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Host plant resistance in sesame genotypes to *Antigastra catalaunalis* Dup

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Abstract
Investigations on "Host Plant Resistance in Sesame genotypes to *Antigastra catalaunalis* Dup." were conducted at Agronomy farm and Department of Entomology, S.K.N. College of Agriculture, Jobner during *Kharif*, 2015 and 2016. *A. catalaunalis* were recorded as major insect pests of sesame during both the years of study. The infestation of *A. catalaunalis* commenced in the third week of August and reached its peak in the last week of August during 2015 and 2016, respectively. Out of 15 varieties of sesame screened against *A. catalaunalis* none was found immune. The varieties, RT-358 (4.63), RT-370 (4.38) and RT-371 (4.18) were ranked as least susceptible, while LT-8(7.93), TC-25 (6.78) and RT-46 (7.88) as highly susceptible. The morphological characters of these varieties *viz*., no. of leaves, no. of branches, no. of capsules and trichome density had negative correlation with the population of *A. catalaunalis*.

Keywords: sesame, *Antigastra catalaunalis*, genotypes, host plant resistance

Introduction
Sesame, *Sesamum indicum* (Linn.) (family: Pedaliaceae) is the oldest oilseed crop of world cultivated throughout the India. East Africa and India are considered to be the native home of sesame [1], [2]. Its seeds contain 52- 57 per cent oil and 25 per cent protein [3]. The important sesame growing countries are India, China, Sudan, Burma and Mexico. In India, the cultivation is mainly confined to Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh, Odisha, Gujarat, Tamil Nadu and Karnataka. In India, production of sesame was estimated to be 8.11 lakh tonnes during 2014-15 [4]. The total area under cultivation of sesame in Rajasthan was about 3.30 lakh hectares with annual production to the tune of 9.49 thousand tonnes and average productivity of 288 kg [5]. Its cultivation gained impetus because of high quality edible oil, rich source of carbohydrate, protein, calcium and phosphorus [6] and, therefore, considered to be the 'queen of oil seeds'. The pests attack tolls a heavy loss (25- 90%) in seed yield [7]. Among 67 insect pests damaging sesame crop, the leaf insect pests, *viz.,* leaf and capsule borer, *Antigastra catalaunalis* (Dup.); jassid, *Orosius albicinctus* Distant; whitefly, *Bemisia tabaci* (Genn.) and mirid bug, *Nesidiocoris tenuis* (Reuter) are considered to be key pests [8]. The *A. catalaunalis* is an important pest because this attacks the crop in all the growth stages after about two weeks of emergence [9]. The attack is more severe during dry seasons and after initiation of flowering. It feeds on tender foliage by webbing the top leaves, bores into the pods and shoots [10]. This insect pest causes 10-70 per cent infestation of leaves, 34-62 per cent of flower buds/ flowers and 10-44 per cent infestation of pods resulting in upto 72 per cent loss in yield [11]. The production and productivity of sesame is greatly affected by biotic and abiotic factors. Among them, insect pests are one of the important limiting factors affecting the production of sesame both in terms of quality and quantity [12]. The pest managers paid little attention towards its management that too especially on the non-chemical and ecofriendly approaches. In order to prevent infestation of the insect pest and to produce a quality crop, it is essential to manage its population at appropriate time with suitable control measures. One of the major aims of this work was to study resistance in sesame genotypes to *A. catalaunalis*, as the resistant varieties provide insect pest management at free of cost and proved an effective component of integrated pest management. There is need to identify the resistant genotypes based on their preference/ non-preference to *A. catalaunalis*.

2. Materials and Methods
The present experiment was laid out in simple randomized block design (RBD) with three replications.

The plot size was kept 2.5x 1.5 m^2 with row to row and plant to plant distance of 30 cm and 10 cm, respectively. The crop was sown on 12th July in both the years (*Kharif*, 2015 and 2016). The observations on sesame leaf and capsule borer population on different genotypes/ varieties of sesame were recorded on five randomly selected and tagged plants in each plot. The observations were recorded at weekly interval right from appearance of the pest till harvesting of the crop. The morphological characters of plants, *viz*., (i) number of leaves per plant, (ii) number of capsules per plant (r= -0.97), (iii) number of branches per plant, and (iv) trichome density of plant leaves were recorded to find out the relationship between plant characters and insect pest, *A. catalaunalis* population.

