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HOST PLANT RESISTANCE TO SESAMUM LEAF WEBBER AND CAPSULE BORER *ANTIGASTRA CATALAUNALIS* (DUPONCHEL)

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ABSTRACT

Fifty-four genotypes of sesamum were evaluated against leaf webber and capsule borer *Antigastra catalaunalis* Duponchel. Correlation of the physiological parameters of the genotypes was observed with plant, flower, capsule damage and larval density. It was found that moisture content (%) and chlorophyll content index exhibiting significant positive correlation with damage and larval incidence. Ash content and water saturation deficit showed significant negative correlation.

Key words: Sesame, genotypes, physiological traits, *Antigastra catalaunalis*, correlation coefficient, moisture, chlorophyll, ash content, water saturation coefficients

India is one of the largest producers of oilseeds (Rai et al., 2016) and of these the sesame, *Sesamum indicum* L. is an important one. However, in India its yield potential has not been fully realized due to insect pests causing yield losses (Ahirwar et al., 2010). Sesame leaf webber and capsule borer *Antigastra catalaunalis* (Duponchel) is a serious pest as this attacks the crop in all the growth stages. If infestation occur at very early stage, the plant dies and at later stage, infested shoot remains without further growth (Karuppaiah, 2014). It feeds on tender foliage by webbing the top leaves, bores into the pods and shoots. It causes 10 to 70% infestation of leaves, 34 to 62% of flower buds/ flowers and 10 to 44% infestation of pods resulting in up to 72% loss in yield (Ahirwar et al., 2010). Insecticides though effective against this pest are not ecofriendly (Rai et al., 2002). In this context, resistance cultivars can be the most desirable, economic and best alternative. The present study evaluates genotypes for their resistance and the physiological traits that are responsible for the same.

MATERIALS AND METHODS

The experiment with 54 genotypes was carried out at the experimental farm, ICAR-Project Coordinating Unit Sesame and Niger at College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalayal, Jabalpur, Madhya Pradesh (22°49”- 24°8”N, 78°21”-80°58”E 411.78 masl), during 2017-2018. Randomized block design was followed with each genotype sown in rows of 3 m length and replicated thrice, and spacing between row to row and plant to plant was kept 30 cm and 10 cm, respectively. The observations on plant, flower and capsule damage (%) were made at different stages of plant growths viz. vegetative (30 DAS), flowering (45 DAS) and capsule maturity stage (70 DAS) by counting the total number of damaged and healthy plants. The larval density was worked out by counting the number of larvae on five randomly selected plants from each genotype, at weekly interval. The resistance/ susceptibility of genotypes was evaluated with the % plant, flower and capsule damage, through the rating system developed by AICRP Sesame and Niger. The physiological parameters viz. total chlorophyll content, relative water content- RWC (%), water saturation deficit (%), moisture content (%) and total ash content (%) were analysed and correlated with plant, flower, capsule damages (%) and larval density. Chlorophyll content was estimated with SPAD-502, RWC (%) after Barrs and Weatherly (1962), and water saturation deficit (WSD) was after the method suggested by Aldesuquy (2014).

RESULTS AND DISCUSSION

The differences among the genotypes evaluated from the plant, flower, capsule damage and larval incidence revealed that these varied from 7.94 to 54.43%, 8.67 to 45.45%, 7.73 to 32.15% and 0.26 and 3.03 larvae/ plant, respectively; these were minimum in SI-250 and maximum in Prachi. The entries IS-178-C and

Table 1. Physiological traits of sesame genotypes and larval density and damage by *A. catalaunalis*

