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MORPHOLOGICAL PARAMETERS OF SESAME IN RELATION TO SUSCEPTIBILITY TO MAJOR SUCKING INSECT PESTS

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ABSTRACT

Based on previous field screening data 15 genotypes were selected (based on the number of insect pests population/ plant) to study the role of morphological parameters of sesame. Trichome density, length and width were estimated under microscope with the help of software. The 15 selected genotypes of sesame were studied for finding trichome's role in host plant resistance against major sucking pests; whitefly *Bemisia tabaci*), leafhopper (*Orocius albicinctus*) and mirid bug (*Nesidiocoris tenuis*) of sesame and the correlation studies revealed that the density of non-glandular trichome showed significant positive correlation with the population of *Orocius albicinctus* (r= 0.868), *Nesidiocoris tenuis* (r=0.549) and *Bemisia tabaci* (r= 0.824) while length and width of non-glandular trichomes and density of glandular trichomes showed non-significant (±) impact on the incidence of tested sucking insect pests.

Key words: Glandular and non-glandular, Trichome, Madhya Pradesh, mirid bug, leafhopper, *Sesamum indicum,* sucking insect pests of sesame, trichome density, trichome length, trichome width, whitefly

Sesame (*Sesamum indicum* L.) is a valuable oilseed crop grown in tropical and subtropical regions of Asia, Africa, and South America. It is known for its high oil (around 50%) and protein content (approximately 25%) (Panday et al., 2021). Sesame productivity in India is hindered by insect pests, such as leafhoppers (*Orocius albicinctus*), whiteflies (*Bemisia tabaci*), and mirid bugs (*Nesidiocoris tenuis*) (Ahirwar et al., 2010), causing significant damage and transmitting diseases like phyllody and leaf curl, leading to yield losses of up to 80% (Salehi et al., 2017). Eco-friendly pest management strategies, including the use of resistant or tolerant sesame varieties, are crucial. Trichomes, the epidermal projections on plants, play a role in plant defense against insect pests (Anilakumar, 2010). Understanding the response of trichomes to major sucking insect pests of sesame could provide insights into developing pest-resistant varieties. This study aims to investigate the response of trichomes to major sucking insect pests of sesame, contributing to the development of sustainable pest management strategies in sesame cultivation.

MATERIALS AND METHODS

The experiment was carried out in the summer 2022 at the breeder seed production unit, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, India. Physically located between 22°49 and 24°8 North latitude and 78°21 East longitude. Trichome density was enumerated from leaves of 15 selected genotypes that depicted the diverse level of leafhopper population. Leaf samples were taken from 30 to 45 days old plants from different portion (top, middle and bottom) of the plant in 1 cm^2 area and the means were subjected to statistical analysis. The trichome density from the leaf lamina, midrib and veins of all the entries were assessed adopting the methodology suggested by Maite et al. (1980). Slides were observed under a binocular compound microscope with 100x magnification, 10 x objective lens and 10 x/ 22 eyepiece lens. Counts of trichome numbers were observed under one random microscopic field, the field of vision was 4.545 mm. The data were correlated with the insect pest incidence using MS-excel and interpretation was made.

RESULTS AND DISCUSSION

The significant differences among the genotypes were observed in recording non glandular trichome density. Among the tested genotypes the non glandular trichome density was ranged from 20 to 44 trichomes/ microscopic field. The highest non- glandular trichomes (44 trichomes/microscopic field) was recorded in

Table 1. Incidence of sucking insect pests with the different parameters of trichome

S No.	Treatment	Leafhopper population	Mirid bug population	Whitefly population	Trichome density (NG)	Trichome length (NG) in mm	Trichome max. width (NG) in mm	Trichome density glandular
1.	T_1 -75-120	0.78	0.78	2.03	20.00	0.120	0.022	85.33
2.	T_2 -IS-265-B	0.84	0.85	1.44	26.00	0.067	0.016	90.33
3.	T_3 -VRI-1	0.88	1.16	1.57	21.00	0.109	0.022	107.00
4.	T_4 -KIS-306	0.99	1.61	2.17	28.00	0.104	0.019	124.33
5.	T_5 -ES-52-184	1.16	1.50	1.92	20.50	0.080	0.024	109.33
6.	T_6 -IC-204200	1.28	1.84	1.78	26.00	0.092	0.022	95.33
7.	T_7 -SI-1004-B	1.34	1.89	2.15	35.00	0.066	0.025	91.67
8.	T_8 -S-0301	1.36	1.70	1.80	23.00	0.135	0.033	145.00
9.	T_9 -IS-112-B	1.31	1.87	2.33	29.00	0.062	0.017	79.33
10.	T_{10}-GT-10	1.18	0.54	1.83	30.00	0.050	0.024	144.00
11.	T_{11}-S-0292	1.5	1.74	2.10	36.00	0.058	0.019	153.00
12.	T_{12} -NIC17930	1.68	1.91	2.56	35.00	0.079	0.021	120.67
13.	T_{13} -K-2	1.6	1.94	2.29	30.00	0.116	0.026	120.33
14.	T_{14} -TC-25	2.55	1.71	3.22	44.00	0.152	0.017	85.00
15.	T_{15} -Prachi	2.38	2.47	3.20	42.00	0.129	0.016	127.33
SEm±					2.17	0.01	0.001	21.39
CD(P=0.05%)					4.42	0.02	0.003	43.69