The data on sesame leaf and capsule borer population were transformed into $\sqrt{X + 0.5}$ (Gomez and Gomez, 1976) and were subjected to analysis of variance. The per cent damage of capsules done by *A. catalaunalis* were transformed into angular values (arc sin $\sqrt{P}$) and subjected to analysis of variance. The peak population of sesame leaf and capsule borer, *A. catalaunalis* and damage caused by it on sesame was recorded during two consecutive years (*kharif* 2015 and 2016) and categorized on the basis of formula $X \pm \sigma$.

Where,
X = Mean of peak population, and
σ = Standard deviation

Table 1: The categories were made as under.

Mean peak larval population/ 5 plants	Categories
Below X -σ	Least susceptible
X – σ and X+ σ	Moderately susceptible
Above X + σ	Highly susceptible

Table 1: Caterpillar population and damage indices of *Antigastra catalaunalis* (Dup.) on different genotypes of sesame (Pooled, *Kharif* 2015 and 2016)

S. No.	Genotypes	Caterpillar population/ five plants											
		I	II	III	IV	V	VI	VII	VIII	IX	Mean	Leaf damage (%)	Flower and Capsule damage (%)
1.	RT-125	5.40	5.70	5.78**	5.25	5.10	4.65	4.20	3.80	3.35	4.80	7.38	14.20
		(2.43)	(2.49)	(2.50)	(2.40)	(2.37)	(2.27)	(2.17)	(2.07)	(1.96)	(2.30)	(2.81)	(3.83)
2.	RT-46	7.45	7.65	7.88	7.05	6.7	6.15	5.75	4.5	3.8	6.33	9.90	20.83
		(2.82)	(2.86)	(2.90)	(2.75)	(2.69)	(2.58)	(2.50)	(2.23)	(2.07)	(2.61)	(3.22)	(4.62)
3.	RT-127	6.05	6.15	6.35	5.95	5.85	5.40	4.95	4.40	3.80	5.43	8.05	18.88
		(2.56)	(2.58)	(2.62)	(2.54)	(2.52)	(2.43)	(2.33)	(2.21)	(2.07)	(2.44)	(2.92)	(4.40)
4.	RT-351	5.13	5.23	5.38	4.85	4.65	3.90	3.20	2.98	2.50	4.20	5.95	13.58
		(2.37)	(2.39)	(2.42)	(2.31)	(2.27)	(2.10)	(1.92)	(1.86)	(1.73)	(2.17)	(2.54)	(3.75)
5.	RT-346	4.96	5.07	5.15	4.80	4.50	3.75	(2.90	2.63	2.20	3.99	5.68	14.78
		(2.34)	(2.36)	(2.38)	(2.30)	(2.24)	(2.06)	1.84)	(1.77)	(1.64)	(2.12)	(2.48)	(3.91)
6.	RT-369	5.98	6.07	6.18	5.75	6.00	5.05	(4.60	4.18	3.35	5.24	7.68	17.23
		(2.54)	(2.56)	(2.58)	(2.50)	(2.55)	(2.36)	2.26)	(2.16)	(1.96)	(2.40)	(2.86)	(4.21)
7.	RT-340	5.15	5.29	5.40	4.90	4.80	4.15	(3.50	3.20	2.80	4.35	6.30	14.45
		(2.38)	(2.41)	(2.43)	(2.32)	(2.30)	(2.16)	2.00)	(1.92)	(1.82)	(2.20)	(2.61)	(3.87)
8.	RT-371	4.2	4.27	4.63	4.1	3.85	3.15	2.3	1.7	1.25	3.25	4.05	10.90
		(2.17)	(2.19)	(2.21)	(2.14)	(2.09)	(1.91)	(1.66)	(1.48)	(1.32)	(1.94)	(2.13)	(3.38)
9	RT-370	4.13	4.25	4.38	3.95	3.80	3.15	(2.30	2.05	1.70	3.30	4.25	10.78
		(2.15)	(2.18)	(2.21)	(2.11)	(2.07)	(1.91)	1.67)	(1.60)	(1.48)	(1.95)	(2.18)	(3.36)
10	RT-358	4.19	4.30	4.18	4.25	4.05	3.30	2.40	2.15	1.75	3.43	4.42	10.76
		(2.17)	(2.19)	(2.22)	(2.18)	(2.13)	(1.94)	(1.66)	(1.59)	(1.47)	(1.98)	(2.22)	(3.35)
11	RT-356	5.40	5.55	5.80	5.15	5.00	4.45	3.95	3.65	3.15	4.68	6.80	12.98
		(2.43)	(2.46)	(2.51)	(2.38)	(2.35)	(2.22)	(2.11)	(2.04)	(1.91)	(2.28)	(2.70)	(3.67)
12	RT-366	5.30	5.48	5.53	5.00	4.90	4.25	3.60	3.30	2.95	4.48	6.68	12.73
		(2.41)	(2.44)	(2.45)	(2.35)	(2.32)	(2.18)	(2.02)	(1.95)	(1.86)	(2.23)	(2.68)	(3.64)
13	RT-103	5.65	5.85	5.98	5.40	5.30	4.85	4.25	3.88	3.55	4.97	7.08	15.26
		(2.48)	(2.52)	(2.54)	(2.43)	(2.41)	(2.31)	(2.18)	(2.09)	(2.01)	(2.34)	(2.75)	(3.97)
14	LT-8	6.35	6.43	6.78	6.60	6.25	5.80	5.40	4.58	4.15	5.81	8.90	19.44
		(2.62)	(2.63)	(2.70)	(2.66)	(2.60)	(2.51)	(2.43)	(2.25)	(2.16)	(2.51)	(3.07)	(4.47)
15	TC-25	7.65	7.78	7.93	7.30	6.75	6.40	6.00	4.98	4.45	6.58	9.95	22.00
		(2.85)	(2.88)	(2.90)	(2.79)	(2.69)	(2.63)	(2.55)	(2.34)	(2.22)	(2.66)	(3.23)	(4.74)
	SEm ±	0.07	0.06	0.06	0.05	0.06	0.05	0.05	0.04	0.04	0.04	0.06	0.04
	CD (p= 0.05)	0.20	0.18	0.17	0.14	0.16	0.14	0.15	0.12	0.12	0.13	0.18	0.12

