

Original Research Article

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 pest; white fly (*Bemisia tabaci* Genn.) and jassid (*Amrasca devastans* Shida) and til hawk moth (*Acherontia styx* Westwood), while the highest per cent of infestation showed in TKG-55. For leaf roller and capsule borer (*Anigastracatala unalis*), TKG-501 and TKG-518 genotypes showed lowest infestation; whereas JTS-8 and SCS-551 showed highest plant damage (%), flower damage (%) and capsule damage (%). 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 purpose. 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 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 sesamolins 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]. The crop is attacked by more than 38 species of insect pest of various stages of growth [Singh et al., 1989]. Among these sesame leaf webber and capsule borer (*Antigastracatalaunalis* 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 [Chaudhary et al., 1987].

Sesame crop is ravaged by 29 insect pests which belong to defoliators, borers and sucking pest complex which dwindling the yield. Among them, leaf webber and capsule borer, *Antigastracatalaunalis* (Duponchel) (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 intern causes seed yield loss up to 90% [Ahuja et al., 2002]. In order to subdue the intensity of damage, 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 ecofriendly approach to mitigate the yield loss caused by this pest. 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 donars in hybridization programme to develop resistant cultivars.

Material and Methods

The 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 pest 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 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 stage and seed yield were recorded, assessment of different genotypes of sesame on the basis of damage. In each replication, the observation on percent 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 percent plant, flower and capsule damage were calculated as -

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

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

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

The resistance / susceptibility for individual line were judged on the basis of percent 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

- **Percent plant damage**

The significant differences among the genotypes in recording percent plant damage were observed. The sesame genotypes were grouped in to different categories based on percent plant damage. None of the screened genotypes were found free from infestation. The plant damage by white fly was ranged from 9.32 to 55.42%. Only one genotype TKG-501 was found resistant showing 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. 3 genotypes TKG-529, TKG-22 and TKG-308 were found moderately susceptible and showing plant damage in the range of 21-30 percent and one genotype *i.e.* TKG-55 was observed as susceptible showing 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 was ranged from 8.53 to 54.08%. Two genotypes TKG-501 and SCS-551 was found resistant showing plant damage 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 were found moderately susceptible and showing plant damage in the range of 21-30 percent and one genotype *i.e.* TKG-308 was observed as susceptible showing 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 ranged from 9.56 to 54.43%. Two genotypes TKG-501 and TKG-518 was found resistant showing 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 showing plant damage in the range of 21-30 percent and only one genotype *i.e.* SCS-551 was observed as susceptible showing 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 Karuppaiah and Nadarajan (2011) and Choudhary *et al.* (2017).

The plant damage by til hawk moth was ranged from 5.52 to 52.43%. Three genotypes TKG-501, TKG-506 and SCS-551 was found resistant showing plant damage less than 10 percent. The moderately resistant category includes 3 genotypes showing 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 were found moderately susceptible and showing plant damage in the range of 21-30 percent and only one genotype *i.e.* TKG-55 was observed as susceptible showing 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).

The plant damage by mirid bug was ranged from 6.68 to 55.27%. Three genotypes TKG-501, TKG-518 and TKG-55 was found resistant showing plant damage less than 10 percent. The moderately resistant category includes 2 genotypes showing mirid bug damage in the range of 10-20 percent *viz.*, TKG-506 and TKG-22. Only one genotype TKG-529 were found moderately

susceptible and showing plant damage in the range of 21-30 percent and the three genotypes *i.e.* TKG-306, TKG-308 and SCS-551 was observed as susceptible showing 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.

- **Percent flower damage**

The significant differences among the genotypes in recording percent flower damage were observed. The sesame genotypes were grouped in to different categories based on percent flower damage. None of the screened genotypes were found free from infestation. The flower damage by white fly was ranged from 8.78 to 45.47%. Only one genotype SCS-551 was found resistant showing flower damage less than 10 percent. The moderately resistant category includes 4 genotypes showing 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 and four genotypes *i.e.* TKG-22, TKG-308, TKG-55 and JTS-8 were observed as susceptible showing infestation in the range of 31-50 percent. Present findings are supported by the findings of Balaji and Selvanarayanan (2016).

The flower damage by jassid was ranged from 9.47 to 46.50%. Only one genotype TKG-501 was found resistant showing 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 genotypes TKG-529, TKG-306 and SCS-551 was found moderately susceptible and showing flower damage in the range of 21-30 percent and two genotypes *i.e.* TKG-308 and TKG-55 were observed as susceptible showing infestation in the range of 31-50 percent.