Correlation coefficient (r) with different parameters of trichome

Parameters	Leafhopper population	Mirid bug population	Whitefly population	Trichome density (NG)	Trichome length (mm)	Trichome width (mm)	Trichome density (G)
Leafhopper population							
Mirid bug population	0.665**						
Whitefly population	0.898**	0.633**					
Trichome density (NG)	0.868**	0.549*	0.824**				
Trichome length (mm)	0.443^{NS}	0.275^{NS}	0.431^{NS}	0.112^{NS}			
Trichome width (mm)	0.045^{NS}	0.275^{NS}	-0.079^{NS}	-0.025^{NS}	0.240^{NS}		
Trichome density (G)	0.098^{NS}	0.074^{NS}	-0.053^{NS}	0.104^{NS}	-0.059^{NS}	0.154^{NS}	

*= significant at 5 % level, **= significant at 1% level, NS= non- significant

genotype TC-25 followed by Prachi (42 trichomes/ microscopic field). The lowest non- glandular trichome density (20 trichomes/microscopic field) was recorded in genotype 75-120 and second lowest in VRI-1 (21.33 trichomes/microscopic field). Density of non-glandular trichome showed significant positive correlation with the population of leafhopper *Orocius albicinctus* (r= 0.868), mirid bug *Nesidiocoris tenuis* (r=0.549) and whitefly *Bemisia tabaci* (r= 0.824). Present findings are in conformity with the findings of Chu et al. (2000) they studied the impact of hairy and non hairy leaves cultivars of cotton on the incidence of whitefly *Bemisia tabaci* and reported that the hairy leaf cultivar Stoneville 474, had significantly more silver leaf whitefly *Bemisia tabaci* eggs, nymphs, and adults than eight other cultivars with smooth leaves. Present findings more or less supported by the findings of Shadhanaikural, (2009) they studied the trichome density in the 10 resistant and susceptible entries of sunflower and reported that the trichome density in resistant 10 entries ranged between 183.55 to 255.52/ 0.64 cm^2 (mean=216.46± 19.45), whereas in the 10 susceptible entries it ranged between 109.07 to 211.69/ 0.64 cm^2 (mean=166.40± 35.21) which clearly indicated that the trichome density was greater in the sucking insect pests resistant entries when compared to susceptible entries. Pastório et al. (2023) worked on the relationship between two whitefly species *Bemisia tuberculata* and *Aleurotrixus aepim* (Hemiptera: Aleyrodidae) occurrences and leaf characteristics in different cassava cultivars. They found that cultivars with the lowest trichome density had fewer whitefly nymphs this support the findings that higher trichome density can support higher infestation of whitefly and other pests. Aherkar et al. 2023 performed microscopic analysis of trichome density and gossypol glands which revealed a positive and significant correlation with *Bemesia tabaci* (whitefly).

Among the selected genotypes the length of non glandular trichomes were ranged from 0.050 to 0.152 mm. The significantly highest mean trichome length was (0.152 mm) recorded in genotype TC-25 followed by (0.135 mm) S-0301. The lowest non- glandular trichome length (0.050 mm) was recorded in variety GT-10 followed by (0.058 mm) S-0292 and (0.062 mm) IS-112-B. The length of non-glandular trichomes showed non-significant (±) impact on the incidence of tested sucking insect pests. Present findings more or less supported by the findings of Shadhanaikural, (2009) they studied the trichome length in the 10 resistant and susceptible entries of sunflower and reported that the trichome length in the 10 resistant entries ranged between 20.30 to 32.96µm (mean = 25.18± 3.90) whereas, in the 10 susceptible entries it ranged between 17.44 to 28.25µm (mean = 22.02± 3.39). They concluded that the trichome length was marginally greater in resistant entries as compared to susceptible entries. Among the selected genotypes the non glandular trichome width were ranged from 0.016 to 0.033 mm. The highest (non- glandular) trichome width (0.033 mm) was recorded in genotype S-0301 followed by (0.025 mm) SI-1004-B while the lowest trichome width (0.016 mm) was recorded in variety Prachi and IS-265-B followed by (0.017 mm) IS-112-B and (0.019 mm) S-0292. Among the selected genotypes the glandular trichome density were ranged from 79 to 153 trichome/ microscopic field. The highest glandular trichome density (153/ microscopic field) was recorded in genotype S-0292 followed by (145/ microscopic field) S-0301 while the lowest trichome density (79/ microscopic field) was recorded in genotype IS-112-B followed by TC-25 (85/ microscopic field), GT-10 (144/ microscopic field) and Prachi (127/ microscopic field).

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AUTHOR CONTRIBUTION STATEMENT

K T and A K P conceived and designed research. K T conducted field trials and recorded data. A K P suggested statistical analysis and analyzed data. K T wrote the manuscript. Both the authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest

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