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CONTENTS

Population dynamics of major insect pests of sesame and their correlation with meteorological factors

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ABSTRACT: The study was performed to study seasonal incidence of major pests affecting sesame from July to September at Pantnagar,2021. The occurrences of till hawk moth*Acherontia Styx* Westwood; Bihar hairy caterpillar *Spilarctiaobliqua* Walker; leaf webber*Antigastracatalaunalis*(Duponchel); whitefly *Bemisiatabaci* Gennadius and leaf hopper *Orosius albicinctus* Distant were monitored during this period. The findings reveal specific patterns of pest emergence and population dynamics. Till hawk moth larvae initially appeared at the end of July, reaching peak infestation by late August before declining and disappearing by the end of September. The population showed various correlations with abiotic factors, with significant positive correlations observed with minimum relative humidity and rainfall. Similarly, Bihar hairy caterpillar and leaf webber showed distinct emergence patterns and correlations with meteorological parameters. Whitefly incidence started in late July, peaking in late August, with correlations indicating positive associations with minimum temperature, maximum relative humidity,minimum relative humidity and rainfall. Leaf hopper population dynamics showed an initial increase from early August to mid-September, with correlations suggesting positive relationships with maximum temperature, wind velocity,evaporation and sunshine hours.

Key words: Defoliators, Sesamum, sucking pest

Sesame (*Sesamum indicum* L.) is India's oldest indigenous oilseed crop and has been cultivated for the longest period. It is an erect annual herb that belongs to the Pedaliaceae family. The oil content of sesame seeds ranges from 52 to 57 per cent, with 25 per cent protein (Dudley *et al.,* 2000). It is also known as the "Queen of oil seeds" due to high natural antioxidants known as lignin. Sesame is cultivated an estimated area of about 11.7 million hectares in worldwide (FAOSTAT, 2020). In India, sesame is grown in 10.226 lakh hectare with total production of 6.575 lakh tons and yield of 405kg/ha. Major sesame cultivating states are Madhya Pradesh, Rajasthan, West Bengal, and Gujarat contributing area of 3.150, 2.797, 2.634 and 1.657 lakh hectare, respectively (FAOSTAT, 2020).Sesame yield varies only because of extensive damage caused by multiple insect pests. Among 67 insect pests damaging sesame crop the leaf Webber and capsule borer (*Antigastra catalaunalis*), Leaf hopper (*Orocious albicinctus*) White fly (*Bemisia tabaci)*, mirid bug (*Crytopeltis tenuis*), Bihar hairy caterpillar (*Spilarctia oblique*)and Til hawk moth (*Acherontia Styx*)are key pests of regular occurrence. Solely sesame leaf webber and capsule borer, *A. catalaunalis*(Lepidoptera: Pyralidae) causes up to 90% losses (Panday *et al.,* 2018). The main components of any pest management programmeare to study the incidence period of the pest, population distribution on crops and regular monitoring or survey of field.Weather parameters will provide the basic information about seasonal occurrence of insect pest and their predators. This also provides an opportunity to develop important management strategies for the control of major pests.Since no such work has been reported on pest complex on sesame ecosystem in Pantnagar region will assist in designing pest monitoring system and ecological sound integrated pest management modules.

MATERIALS AND METHODS

Investigations of insect fauna associated with sesame were conducted at Norman E. Borlaug Crop Research Centre, G. B. Pant University of Agriculture and Technology, Pant Nagar (Uttarakhand) during the *kharif* season of 2021-22. The study covered the entire growth cycle of the sesame crop, starting from the seedling stage till the maturity stage. To investigate the effect of abiotic factors on the abundance of major defoliators

associated with sesame, the data on the seasonal incidence of major insect pests of sesame *i.e.*, Leaf Webber and roller, til hawk moth, Bihar hairy caterpillar, Whitefly, Leafhopper were recorded on weekly basis. Total 10 plants were selected randomly from three sites of the plot. The number of larvae per plant for defoliators and for sucking pests' number of adults and nymphs per plant were counted. The meteorological data was obtained from meteorological observatories located at Norman E. Borlaug Crop Research Centre, Pantnagar thereafter, incidence of pests was correlated with the abiotic factors.