The flower damage by leaf roller and capsule borer was ranged from 9.63 to 45.43%. Only one genotype TKG-501 was found resistant showing flower 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 *i.e.*, TKG-518, TKG-506, TKG-529 and TKG-306. Two genotypes TKG-22 and TKG-308 was found moderately susceptible and showing flower damage in the range of 21-30 percent and three genotypes *i.e.* TKG-55, JTS-8 and SCS-551 were observed as susceptible showing 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 damage by til hawk moth was ranged from 8.77 to 47.32%. Only one genotype SCS-551 was found resistant showing 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. Four 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 showing infestation in the range of 31-50 percent. Present findings are supported by the findings of Kumar *et al.* (2009).

The flower damage by gall fly was ranged from 17.15 to 48.45%. 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 and showing 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 showing 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.

- **Percent capsule damage**

The significant differences among the genotypes in recording percent capsule damage were observed. The sesame genotypes were grouped in to different categories based on percent capsule damage. None of the screened genotypes were found free from infestation. The capsule damage by white fly was ranged from 8.55 to 32.15%. Two genotypes *viz.*, TKG-501 and SCS-551 was found moderately resistant showing whitefly damage in the range 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 genotypes TKG-506, TKG-529 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, 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 Karuppaiah *et al.* (2009).

The capsule damage by jassid was ranged from 5.24 to 33.12%. Four genotypes *viz.*, TKG-501, TKG-518, TKG-22 and SCS-551 was found moderately resistant showing jassids damage in the range 5 to 10 percent. The moderately susceptible category includes 1 genotype showing jassids damage in the range of 11-15 percent *i.e.*, TKG-506. Three genotypes TKG-529, TKG-306 and JTS-8 was found susceptible and showing capsule damage in the range of 16-25 percent and the two genotypes *i.e.* 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%. Three genotypes *viz.*, 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 one genotype *i.e.* 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).

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.

Reference

- Ahmed ME. Genetic and geographical diversity of sesame. Thesis Ph. D., University of Gezira, Sudan 2004.
- Ahuja DB, Kalyan RK. Losses in seed yield due to insect pests in different varieties of sesame, *Sesamum indicum* L. Annals of Plant and Soil Research 2002;4(1):99-103.
- Balaji K, Selvanarayanan V. (2016) Evaluation of resistance in sesame germplasm against shoot webber and capsule borer. Indian Journal of Plant Protection. 2009; 37(1-2):35-38.
- Chaudhary R, Rai S, Singh G. Economic injury level of sesamum leaf webber, *Antigastracatalaunalis* (Dup.) in Delhi. Indian Journal of Plant protection 1987;15:131-136.
- Choudhary, M.D. Kumawat, K.C., Samota, R.G. and Bajaya, T. (2017). Evaluation of sequences of integrated pest management practices against sesame Leaf and Capsule Borer, *Antigastracatalaunalis*. Journal of Pharmacognosy and Phytochemistry, 6(4): 1440-1444.
- Karuppaiah, V. and Nadarajan, L. (2011). Evaluation of sesame genotypes for resistance to sesame leaf roller and capsule borer, *Antigastracatalaunalis* (Duponchel) (Pyraustidae: Lepidoptera). *Archives of Phytopathology and Plant Protection*, 44(9): 882–887.
- Karuppaiah, V., L. Nadarajan and K. Kumar. 2009. Mechanism of resistance in sesame genotypes to *Antigastracatalaunalis*Dup. Ann. Plant Prot. Sci. 17: 337-340.

- Kumar, Rakesh, Ali, Shamshad and Chandra Umesh (2009). Seasonal incidence of insect-pests of *Sesamum indicum*. *Annals of Plant Protection Sciences*, 17(2): 487-488.
- Mishra M, Thakur SR, Gupta MP, Yogranjan. Field screening of sesame accessions against leaf roller and capsule borer, *Antigastracatalaunalis* Dup. *Indian journal of plant genetic resources* 2016;29(1):8-10.
- Murli Baskaran, R.K.; S.K. Ganesh and S. Thangavelu (1990). Effect of different time sowing on shoot webber and phyllody incidence and yield of sesame. *Sesame and safflower newsl* 5:40-45.
- Rai BK. Pests of oilseed crops in India and their control. Indian council of Agricultural Research. New Delhi, India 1976, 76-80.
- Singh G, Grewal GS. Efficiency of new insecticides against sesamum leaf webber and pod borer *Antigastracatalaunalis* (Dup.) in Punjab. *Journal of Insect Science* 1989;2:146-15.
- Shrivastava, N.S.S., Duhoon and K.M.S. Raghuvanshi (2002). Testing of different germplasm lines of sesame against leaf roller and capsule borer *Antigastracatalaunalis* dup. *Sesame and Safflower Newsletter* No. 17: 69-70.
- Suja KP, Abraham JT, Thamizh SN, Jayalekshmy, Arumughan C. Antioxidant efficacy of sesame cake extract in vegetable oil protection. *Food Chemistry* 2004;84(3):393-400.

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

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
-----------------	--------------	--------------	--------------	--------------	--------------	--------------	--------------	--------------

UNDER PEER REVIEW