* Mean of three replications Figures in the parentheses are $\sqrt{x+0.5}$ values
******Peak population

Table 2: Effect of morphological parameters of plant on incidence of leaf and capsule borer, *Antigastra catalaunalis* on sesame, (pooled, *Kharif* 2015 and 2016)

S. No.	Genotypes	Mean Caterpillar population of *A. catalaunalis* borer/ 5 plants	No. of leaves/ plant	No. of capsules/ plant	No. of branches/ plant	No. of trichomes/ mm^2
1	RT-125	4.81	177.00	93.00	22.50	12.90
2	RT-46	6.33	126.50	81.00	1.00	8.54
3	RT-127	5.44	149.00	86.00	14.00	12.49
4	RT-351	4.20	204.00	108.50	24.50	18.63
5	RT-346	4.00	212.50	111.50	28.50	22.67
6	RT-369	5.24	164.00	88.00	16.00	12.67
7	RT-340	4.36	199.00	106.50	32.50	25.92
8	RT-371	3.24	232.50	125.50	31.50	26.31
9	RT-370	3.30	232.50	124.00	36.00	26.42
10	RT-358	3.425	232.50	128.00	39.50	26.82
11	RT-356	4.68	188.50	94.00	22.00	19.00
12	RT-366	4.48	192.50	101.50	24.50	22.34
13	RT-103	4.97	173.50	89.00	19.00	18.29
14	LT-8	5.82	144.50	84.00	10.00	9.12
15	TC-25	6.53	119.50	75.50	4.50	8.90
	Correlation coefficient with leaf capsule borer (r)*		-0.99**	-0.97**	-0.96**	-0.93**

** Significant at 1% level

3. Results and Discussion

During this field experiment, the pooled analysis of data revealed that in the first observation of the study, the leaf and capsule borer population was observed on all the genotypes. The minimum population was observed on RT-371, RT-370 and RT-358 and maximum on RT-46, LT-8 and TC-25.