S.No.	Treatment	Larval density/ plant	Damage (%)			Physiological traits (%)				
			Plant	Flower	Capsule	Ash content	Moisture content	Relative water content	Water saturation deficit	Chlorophyll content index
1.	SI-3237	2.15	24.25	32.38	21.20	2.95	94.33	46.51	53.49	42.78
2.	IC-131607	2.02	19.38	22.36	17.29	3.15	90.00	42.15	57.85	37.11
3.	SI-3179	1.76	21.65	24.73	18.61	3.00	93.33	43.32	56.68	39.84
4.	SI-3231	0.76	11.70	15.81	11.94	4.43	81.00	35.54	64.46	33.08
5.	EC-33507	0.67	12.70	18.03	12.32	4.00	82.50	36.61	63.39	33.30
6.	IS-321	1.33	15.08	20.50	17.09	3.30	89.17	42.10	57.90	36.97
7.	SI-1156	0.82	13.05	13.51	11.81	4.35	80.50	35.13	64.87	33.01
8.	EC-335011-A	1.39	18.99	18.09	18.69	3.00	94.00	43.19	56.81	39.95
9.	EC-334990	0.64	9.84	13.74	9.16	4.93	78.83	26.56	73.44	31.08
10.	EC-334989	0.67	12.94	13.95	12.68	4.35	82.48	36.69	63.31	33.66
11.	ICA-14146-A	0.94	13.53	18.33	13.37	4.20	83.45	37.34	62.66	34.10
12.	BC-303427	1.61	21.54	17.47	21.49	3.05	95.00	46.69	53.31	42.82
13.	IS-665	1.30	16.95	25.70	16.18	3.50	89.00	41.85	58.15	35.55
14.	SI-3234	1.70	18.64	12.08	19.31	3.07	94.00	44.64	55.36	40.54
15.	EC-334280	0.91	12.61	18.66	13.80	4.23	83.53	37.76	62.24	34.35
16.	S-0182-I	0.94	15.84	19.74	16.22	3.43	89.33	41.95	58.05	35.82
17.	IS-475	0.70	16.00	18.07	16.10	3.70	89.05	41.19	58.81	35.49
18.	EC-334983	0.55	15.17	25.62	15.75	3.37	87.00	40.23	59.77	35.10
19.	KIS-375	1.12	13.41	19.37	14.51	3.52	86.50	38.66	61.34	34.93
20.	Agra-balik	0.67	13.61	16.11	14.24	3.77	86.00	38.27	61.73	34.63
21.	IS-100-8	0.79	13.51	20.23	12.65	4.00	82.57	36.71	63.29	33.53
22.	SI-1679	1.12	16.39	20.57	16.13	3.58	89.40	41.14	58.86	35.28
23.	SI-76-1	0.73	10.80	13.95	9.90	4.47	80.55	26.90	73.10	31.76
24.	EC-334984	0.73	10.61	14.08	9.57	4.28	80.00	26.59	73.41	31.16
25.	SP-1144	0.88	9.94	13.83	9.88	4.77	80.50	26.62	73.38	31.61
26.	IS-723	1.12	14.67	24.96	15.65	3.78	86.05	40.09	59.91	40.20
