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Seasonal incidence of leaf webber and capsule borer, *Antigastra catalaunalis* (Dup.) on sesame in relation to abiotic factors

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Abstract

A field study on seasonal incidence of leaf webber and capsule borer, *Antigastra catalaunalis* (Dup.) on sesame was carried out at research farm College of Agriculture, Bikaner (Rajasthan) during *Kharif*, 2019. The incidence of *A. catalaunalis* initially observed from 33rd standard meteorological week (SMW) with the population of 1.01 larvae per 5 plants. The larval number reached maximum on 37th standard Meteorological week with the population of 6.40 larvae per 5 plants. The correlation between occurrence of *A. catalaunalis* and predominant weather factors revealed that both maximum ($r=0.642$) and minimum temperature ($r=0.534$), had significant positive correlation whereas, relative humidity during morning ($r=0.363$) and evening ($r=0.220$) had non-significant positive correlation with *A. catalaunalis*. The rainfall ($r = -0.363$) had shown negative correlation with larval incidence. Pod infestation initially observed on 36th standard Meteorological week with 12.12 per cent pod damage and the pod damage gradually increased reached to its peak in the 38th standard Meteorological week with 17.07 per cent.

Keywords: Abiotic factors, *Antigastra catalaunalis*, seasonal incidence, sesame

Introduction

Sesame (*Sesamum indicum* L.) commonly called as Til, is one of most ancient and important oilseed crops cultivated over 5000 years by human beings. It belongs to family Pedaliaceae and described as 'Queen of Oilseed crops' for its high oil content (46-52%) and high protein content (18-20). The information on seasonal incidence was however, generated by many researchers in different regions across India, but in semi-arid region of Rajasthan, there is need of investigation. The leaf webber and capsule borer, *Antigastra catalaunalis* (Dup.) as one of the major pest of sesame in India, that caused economic losses in crop yield. This pest is active from germination to till the harvest of the crop, so called this pest as Key pest of sesame (Thakur and Ghorpade, 2006) ^[9]. The larvae web together the top leaves or bore into tender shoots and capsules and feed on them. The damage results in webbed leaves at top with young caterpillars, bored shoots, flower buds and pods in case of severe infestation the yields are drastically reduced. 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 capsules resulting in upto 72 per cent loss in yield (Ahirwar *et al.* 2010) ^[1]. Among the many factors for the low productivity of this crop in India one of the most important one is infestation caused by the sesame leaf and capsule borer, *A. catalaunalis* which causes a heavy seed yield loss upto 90 per cent (Ahuja and Kalyan, 2002).

Seasonal incidence of *A. catalaunalis* and their relation with abiotic factors like temperature and relative humidity. Correlation study helps in providing suitable data *i.e* the manner in which incidence of *A. catalaunalis* and their relation with abiotic factors. The present experiment was conducted for further understanding of the role played by the abiotic factors in the incidence of insect pest which is harmful to the crop which ultimately will help the sesame growers for better return in terms of yield as well as income generation.

Materials Methods

The field studies of seasonal incidence of sesame leaf webber and capsule borer, *A. catalaunalis* was estimated under natural condition at the College of Agriculture, Bikaner (Rajasthan) during *Kharif*, 2019. The region falls under agro-climatic zone I C, ('Hyper arid partially irrigated western plain zone') of Rajasthan and agro climatic zone xiv (western dry

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region) of India. The climate of this zone is typically arid, which is characterized with low rainfall and wide range of temperature in summer and winter. During summers, temperature may go as high as 48 °C while in winters, it may fall as low as 0 °C. The average annual rainfall of the locality varies 250 mm through 80 per cent of this rainfall is received during last week of June to September. The relative humidity varies between 10 to 85 per cent and frost is not uncommon during winters.

Experimental Design: Sowing of sesame variety RT-351 was done on 23rd of July, 2019 in the plot measuring 10x10 m keeping row to row and plant to plant distance of 30 cm and 10 cm, respectively. All agronomic practices were followed as per recommendation of package of practices of zone 1C.

Observations: The population of sesame leaf webber and capsule borer was recorded from five quadrates of each sized 2 x 2 m² were fixed and five plants were selected randomly and tagged from each quadrates. Timely visits of the experimental field were made to observe the occurrence of sesame leaf webber and capsule borer larva. As soon as the larval population appeared, the number of leaf webber larvae per plant and number of damaged and healthy pods per plant were counted in early morning hours at weekly interval from appearance to harvesting of the crop.

