Mechanism of Resistance in Sesame genotypes to *Antigastra catalaunalis* Dup.

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ABSTRACT

Twenty one species of sesame genotypes were evaluated to determine the mechanism of resistance to *Antigastra catalaunalis,* only four genotypes *viz*, ES 22, UMA, SI 250 and KMR 14 were less preferred for oviposition. The lowest number of eggs was laid on UMA (12.33 ± 2.33). The egg laying of *A. catalaunalis* was positively correlated (r = 0.749) with the trichome density in the leaf. The growth index of *A. catalaunalis* was low in the resistant genotypes ES 22, SI 250 and UMA and high in susceptible genotypes TMV 3, TMV 4, TMV 5, TMV 6 and TC 25 indicated antibiosis mechanism. The total phenols in the leaves, flowers and pods were negatively correlated with damage of *A. catalaunalis*.

Key words : *Antigastra catalaunalis, Mechanism* of Resistance, *Sesamum indicum*

Sesame (*Sesamum indi*cum Linn.) is an oldest and important crop among the major oil seed crops grown in India. Damage due to pest attack tolls a heavy loss (25.9%) in seed yield. Leaf webber and capsule borer, *Antigastra catalaunalis* Duponchel is the most serious and key pest of sesame, which causes the damage to the crop from 5 to 40% (Manisegaran *et al*., 2001). Management of these pest using insecticides though effective is discouraged in view of the environmental considerations (Rai *et al*., 2002). The potential value of genetic diversity of *Sesamum* spp. is often exploited by breeders to develop insect resistant cultivar or for enhancing yield attributes. Hence, the present study was initiated to determine their mechanism of resistance of sesame genotypes to *A. catalaunalis*.

Materials and Methods

The genotypes were sown inside the wire net cage in controlled conditions. Fifteen days after the emergence of plants, small transparent mylar cage (20 x 10) cm was used to cover the single sesame plant, replicated three times. A pair of mated adults was released inside the mylar cage and moth was replaced if any death occurred within 5 days. Cotton soaked with 10 % honey solution was placed inside the mylar cage to provide the adequate nourishment to the egg laying adults. The eggs laid were recorded consecutive for 5 days from the date of release.

To examine the trichome density, second leaf from 25 days old plant was sampled in each line. Standard procedure for clearing of leaves for microscopic study was adopted of leaf trichomes density. Fifteen days after the emergence of plants, the newly emerged larvae from the laboratory culture were transferred with the help of moist camel hair brush / plant. Each plant cover with mylar film cage, replicated three times. The observations on larval and pupal development and weight were recorded from the date of release of larvae till pupation.

The estimation of total phenols on the leaf, flower and pod, collected from different genotypes from the top, middle and bottom of the plants and pooled samples were taken for the analysis. Total phenol was determined by using colorimetric method (Thimmaiah, 1999).

Results and Discussion

The significant variation was observed among the genotypes studied for ovipositional preference. The range of egg laying was recorded between 12.33 ± 2.33 to 31.00 ± 1.73 (Table.1) The genotypes UMA, SI 250. TKG 22, KMR 14 and ES 22 were less preferred for oviposition compared with the susceptible check TC 25. The maximum number of egg laying was recorded in genotypes KMR 85 (31 ± 1.73). The variation might be due to the presence of antibiosis and / or less number of trichomes in the leaf. Haldar *et al*. (2006) reported that the ovipositional preference of *Maruca vitrata* on the various genotype of mung bean. The highly significant positive correlation (r= 0.749) was noticed between the trichomes on the leaf and the egg laid by the moth. The maximum numbers of trichomes were observed in the genotypes KMR 79 (49/ microscopic field) and KMR 85 (31.66/ microscopic field) (Table.1). Sridhar and Gopalan (2002) stated that the susceptible sesame genotypes to *A. catalaunalis* had higher number of trichomes on the leaf and minimum oviposition on the genotypes with glabrous nature (*Sesamum allatum*). Halder *et al*. (2006) observed that highly susceptible

Table 1. Growth index of *Antigastra catalaunalis* on sesame genotypes.