27.	IS-253	0.70	12.92	21.97	12.81	4.05	82.50	36.57	63.43	35.60
28.	S-0388	1.30	17.12	21.66	17.08	3.05	89.45	42.07	57.93	34.47
29.	ES-75-2-84	0.85	15.19	25.89	15.40	3.52	86.00	40.31	59.69	32.80
30.	ES-334966	0.76	13.22	22.56	13.44	4.22	82.50	37.40	62.60	34.18
31.	ES-81	0.64	13.90	19.71	11.10	4.38	80.95	35.13	64.87	32.71
32.	IC-199443	0.91	12.31	18.26	12.38	4.23	82.45	36.17	63.83	33.18
33.	EC-334995	0.55	11.32	21.40	10.17	4.13	79.55	26.95	73.05	32.15
34.	EC-3349997	1.70	22.01	21.85	19.07	2.90	93.55	44.22	55.78	40.33
35.	KMR-1	0.73	14.03	12.93	13.04	3.58	82.95	37.21	62.79	34.00
36.	ES-62	0.67	9.56	13.08	9.72	4.95	80.40	26.24	73.76	31.28
37.	SI-2192	0.42	9.95	13.54	9.82	4.75	80.45	26.49	73.51	31.51
38.	IS-17	0.97	10.93	14.44	10.05	4.15	80.92	26.29	73.71	32.01
39.	IS-722-2-84	1.70	20.28	23.54	18.41	3.45	92.50	43.11	56.89	39.02
40.	IS-3179	0.85	14.99	18.16	13.98	3.82	85.82	37.94	62.06	34.37
41.	IS-446-1-64	0.52	9.19	13.67	8.87	6.23	78.55	25.80	74.20	24.84
42.	IS-391	1.03	11.09	17.16	11.32	4.28	80.25	35.24	64.76	32.99
43.	EC-303440-B	0.52	10.91	11.47	9.99	4.38	80.65	26.97	73.03	31.94
44.	IS-461-1-84-I	1.36	16.47	20.76	16.20	3.38	89.55	41.91	58.09	35.67
45.	ES-335005	0.61	9.34	12.00	8.56	5.53	78.30	25.44	74.56	24.57
46.	NIC-163-88	1.48	17.48	22.05	18.41	3.33	92.45	43.15	56.85	39.26
47.	SI-995	0.55	10.83	14.83	9.90	4.40	80.60	26.54	73.46	31.72
48.	SI-1345	0.91	12.59	17.50	11.84	4.40	80.22	35.25	64.75	33.00
49.	SI-63	1.73	18.38	21.30	18.89	3.23	92.85	43.83	56.17	39.98
50.	EC-334993	2.17	25. 51	34.49	28.02	2.90	95.37	49.64	50.36	45.65
51.	SI-250	0.26	7.94	8.67	7.73	6.50	74.33	22.60	77.40	23.45
52.	IS-178-C	0.36	8.56	9.44	8.24	6.25	75.00	24.17	75.83	24.22
53.	Prachi	3.03	54.43	45.45	32.15	1.83	97.70	56.27	43.73	49.16
54.	TC-25	2.66	48.27	42.17	29.20	2.07	96.55	51.68	48.32	46.18
SEm ±		0.10	0.48	4.93	4.01	0.05	0.08	0.05	0.05	0.05
CD (p= 0.05%)		0.28	1.17	13.81	12.09	0.13	0.20	0.13	0.13	0.12