Interpretation of data: The simple correlation was worked out between larval population and abiotic factors of environment (maximum and minimum temperatures, average relative humidity and rainfall). Correlation between leaf webber larval populations computed. Following formula was used for calculating correlation coefficient.

$$r_{X_1Y_1} = \frac{\sum X_1Y_1 - \frac{\sum X_1 \sum Y_1}{n}}{\sqrt{\left[\sum X_1^2 - \frac{(\sum X_1)^2}{n} \right] \left[\sum Y_1^2 - \frac{(\sum Y_1)^2}{n} \right]}}$$

Where,

$r_{X_1Y_1}$ = Simple correlation coefficient

X_1 = Independent variable i.e. abiotic component

Y_1 = Dependent variable i.e. larval population and per cent pod damage

n = Number of observations

Results and Discussion

The incidence of leaf webber and capsule borer, *A. catalaunalis* was recorded during *Kharif*, 2019 on sesame variety RT-351 has been presented in Table-1. The observations recorded in the seasonal incidence were number of larvae per five plants and per cent pod damage along with meteorological parameters, viz., minimum and maximum temperature, relative humidity and rainfall. The population of leaf webber *A. catalaunalis* was recorded at weekly intervals starting from 13-8-2019 to 25-11-2019. The occurrence *A. catalaunalis* (1.01 larvae/5 plants) was first noticed on 25 days after sowing at the time when the maximum and minimum temperatures were 35.7 °C and 26.8 °C, relative humidity during morning and evening were 83.7 and 68.3 per cent and rainfall of 21.0 mm. These results are in accordance with Cheema and Singh (1987) [6] who reported that the pest continued to breed on sesame crop from August to till the end of September in early maturing varieties and upto November in late maturing varieties. The similar results are found in the investigation of Kumar and Goel (1994) [7] observed that

sesame leaf webber, *A. catalaunalis* (Dup.) infestation during late September to mid-October.

The larval number reached maximum on 37th standard Meteorological week (second week of September) when the maximum and minimum temperatures were 40.7 °C and 26.8 °C, relative humidity during morning and evening were 83.0 and 63.3 per cent. The present investigation are in accordance with Singh and Prasad (1992) who reported that the incidence of *A. catalaunalis* (Dup) started on sesame from August and maximum number of insect was recorded in 2nd week of September around 5.6 insect/plant. Similar results were found in the investigation of Singh *et al.* (1992) stated that maximum number of populations of *A. catalaunalis* (Dup) were recorded during 1st and 2nd week of September. Author also reported that peak stage population during early 15 days of September. The present investigation is in accordance with Ahirwar and Banerjee (2009) [2] conducted field trail and reported that the incidence of larval and adult population of *A. catalaunalis* (Dup) were maximum at 32nd Meteorological week. Thereafter larval number started decreasing recorded lowest of 1.20 larvae per 5 plants on 46th standard meteorological week (second week of November) when the maximum temperature and minimum temperature were 25.5 °C and 13.3 °C, relative humidity during morning and evening were 80.1 and 58.6 per cent and with rainfall of 9.6 mm.

The correlation between occurrence of leaf webber, *A. catalaunalis* and predominant weather factors revealed that both maximum atmospheric temperature ($r=0.642$) and minimum atmospheric temperature ($r=0.534$), had significant positive correlation with the population fluctuation of leaf webber, *A. catalaunalis* in sesame field. Whereas, relative humidity during morning ($r=0.363$) and evening ($r=0.220$) had non-significant positive correlation with incidence of *A. catalaunalis*. The rainfall ($r -0.363$) had shown negative correlation with larval incidence. The result of present findings are in accordance Vishnupriya *et al.* (2003) [10] who reported that the relative humidity during morning and evening showed a non-significant positive correlation with the incidence of this pest. Pest incidence were positively correlated with maximum and minimum temperature. The result of present findings are in accordance Ahuja (1989) [4] who reported that Rainfall had a negative effect on the abundance of various insect pests of sesame. Similar results were reported by Rakholiya (2000) [8] where they observed that maximum temperature and sunshine was found favourable for this pest.