The population increased gradually and reached to peak in the last week of August on all the genotypes. During peak RT-371, RT-370 and RT-358 harboured minimum leaf and capsule borer population of 4.63, 4.38 and 4.18 per five plants, respectively and stood at par with each other in their degree of infestation and were regarded as least susceptible. Whereas, RT-46, LT-8 and TC-25 harboured maximum population of 7.93, 6.78 and 7.88 per five plants, respectively and remained statistically at par with each other and was regarded as highly susceptible. The other genotypes, *viz.* RT-346, RT-351, RT-125, RT-356, RT-366, RT-103, RT-356, RT-346 ranked in middle order of susceptibility. The ascending order of susceptibility in genotypes was observed to be: RT-346, RT-351, RT-125, RT-356, RT-366, RT-103, RT-356, and RT-346.

The mean population of pest in the season ranged from 3.04-6.58 per five plants on different genotypes. The minimum population was observed on RT-371(3.25/ five plants) RT-370 (3.30/ five plants) and RT-358 (3.43/ five plants) followed by RT-340 (4.35/ five plants), these genotypes were found statistically on par. The maximum population was observed on RT-46 (6.33/ five plants), LT-8 (5.81/ five plants) and TC-25 (6.58/ five plants) followed by RT-127 (5.43/ five plants) and both were found statistically at par with each other in their degree of infestation. The other genotypes, *viz.*, RT-346, RT-351, RT -125, RT-356, RT-366, RT-103, RT-356 and RT-369 were grouped in the middle order of infestation and the leaf and capsule borer population ranged from 3.99- 5.24 per five plants. A gradual increase in population build up was noticed on all the genotypes, thereafter.

Leaf, flower and capsule damage of *A. catalaunalis*

The leaf damage in different genotypes of sesame was in the range of 4.05-9.95 per cent. The minimum leaf damage was recorded on genotypes, RT-371 (4.05%), RT-370 (4.42%), RT-358 (4.93%) and RT-125 (7.38) which differed non-significantly with each other. Rest of the genotypes possessed high leaf damage. The capsule damage was in the range of 10.90- 22.00 per cent, it was minimum in genotypes, RT-371 (10.90%), RT-370 (10.78%), RT-358 (10.76%) and RT-127 (18.88%) and was at par with each other, significantly superior over rest of the genotypes and formed a non-significant group possessing high capsule damage.

Morphological parameters of plant and incidence of *A. catalaunalis*

The data showed that the number of leaves per plant bear by different sesame genotypes varied from 119.50 (TC-25) to 232.50 (RT-371). The number of capsules per plant varied from 75.50 (RT-46) to 125 (RT-371). The branches per plant varied from 1 (TC-25) to 31.50 (RT-371). The number of leaves (r= -0.99), capsules per plant (r= -96), branches per plant (r= -0.93) had significant negative correlation with that of *A. catalaunalis* population. The trichome density (8.54-26.82/ mm^2) was negatively correlated (r= -0.93) with the population of *A. catalaunalis.* The RT-46 and TC- 25 possessing high incidence of sesame leaf and capsule borer gets support from the finding of Karuppaiah and Nadarajan [13]. Earlier various genotypes of sesame were screened by Mahadeven [14], Sasikumar and Sardana [15], Tiwari and Shaw [16]., Jebaraj *et al.* [17]., Padmaja and Savitri [18], Baskaran *et al.* [19], Ahuja and Kalyan [20], Manissegaran *et al.* [21], Anandh and Selvanarayanan [22], Balaji and Selvanarayanan [23] but none of them included the genotypes of present investigations, therefore, these results could not be discussed.

4. Conclusion

Based on the statistical categorization, the genotype RT-371, RT-370 and RT-358 were considered as least susceptible; RT-346, RT-351, RT-127, RT-125, RT-356, RT-366, RT-103, RT-356 and RT-346 as moderately susceptible and LT-8, RT-46 and TC-25 as highly susceptible.

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