Table 2. Physiological traits of sesame genotypes vs larval incidence and damage by *A. catalaunalis*

Correlation of	Larval incidence	Plant damage (%)	Flower damage (%)	Capsule damage (%)	Ash content (%)	Moisture content (%)	Relative water content (%)	Water saturation deficit (%)	Chlorophyll content index (%)
Larval incidence	1.00								
Plant damage (%)	0.88**	1.00							
Flower damage (%)	0.79*	0.86**	1.00						
Capsule damage (%)	0.92**	0.91**	0.85**	1.00					
Ash content (%)	-0.80**	-0.75*	-0.75*	-0.87**	1.00				
Moisture content (%)	0.87**	0.77*	0.71*	0.93**	-0.91**	1.00			
Relative water content (%)	0.83**	0.78*	0.78*	0.93**	-0.90**	0.92**	1.00		
Water saturation deficit (%)	-0.83**	-0.78*	-0.78*	-0.93**	0.90**	-0.92	-0.98**	1.00	
Chlorophyll content index (%)	0.89**	0.83**	0.79*	0.95**	-0.94**	0.93**	0.92**	-0.92**	1.00

ES-335005 were found promising in all three stages of plant growth with 8.56 and 9.34%, 9.44 and 12.00%, and 8.24 and 8.56% plant, flower and capsule damage, respectively; as regards larval incidence (0.26 larvae/ plant/ week), least values were with SI-250 followed by IS-178-C (0.36 larvae/ plant/ week); and maximum was observed on the 56th DAS (1.82 larvae/ plant) and minimum was recorded on 14th DAS (0.28 larvae/ plant) (Table 1). The present results are in conformity with the findings of Swapna et al. (2021) on the relative resistance/ susceptibility showing the 10 genotypes viz., IC-14120-1, SI-225, Jagtiala til-1, JCS 3980, JCS 3981, JCS 4053, JCS 3886, JCS 4120, YLM 11 and YLM 66 as less susceptible. Makwana et al. (2020) observed that the genotypes viz., SI-250, IS-178-C and ES-335005 were found promising. Similarly, Choudhary et al. (2018) screened 15 varieties and found that none was immune.

The significant differences were observed among the genotypes in their physiological traits. The ash content (%) was from 1.83 to 6.50%, being the lowest in Prachi and maximum with SI-250. The entries SI-250 (6.50%) followed by IS-178-C (6.25%) and IS-446-1-64 (6.23%) recorded comparatively higher ash content while the lowest ash content was recorded in entries TC-25 (2.07%), EC-334993 (2.90%) and EC-3349997 (2.90%). The moisture content was from 74.33 to 97.70%, maximum being with Prachi (97.70%) followed by TC-25 (96.55%) and EC-334993 (95.37%), and the least (74.33%) with SI-250 followed by IS-178-C (75.00%). The relative water content (%) ranged from 22.60 to 56.27%, being lowest (22.60%) in SI-250 followed by IS-178-C (24.17%), while the maximum was in Prachi (56.27%) followed by TC-25 (51.68%). The highest (%) water saturation deficit was in genotype SI-250 (77.40%) followed by IS-178-C (75.83%), with the least value (43.73%) being in Prachi followed by TC-25 (48.32%). The chlorophyll content index ranged from 23.45 to 49.16%, the least being in SI-250 (23.45%) followed by IS-178-C (24.22%), and the maximum (49.16%) was in Prachi followed by TC-25 (46.18%) and EC-334993 (45.65%) (Table 1).

Correlation coefficients of plant, flower, capsule damage (%) and larval density with physiological traits showed that the plant (r= 0.88), flower (0.79) and capsule damage (0.92) showed significant strong positive relationship with larval incidence. Moisture content (%) and relative water content (%) revealed a significant positive correlation with larval incidence (r= 0.87 and r= 0.83), and % plant (r= 0.77 and r= 0.78), flower (r= 0.71and r= 0.78) and capsule damage (r= 0.93 and r= 0.78). Ash content (%) and water saturation deficit (%) exhibited a significant negative correlation with larval incidence (r= - 0.80 and r= - 0.83), % plant (r= - 0.75 and r= - 0.78), flower (r= - 0.75 r= - 0.78) and capsule damage (r= - 0.87 and r= - 0.93). Chlorophyll content index, showed significant positive correlation with larval incidence (r= 0.89), plant (r= 0.83), flower (r= 0.79) and capsule damage (r= 0.95) (Table 2). The present findings are in conformity with those of Elanchezhyan et al. (2009) in brinjal hybrid Swetha that was highly resistant to shoot and fruit borer because of ash content (12.3%), total phenols (7.6 mg g-1), lowest moisture content (78.4%), total chlorophyll (1.2 mg g-1) and total sugars (5.8 mg g-1). Similarly, Imtiaz et al. (2015) observed that the ash and fat content were significantly negatively correlated while moisture and protein were significant positively correlated with the incidence of *Aphis gossypii*, *Amrasca biguttula biguttula* and *Leucinodes orbonalis,* respectively. In the present findings significant differences were observed in plant, flower, capsule damages (%) and larval incidence among the 54 genotypes. The study reported a strong correlation among all the tested physiological parameters with plant, flower, capsule damage (%) and larval density and therefore, these physiological parameters can be used as markers to select resistant genotypes to manage *A. catalaunalis*.

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