-308 was found moderately susceptible to flower damage in the range of 21-30 percent and three genotypes *i.e.* TKG-55, JTS-8 and SCS-551 were observed to be susceptible to infestation in the range of 31-50 percent. Present findings are supported by the findings of Balaji and Selvanarayanan, (2016) and Shrivastava *et al.,* (2002).

The flower damaged by til hawk moth ranged from 8.77 to 47.32%. Only one genotype SCS-551 was found resistant that shows flower damage less than 10 percent. The moderately resistant category includes 3 genotypes showing til hawk moth damage in the range of 10-20 percent *i.e.*, TKG-501, TKG-506 and TKG-22. Genotypes TKG-518, TKG-529, TKG-22 and TKG-308 was found moderately susceptible and showing flower damage in the range of 21-30 percent and two genotypes *i.e.* TKG-55 and JTS-8 were observed as susceptible and show infestation in the range of 31-50 percent. Present findings are supported by the findings of Kumar *et al.,* (2009).

The flowers damaged by gall fly were in the range of 17.15 to 48.45% while the moderately resistant category includes 3 genotypes showing gall fly damage in the range of 10-20 percent *i.e.*, TKG-501, TKG-518 and TKG-308. Three genotypes TKG-506, TKG-529 and TKG-306 was found moderately susceptible that show flower damage in the range of 21-30 percent and four genotypes *i.e.* TKG-22, TKG-55 JTS-8 and SCS-551 were observed as susceptible and shows infestation in the range of 31-50 percent. Present findings are supported by the findings of Kumar *et al.* (2009).

The flower damage by mirid bug was ranged from 11.48 to 42.10%. The moderately resistant category includes 5 genotypes showing mirid bug damage in the range of 10-20 percent *i.e.*, TKG-501, TKG-518, TKG-506, TKG-22 and TKG-55. Two genotypes TKG-529 and TKG-308 was found moderately susceptible and showing flower damage in the range of 21-30 percent and three genotypes *i.e*. TKG-306, JTS-8 and SCS-551 were observed as susceptible showing infestation in the range of 31-50 percent.

iii) Percent capsule damage

The significant differences among the genotypes recorded percent capsule damage were observed. The sesame genotypes here were also grouped into different categories based on the percentage capsule damaged. None of the screened genotypes were found free from infestation. The capsule damaged by white fly was ranged from 8.55 to 32.15%. Two genotypes *viz.*, TKG-501 and SCS-551 was found moderately resistant and shows whitefly damage in the range of 5 to 10 percent. The moderately susceptible category includes 2 genotypes showing whitefly damage in the range of 11-15 percent *i.e*., TKG-518 and TKG-306. Three more genotypes; TKG-506, TKG-529 and TKG-22 was found susceptible and indicated capsule damage in the range of 16-25 percent and the three genotypes *i.e.* TKG-308, TKG-55 and JTS-8 was found in the highly susceptible category with more than 25 percent capsule damage. Present findings are supported by the findings of Karuppaiah *et al.,* (2009).

The capsule damaged by jassid was ranged from 5.24 to 33.12% while, four genotypes *viz.*, TKG-501, TKG-518, TKG-22 and SCS-551 was found moderately resistant and revealed jassids damage in the range 5 to 10 percent.

The moderately susceptible category includes TKG-506 genotype showing jassids damage in the range of 11-15 percent. Three genotypes, namely; TKG-529, TKG-306 and JTS-8 was found susceptible and show capsule damage in the range of 16-25 percent and genotypes TKG-308 and TKG-55 was found as highly susceptible category with more than 25 percent capsule damage.

The capsule damage by leaf roller/capsule borer was ranged from 8.24 to 29.21% while genotypes; TKG-501, TKG-518 and JTS-8 was found moderately resistant showing leaf roller/capsule borer damage in the range 5 to 10 percent. The moderately susceptible category includes 2 genotypes showing leaf roller/capsule borer damage in the range of 11-15 percent *i.e.*, TKG-506 and TKG-529. Four genotypes; TKG-306, TKG-22, TKG-308 and TKG-55 was found susceptible and showing capsule damage in the range of 16-25 percent and the genotype SCS-551 was found as highly susceptible category with more than 25 percent capsule damage. Present findings are supported by the findings of Karuppaiah *et al.*, (2009) and Earlier Murli Baskaran *et al.*, (1990).

The capsule damage by til hawk moth was ranged from 7.31 to 33.15%. Two genotypes *viz.*, TKG-501 and SCS-551 was found moderately resistant showing til hawk moth damage in the range 5 to 10 percent. The moderately susceptible category includes one genotypes showing til hawk moth damage in the range of 11-15 percent *i.e.*, TKG-506. Five genotypes TKG-518, TKG-529, TKG-306, TKG-22 and TKG-308 was found susceptible and showing capsule damage in the range of 16-25 percent and the two genotypes *i.e*. TKG-55 and JTS-8 was found as highly susceptible category with more than 25 percent capsule damage. Present findings are supported by the findings of Kumar *et al.* (2009).