Genotypes	Larval duration (Days) (A)	Larval length (mm)	Larval weight (mg)	Pupation rate(%) (B)	Growth index (B/A)	Field reaction
	Mean of three replication of 5 observation each					
TKG 314	9.40 ± 0.42^{abc}	13.43 ± 0.14^{fg}	22.82 ± 1.57^{defgh}	71.42	7.59	S
YLM 66	9.70 ± 0.12^{bcde}	13.00 ± 0.17^{de}	21.08 ± 0.38^{cdef}	60.00	6.18	S
TMV 3	9.00 ± 0.27^{ab}	13.83 ± 0.12^{ghij}	25.64 ± 0.85^{hij}	73.33	8.14	HS
TMV 4	9.10 ± 0.29^{abc}	13.97 ± 0.03^{hij}	25.04 ± 0.61^{hij}	80.00	8.79	HS
TMV 5	9.00 ± 0.22^{ab}	14.03 ± 0.07^{ij}	24.14 ± 0.51^{fghi}	78.57	8.73	HS
TMV 6	9.00 ± 0.27^{ab}	14.17 ± 0.14^{j}	26.16 ± 0.99^{ij}	76.92	8.54	HS
VRI 1	9.30 ± 0.20^{abc}	13.62 ± 0.14^{fghi}	23.88 ± 1.39^{fghi}	73.33	7.88	HS
VS 9701	9.00 ± 0.22^{ab}	13.70 ± 0.25^{fghi}	23.90 ± 1.25^{fghi}	66.66	7.41	HS
KS 95010	9.10 ± 0.19^{abc}	14.04 ± 0.12^{ij}	25.18 ± 0.62^{hij}	71.42	7.84	HS
UMA	11.30 ± 0.20^{f}	11.24 ± 0.13^{c}	18.72 ± 1.66^{bc}	46.15	4.08	R
TC 25	8.70 ± 0.34^{a}	14.17 ± 0.06^{j}	23.24 ± 0.97^{efghi}	73.33	8.42	HS
SI 250	12.25 ± 0.19^{g}	10.27 ± 0.12^{b}	13.48 ± 0.24^{a}	35.71	2.91	R
KMR 14	10.40 ± 0.37^{e}	12.83 ± 0.03^{d}	20.14 ± 0.89^{cd}	58.33	5.61	MR
KMR 85	10.20 ± 0.33^{de}	13.53 ± 0.17^{fgh}	22.86 ± 1.13^{defgh}	66.66	6.53	HS
ES 22	11.50 ± 0.22^{fg}	9.83 ± 0.13^{a}	16.42 ± 0.28^{ab}	33.33	2.89	R
KMR 79	9.30 ± 0.41^{abc}	13.53 ± 0.20^{fg}	24.62 ± 1.18^{ghij}	64.28	6.91	HS
KMR 95	9.00 ± 0.27^{ab}	13.33 ± 0.22^{ef}	25.06 ± 1.10^{hij}	60.00	6.66	HS
KMR 75	9.50 ± 0.27^{bcd}	13.00 ± 0.11^{dc}	20.40 ± 1.21^{cde}	69.23	7.28	HS
KMR 92	9.80 ± 0.25^{cde}	12.83 ± 0.12^{d}	22.00 ± 1.06^{defgh}	76.92	7.85	HS
TKG 22	11.30 ± 0.25^{f}	10.23 ± 0.03^{b}	18.06 ± 0.97^{bc}	38.46	3.40	MR
LTK 4	9.30 ± 0.41^{abc}	13.50 ± 0.21^{fg}	21.74 ± 1.18^{defg}	66.66	7.17	HS
CD (P=0.05)	0.89*	0.41*	3.03*			
Over all mean	9.76	12.95	23.35	63.84	6.70	

R-Resistant; MR- Moderately Resistant; S- Susceptible; HS- Highly Susceptible cultivar had least number of trichome on stem, pods and leaves, as compared to highly tolerant cultivar. Similarly trichome length was least in susceptible than resistant ones. Susceptibility of hairy varieties to *A. catalaunalis* had also been reported. The pubescence leaf surface might have provided a better foot hold for the female as reported for *Heliothis zea*. The results are in conformity on biophysical factors responsible for imparting resistant (Maheshwari *et al.*, 2006).

Out of twenty-one genotypes tested for the larval development of shoot webber, ES 22, SI 250, UMA and TKG 22 were found unfavorable exhibiting prolonged larval period, reduction in size, weight, % pupation and growth index indicating the antibiosis mechanism (Table.2). The higher growth index noticed in the susceptible genotypes TMV 3, TMV 4, TMV 5, TMV 6 and TC 25. This might due to the non- preference and presence and absence of secondary metabolites like phenol. The larvae fed on the genotypes having higher phenol content

Table 2. Ovipostional preference (in lab) and field reaction of sesame genotypes to *Antigastra catalaunalis.*