RESULTS AND DISCUSSION

Seasonal incidence of Til hawk moth: Acherontia Styx Westwood

As given in Table 1seasonal incidencedata revealed that till hawk moth first appeared on 30th standard meteorological week (last week of July) with initial larval population of 0.73 larvae/plant and reached its peak infestation with 3.43 larvae/plant on 35th standard meteorological week (last week of August).Then onwards population starts declining and disappeared during 39thstandard meteorological week (last week of September) due to the maturity of crop. The effect of various abiotic factors on the larval population of till hawk moths showed a non-significant but positive correlation with minimum temperature, maximum relative humidity, and wind velocity, each having a correlation value of 0.067. Similarly, the larval population of till hawk moths exhibited non-significant but positive correlations with minimum temperature, maximum relative humidity, and wind velocity, with correlation values of 0.067, 0.460, and 0.194, respectively. Whereas in case of maximum temperature and sunshine hours the population of till hawk moth larvae is non-significantly and negatively correlated with the incidence of till hawk moth correlation value (-0.462 and -0.514) respectively. The population of till hawk moth larva is significantly positively correlated with minimum relative humidity and rainfall (0.652*, 0.738*) respectively whereas significantly negative correlated with evaporation -0.636*.Bondre *et al.* (2016) reported similar findings for hawk moth with significant correlation of meteorological parameters *i.e.,* minimum temperature, relative humidity and vapour pressure with the population of hawk moth, *Acherontia Styx.*

Seasonal incidence of Bihar hairy caterpillar: Spilarctia obliqua, Walker

The data presented in Table 1 shows that the Bihar hairy caterpillar first appeared during the 30th standard week (last week of July) with an initial larval population of 1.57 larvae per plant. The population reached its peak at 8.23 larvae per plant during the 36th standard week (first week of September). Correlation matrix revealed that *S. obliqua* damage showed positive correlation with the minimum relative humidity, rainfall, sunshine, and wind velocity with a correlation of 0.078, 0.178 and 0.206, 0.481respectively. But negative correlation of -0.192, -0.201 and -0.054, -0.294 was observed with maximum temperature, minimum temperature, maximum relative humidity, and evaporation respectively**.**Gangwar*et al.* (2014) reported that the population of Bihar hairy caterpillar is negatively correlated with the maximum temperature and positively correlated with relative humidity.

Seasonal incidence of leaf webber: Antigastra catalaunalis (Duponchel)

The data in Table 1 shows that the leaf webber population ranged from 1.4 to 8.23 larvae per plant, with peak infestation reaching 8.23 larvae per plant during the 35th standard meteorological week (last week of August).The population then begins to decline and reaches 1.4 larvae per plant during the 39th standard meteorological week (last week of September) due to the maturity of crop. Population of Leaf webber larvae is correlated positively with different abiotic factors such as minimum temperature, maximum relative humidity and wind velocity, with coefficients of 0.336, 0.505 and 0.281, respectively. Maximum temperature, evaporation and sunshine hours had a negative correlation with the larval population, with a correlation coefficient of -0.510, -0.574, -0.592.While, minimum relative humidity and rainfall was found to be positively non-significantly correlated with *A.*

Table 1: Seasonal incidence of the insect pests on sesame at Pantnagar, during the *kharif* season of 2021-22

SMW	Date of observation	Till hawk moth	Leaf webber	Bihar hairy caterpillar	Whitefly	Leaf hopper	Weather parameter						
							Temperature		RH (%)		Rainfall (mm)	Sunshine (hr)	Wind velocity (km/hr)	Evaporation
							Max. temp.	Min. temp.	Max. R.H.	Min. R.H.				
30	27-07-2021	0.73	4.4	1.57	1.32	0	32.1	26.6	88	74	33.8	4.1	5.2	4.3
31	01-08-2021	1.17	4.8	2.57	1.62	0.7	33.4	26.3	86	66	19.6	6.4	6.4	4.5
32	08-08-2021	1.7	5.33	2.87	5.67	0.8	33.7	26.2	85	66	12.2	6.2	3	4.5
33	15-08-2021	2.5	5.9	3.47	7.32	1.2	33.4	25.8	90	69	96.7	4.4	3.5	4.3
34	22-08-2021	3.37	7	4.43	8.43	0.8	31.4	25.4	91	79	60.4	2.3	4.6	3
35	29-08-2021	3.43	8.23	6.17	4.23	1.5	31.4	25	89	75	114.6	3.1	4.5	3.2
36	05-09-2021	2.23	5.37	8.23	2.34	2.3	33	25.7	85	62	0	9	7.2	4.1
37	12-09-2021	1.47	4.17	5.2	1.08	2.5	33.5	24.7	84	69	27.2	6.7	4.3	4.9
38	19-09-2021	0.6	3.23	3.23	0.83	1.3	32.2	24.8	90	63	9.4	5.5	2.9	3.8
39	26-09-2021	0.37	1.4	2.03	0	1.4	33.4	24.2	84	58	0	7.4	3.1	4.3

*catalaunalis*population with correlation coefficient 0.752 and -0.759 respectively.These are narrated in Table 2

Bharodia *et al.* (2007) reported that the leaf roller population peaked during the last week of September. Kumar and Goel (1994) found that an average weekly temperature of 28.85ºC to 29.75ºC and relative humidity of 71.21% to 72.21%, combined with rainfall, were the most favorable environmental conditions for a rapid population increase. Additionally, Kumar *et al*. (2012) reported that *A. catalaunalis* was negatively correlated with maximum temperature.