The capsule damage by gall fly was ranged from 9.94 to 34.15%. Only one genotypes *viz*., TKG-308 was found moderately resistant showing gall fly damage in the range 5 to 10 percent. The moderately susceptible category includes 2 genotypes showing gall fly damage in the range of 11-15 percent *i.e.*, TKG-501 and TKG-518. Five genotypes TKG-506, TKG-529, TKG-306, TKG-22 and TKG-55 was found susceptible and showing capsule damage in the range of 16-25 percent and the two genotype *i.e.* JTS-8 and SCS-551 was found as highly susceptible category with more than 25 percent capsule damage. Present findings are supported by the findings of Kumar *et al.* (2009).

Conclusion

The capsule damage by mirid bug was ranged from 4.29 to 32.43%. Only one genotype TKG-501 was found resistant showing plant damage less than 5 percent. Two genotypes *viz.*, TKG-518 and TKG-55 was found moderately resistant showing mirid bug damage in the range 5 to 10 percent. The moderately susceptible category includes one genotypes showing mirid bug damage in the range of 11-15 percent *i.e*., TKG-506. Three genotypes TKG-529, TKG-306 and TKG-22 was found susceptible and showing capsule damage in the range of 16-25 percent and the three genotypes *i.e.* TKG-308, JTS-8 and SCS-551 was found as highly susceptible category with more than 25 percent capsule damage.

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Table 1: - sesame major insect pests per cent infestation on the basis of plant damage, flower damage and capsule damage

S. No.	Genotypes	White fly infestation			Jassid infestation			leaf roller and capsule borer infestation		
		Plant damage (%)	Flower damage (%)	Capsule damage (%)	Plant damage (%)	Flower damage (%)	Capsule damage (%)	Plant damage (%)	Flower damage (%)	Capsule damage (%)
1	TKG-501	9.32	12.01	8.55	8.53	9.47	5.24	9.56	9.63	8.24
2	TKG-518	13.05	13.35	11.82	10.86	14.77	7.94	9.95	13.54	9.89
3	TKG-506	18.64	12.08	19.38	14.03	12.91	13.38	13.41	18.27	15.58
4	TKG-529	21.65	24.52	18.70	17.49	22.03	17.74	13.51	20.24	12.82
5	TKG-306	12.31	18.92	12.69	19.39	22.39	16.20	16.39	20.63	17.53
6	TKG-22	24.25	32.37	21.27	10.91	11.27	8.89	20.33	23.52	18.58
7	TKG-308	25.52	34.49	27.02	48.49	41.73	26.12	17.12	21.67	17.75
8	TKG-55	48.27	42.19	28.20	54.08	46.50	33.12	25.51	34.49	21.42
9	JTS-8	55.42	45.47	32.15	23.91	13.68	20.13	54.43	45.43	8.34
10	SCS-551	10.94	8.78	10.21	9.18	29.38	7.92	48.27	42.19	29.21
SE(m)±		0.490	0.534	0.695	0.718	0.799	1.100	0.460	0.735	1.040
CD at 5%		1.468	1.602	2.083	2.152	2.396	3.297	1.378	2.203	3.117

Table 2 : Major genotypes for different infestation

S. No.	Genotypes	Til hawk moth infestation			Gall fly infestation		Mirid bug infestation		
		Plant damage (%)	Flower damage (%)	Capsule damage (%)	Flower damage (%)	Capsule damage (%)	Plant damage (%)	Flower damage (%)	Capsule damage (%)
1	TKG-501	8.15	14.75	9.19	17.15	13.17	6.68	11.48	4.29
2	TKG-518	16.81	23.07	18.74	18.17	13.32	9.13	15.64	7.47
3	TKG-506	9.93	15.58	11.21	22.86	21.25	16.38	19.57	11.28
4	TKG-529	16.19	26.92	17.41	27.85	20.55	25.41	27.17	16.57
5	TKG-306	22.51	19.47	20.44	26.81	16.57	33.70	35.76	21.37
6	TKG-22	20.38	22.31	19.97	33.39	18.27	17.65	19.55	23.43
7	TKG-308	24.01	22.86	20.25	18.12	9.94	49.35	26.58	31.14
8	TKG-55	46.15	42.51	28.18	44.48	16.09	7.30	13.43	9.55
9	JTS-8	52.43	47.32	33.15	43.19	25.18	55.27	36.24	32.43
10	SCS-551	5.52	8.77	7.31	48.45	34.15	38.40	42.10	26.67
SE(m)±		0.552	1.028	0.836	0.887	0.662	1.196	1.158	0.794
CD at 5%		1.654	3.081	2.507	2.659	1.984	3.585	3.472	2.381