As the occurrence of leaf webber larvae was first noticed on 25 days after sowing but capsule infestation was first noticed on 36th standard Meteorological week with 12.12 per cent pod damage at the time when the maximum and minimum atmospheric temperatures were 38.8 °C and 27.4 °C, relative humidity during morning and evening were 90.7 and 59.7 per cent and with no rainfall. The pod damage reached maximum on 38th standard Meteorological week (third week of September) with 17.07 per cent at the time when the maximum and minimum temperatures were 38.1 °C and 25.4 °C, respectively, relative humidity during morning and evening were 90.3 and 57.9 per cent and with no rainfall. As the crop matures there were decrease in pod damage, lowest pod damage recorded in the 47th standard Meteorological week with 1.89 per cent.

Table 1: Seasonal incidence of leaf webber and capsule borer *A. catalaunalis* on sesame during *Kharif*, 2019.

S.M.W.	Duration		Temperature (°C)		Relative Humidity (%)		Total Rainfall (mm)	Number of larvae / 5 plants	Pod damage (%)
	From	To	Max.	Min.	Morning	Evening			
33	13-08-2019	19-08-2019	35.7	26.8	83.7	68.3	21.0	1.01	0.00
34	20-08-2019	26-08-2019	38.0	26.7	85.1	62.9	0.0	1.84	0.00
35	27-08-2019	02-09-2019	35.8	26.0	87.4	62.7	41.8	4.40	0.00
36	03-09-2019	09-09-2019	38.8	27.4	90.7	59.7	0.0	6.22	12.12
37	10-09-2019	16-09-2019	40.7	26.8	85.0	63.3	0.0	6.40	16.22
38	17-09-2019	23-09-2019	38.1	25.4	90.3	57.9	0.0	5.56	17.07
39	24-09-2019	30-09-2019	35.1	24.4	83.7	60.0	0.8	5.18	16.67
40	01-10-2019	07-10-2019	32.6	20.6	82.6	55.3	28.8	4.12	15.91
41	08-10-2019	14-10-2019	35.6	19.1	73.6	34.0	0.0	3.40	14.89
42	15-10-2019	21-10-2019	35.2	18.9	67.4	32.4	0.0	3.16	12.24
43	24-10-2019	28-10-2019	35.1	15.8	64.6	35.7	0.0	2.88	10.00
44	29-10-2019	04-11-2019	31.6	17.6	78.9	46.6	8.4	2.26	8.00
45	05-11-2019	11-11-2019	29.7	12.8	86.4	34.4	1.4	2.14	9.62
46	12-11-2019	18-11-2019	25.5	13.3	80.1	58.6	9.6	1.2	3.85
47	19-11-2019	25-11-2019	28.0	11.9	79.1	42.3	0.0	0.00	1.89

The results of present findings are in accordance Cheema (1981) [5] who reported that incidence of sesame *A. catalaunalis* (Dup.) under field condition where they concluded that the damage by *A. catalaunalis* in various parts of sesame crop as they mentioned 9.5 per cent of pods are damaged due to this pest. Kumar and Goel (1994) [7] who reported that *A. catalaunalis* was resulted damage of 66.31% seed per pod. The correlation between per cent pod damage due to *A. catalaunalis* in sesame and predominant weather factors revealed that both maximum ($r=0.560$) and minimum

atmospheric temperature ($r=0.686$), had significant positive correlation. Whereas, relative humidity during morning ($r=0.356$) had shown positive correlation and while during evening ($r=0.583$) had significant positive correlation with pod damage due to *A. catalaunalis*. The rainfall ($r=0.108$) has shown non-significant positive correlation with per cent pod damage. Similar results were found by Ahirwar and Banerjee (2009) [2] who reported that rainfall and maximum temperature were significantly and positively correlated with pest populations.

**Fig 1:** Damage Symptoms of *A. catalaunalis*

Conclusion

As per the field studies sesame leaf webber and capsule borer, *A. catalaunalis* were recorded as major pest of sesame during *Kharij*, 2019. Sesame leaf webber *A. catalaunalis* is major constraint in sesame from seedling to maturity of the crop. The initial observation on incidence of *A. catalaunalis* was noticed on 25th days after sowing *i.e* in the 2nd week of August. The peak larval population was noticed on second week of September. Maximum of 6.40 larvae per 5 plants were noticed at peak stage. Maximum pod damage (17.07%) was observed on the 38th standard meteorological week *i.e* third week of September.

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