Seasonal incidence of whitefly: Bemisia tabaci, Gennadius

The data given in Table 2 revealed that the incidence of whitefly was observed from 30th standard meteorological week with 1.32 mean population per plant. Then onwards the population continued to fluctuate and reached its peak activity on 34th standard meteorological week with 8.43 mean population per plant. Data is presented in Table 2 Correlation studies revealed that whitefly population showed positive correlation with minimum temperature, maximum relative humidity, minimum relative humidity and rainfall with correlation coefficient 0.285, 0.612, 0.611 and 0.612 respectively whereas maximum temperature, sunshine, wind velocity and evaporation show negative correlation with population of whitefly and have the correlation coefficient of -0.245, -0.596, -0.134 and -0.473 respectively.

Whitefly incidence started from vegetative stage to pre-maturity stage of crop, and these are the major source of causing yellow mosaic virus and leaves becomes yellowish (Byrne and Bellows Jr., 1991). Selvaraj and Ramesh (2012) found that the population of *B. tabaci* correlated positively with minimum temperature. Gaur *et al.* (2015) observed that the population of white fly is negatively correlated with maximum temperature, while in case of maximum relative humidity and rainfall they observed that the population of white fly is positively correlated.

Seasonal incidence of leaf hopper: Orosius albicinctus Distant

The data given Table 1 revealed that the initial incidence of leaf hopper population was observed from 31st standard meteorological week with 0.7 mean population per plant. Then onwards the population gradually increased and reached its peak activity on 37th standard meteorological week with 2.50 mean population per plant. The population then starts declining 1.4 mean population of leaf hopper.Population showed positive correlation with the maximum temperature, wind velocity, sunshine, and evaporation with correlation coefficient of 0.256,

Table 2:Correlation of insect pest on sesame with abiotic factorsduring the *kharif* season of 2021-22

S. No.	Common Name	Weather parameter							
		Temperature		RH (%)		Rainfall	Sunshine	Wind velocity	Evaporation
		Max. temp.	Min. temp.	Max. R.H.	Min. R.H.	(mm)	(hr)	(km/hr)	
1	Till Hawk moth	-0.462	0.067	0.46	0.652*	0.738*	-0.514	0.194	-0.636*
2	Bihar hairy caterpillar	-0.192	-0.201	-0.054	0.078	0.178	0.206	0.481	-0.294
3	Leaf webber	-0.51	0.336	0.505	0.752*	0.759	-0.592	0.28	-0.574
4	Whitefly	-0.245	0.286	0.612	0.611	0.612	-0.596	-0.134	-0.473
5	Leafhopper	0.256	-0.615	-0.43	-0.355	-0.101	0.53	0.107	0.156

0.107, 0.530 and 0.156, respectively. While in case of maximum relative humidity and rainfall, the population of leaf hopper is negatively correlated with leaf hopper with correlation coefficient -0.430 and -0.101, respectively.Correlation coefficientis narrated in Table 2

Yadav *et al.* (2015) reported that leaf hopper is positively correlated with maximum temperature and sunshine. Kumar *et al.* (2012) also reported that the population of leaf hopper is positively correlated with maximum temperature andnegatively correlated with rainfall. Ahirwar*et al.* (2009) noted that population of leaf hopper is negatively correlated with minimum relative humidity and relative humidity.

CONCLUSION

The investigation into the seasonal incidence of major pests affecting sesame crops at Pantnagar provides valuable insights into the dynamics of pest populations and their relationships with meteorological parameters. The study identified specific emergence patterns for till hawk moth, Bihar hairy caterpillar, leaf webber, whitefly, and leaf hopper, shedding light on their lifecycle and environmental habits. Correlation analyses revealed significant associations between pest populations and abiotic factors such as temperature, humidity, rainfall, wind velocity, and sunshine hours. The positive correlations observed between pest populations and certain meteorological, underscore the importance of understanding climatic influences on pest behavior and population growth. Overall, this research enhances our understanding of the factors influencing pest infestations in sesame crops and provides a scientific basis for the development of targeted pest management practices. By incorporating knowledge of pest ecology and environmental dependencies, farmers and agricultural practitioners can adopt more sustainable and effective approaches to pest control, ultimately improving crop yields and agricultural productivity.

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