Genotypes	Mean number of eggs in three replications		Field reaction
	No choice condition No. of eggs ± SE	No of trichomes /microscopic field Mean ± SE	
TKG 314	19.33 ± 2.03^{abcdef}	21.66 ± 1.85^{g}	S
YLM 66	16.33 ± 2.40^{abcde}	17.33 ± 2.18^{defg}	S
TMV 3	18.67 ± 3.38^{cdef}	13.00 ± 0.57^{abcd}	HS
TMV 4	19.67 ± 2.18b^{cdef}	13.67 ± 1.76^{abcde}	HS
TMV 5	22.00 ± 2.64^{defg}	15.00 ± 1.99^{bcdef}	HS
TMV 6	22.67 ± 2.02^{defg}	14.67 ± 2.02^{bcdef}	HS
VRI 1	23.33 ± 4.09^{efg}	16.67 ± 0.66^{defg}	HS
VS 9701	24.33 ± 5.23^{efg}	19.33 ± 3.28^{efg}	HS
KS 95010	19.00 ± 1.53^{abcdef}	13.66 ± 0.88^{abcde}	HS
UMA	12.33 ± 2.33^{a}	13.00 ± 1.15^{abcd}	R
TC 25	17.00 ± 0.58^{abcde}	7.67 ± 1.15^{a}	HS
SI 250	13.67 ± 2.03^{abc}	9.00 ± 1.73^{ab}	R
KMR 14	14.67 ± 0.88^{abc}	10.00 ± 3.18^{abc}	MR
KMR 85	31.00 ± 1.73^{h}	31.66 ± 2.02^{h}	HS
ES 22	16.33 ± 2.33^{abcde}	11.33 ± 1.20^{abcd}	R
KMR 79	27.67 ± 4.91^{gh}	49.00 ± 4.93^{i}	HS
KMR 95	25.33 ± 1.45^{fgh}	29.33 ± 1.85^{h}	HS
KMR 75	23.00 ± 3.21^{efg}	20.66 ± 3.28^{fg}	HS
KMR 92	15.67 ± 1.45^{abcd}	13.66 ± 1.20^{abcde}	HS
TKG 22	12.67 ± 2.40^{ab}	15.00 ± 2.08^{bcdef}	MR
LTK 4	19.00 ± 1.53^{abcdef}	15.66 ± 1.33^{cdefg}	HS
Overall mean	19.69	17.69	
CD P=0.05	7.05*	6.12*	

R-Resistant; MR- Moderately Resistant; S- Susceptible; HS- Highly Susceptible

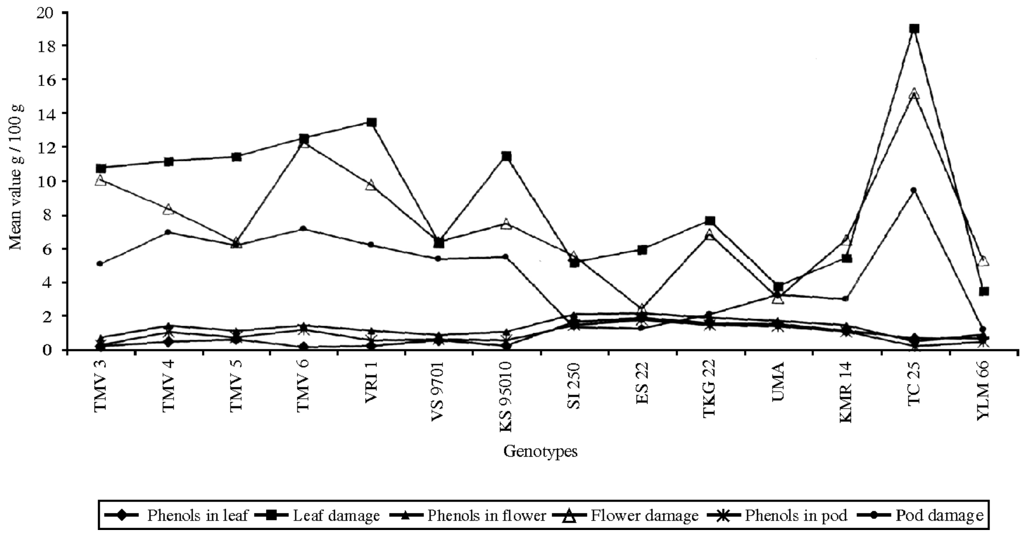

Fig. 1. Relationship between the total phenols in the sesame genotypes and damage intensity of *Antigastra catalaunalis*.

showed lesser growth index and minimum larval length, larval weight, lesser pupation rate and higher larval duration were noticed in the genotypes showing resistance to *A. catalaunalis* (Manisegaran *et al.*, 2001). The overall development of *A. catalaunalis* was highly reduced in the resistant genotype ES 22 and lower in SI 250 and good growth when the larvae fed with the susceptible check TC 25. The genotypes exhibited resistant to *A. catalaunalis* showed lesser growth index was earlier reported by Sridhar and Gopalan (2002).The highly significant negative correlation was noticed between total phenols and damage intensity of leaf (r = –0.768), flower (r = –0.813) and pod (r = –0.731) (Fig. 1). Significant differences in phenol contents of different genotypes of urdbean. Phenolics in a fairly large concentration could ward off insect pests. (Rao & Panwer, 2001). Similar results were reported by Halder and Srinivasan (2007). Maheshwari *et al.* (2006) reported similar trend in rice against brown plant hopper while studying biochemical factors of resistance.

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