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Study the Seasonal Incidence of Major Sucking Insect-Pests of Sesame (*Sesamum indicum*, L.) Crop

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was carried out at the experimental farm of Project Coordinating Unit Sesame and Niger (ICAR), College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh) during summer season, 2022. The results revealed that the peak period for the incidence of whitefly and mirid bug were recorded in 19th standard week while peak period for the incidence of leafhopper was recorded in 20 standard week. The 40°C maximum and 24°C minimum temperature and 59% morning and 30% evening relative humidity were found

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congenial for the multiplication of whitefly and mirid bug while 41.70°C maximum and 27.60°C minimum temperature and 52% morning and 28% evening relative humidity were found congenial for the multiplication of leafhopper.

Keywords: Weather variables; sucking insect pests; sesame; whitefly; mirid bug; leafhopper.

1. INTRODUCTION

Sesame is one of the world's oldest oil seed crop grown mainly for its seeds that contain approximately 48 to 52% oil and 25% protein. In India, sesame can be grown in all the seasons. Trials have shown that summer sesame crop with sufficient irrigation can yield double the production of sesame yield. But the yield potential of summer season sesame has not been fully realized due to number of biotic and abiotic factors. Among the various biotic factors responsible for crop damage during summer season the attack of sucking insect pests (leafhopper, whitefly and mirid bug) impose severe loss. Due to attack of sucking insect pests the leaf margin curl down and turned yellow resulting in to stunted growth of the plants, sickly appearance and subnormal growth of the leaf tissue occurs. Besides this leafhopper and whitefly are also responsible for transmitting phyllody and leaf curl disease in sesame, respectively Ahirwar et al. [1]. Phyllody causes up to 80% yield loss Salehi et al. [2]. The peculiar yellow spots are found on upper surface of leaves affected by whitefly. As insects are cold blooded creatures, weather plays an important role on the population fluctuation and distribution of them. The degree of influence of various environmental factors determined the magnitude of increase or decrease in the number of a pest population. Temperature, rainfall and relative humidity are the major weather parameters influencing the pest incidence. Information on peak periods for the incidence of insect pests in particular agro climatic condition is a prerequisite, which helps in designing a successful pest management strategy [3-5]. Similarly among the ecofriendly management measures the use of resistant/tolerant varieties is one of the effective alternatives and will not have adverse effect on the ecosystem it can be integrated into ecologically sound integrated pest management programmes. In this context, the present study aimed to study the influence of weather variables on the incidence of sucking insect pests.

2. MATERIALS AND METHODS

The observations were started from one week after germination and continued till the maturity of the crop. The population of insect pests and natural enemies were recorded in each standard week on five plants from ten spots selected randomly. The population of sucking insect pests (leafhopper, whitefly and mirid bug) were recorded by counting the number of nymphs and adults/six leaves/plant (2 leaves each from top, middle and bottom). The population of ladybird beetle was recorded by counting the number of adults/plant while the population of spider was recorded by counting the number of spider/plant. Correlation and regression of the abiotic factors on sucking insect pest population were worked out by using the formula as suggested by Snedecor and Cochran [6].

3. RESULTS AND DISCUSSION

3.1 Whitefly [*Bemisia tabaci* (Genadius)]

The observations were recorded on 10 plants from randomly selected five spots. The incidence of whitefly was noticed from 11^{th} standard week (1.54 whitefly/six leaves/plant) and continued till maturity of the crop (2.52 adults/six leaves/plant). The maximum population of whitefly (2.94 whitefly/six leaves/plant) was recorded in 19^{th} standard week when the maximum and minimum temperature was 40°C and 24°C, respectively with morning and evening relative humidity 59 percent and 30 respectively. Present findings are inconformity with the findings of Watson et al. [7] they reported that temperature above 30˚C are congenial for the multiplication of whitefly while temperature above 40˚C reduced the life cycle of whitefly. Rakesh *et al.* (2009) reported that the whitefly *Bemisia tabaci*, remained active from the vegetative stage of the crop and the peak population was recorded in the 36th standard week.

Correlation studies carried out between meteorological parameters and population of whiteflies. Whitefly population showed significant positive correlation with maximum temperature (r= 0.90), minimum temperature(r= 0.79), vapor pressure morning (r=0.60) and evaporation (r= 0.85). Present findings are partially supported by the findings of Ahirwar et al. [8] they reported that the whitefly population (*Bemisia tabaci*) showed significant positive correlation with maximum temperature and rainfall whereas it showed significant negative correlations with minimum temperature and relative humidity.

3.2 Leafhopper [*Orocious albicinctus* (Distance)]

The incidence of leafhopper was noticed from 9th standard week (1.30 leafhopper/six leaves/plant) and continued till maturity of the crop. The maximum population (2.54 leafhopper /six leaves/plant) of leafhopper was recorded in 20th standard week when the maximum and minimum temperature was 41.70°C and 27.60°C respectively with relative humidity morning and evening 52 percent and 28 percent respectively. Correlation studies carried out between meteorological parameters and population of Leafhopper and found that leafhopper population was non -significant positive with rainfall (r= 0.23), temperature minimum (˚C) (r= 0.15), relative humidity morning (r= 0.14), relative humidity (evening) (r= 0.42), wind speed (km/hr) (r= 0.40), vapor pressure (morning) (r= 0.17), and vapor pressure (evening) (r= 0.36), while it showed non-significant negative correlation with temperature maximum (˚c) (r= -0.18), sunshine hours (r= -0.67), and evaporation (mm) (r= -0.01). With biotic factors spider (r= 0.049) and ladybird beetle population (r= -0.551) it showed non- significant positive correlation and non-significant negative, respectively.

Table 1. Seasonal incidence of sucking insect-pests of sesame and their natural enemies

SMW	Met. Week	Average no. of nymphs and adults/six leaves/plant			No. of natural enemies/plant	
		Leaf hopper	Whitefly	Mirid bug	Spider	Ladybird beetle
09	February 26 – March 04	1.30	0.00	1.00	0.02	0.00
10	March 05 - 11	0.96	0.00	1.34	0.06	0.06
11	March 12 - 18	1.00	1.54	1.94	0.08	0.08
12	March19 - 25	0.88	1.50	1.28	0.12	0.14
13	March 26 - April 01	0.62	2.76	3.28	0.18	0.20
14	April 02 - 08	0.56	2.24	3.56	0.18	0.24
15	April 09 - 15	0.38	1.58	4.54	0.24	0.12
16	April 16 - 22	0.60	2.18	5.06	0.22	0.24
17	April 23 - 29	0.44	2.34	5.22	0.28	0.32
18	April 30 - May 06	0.44	2.80	5.68	0.22	0.28
19	May 07 - 13	0.16	2.94	6.22	0.24	0.26
20	May 14 -20	2.54	2.52	5.98	0.34	0.12

SMW= Standard meteorological week

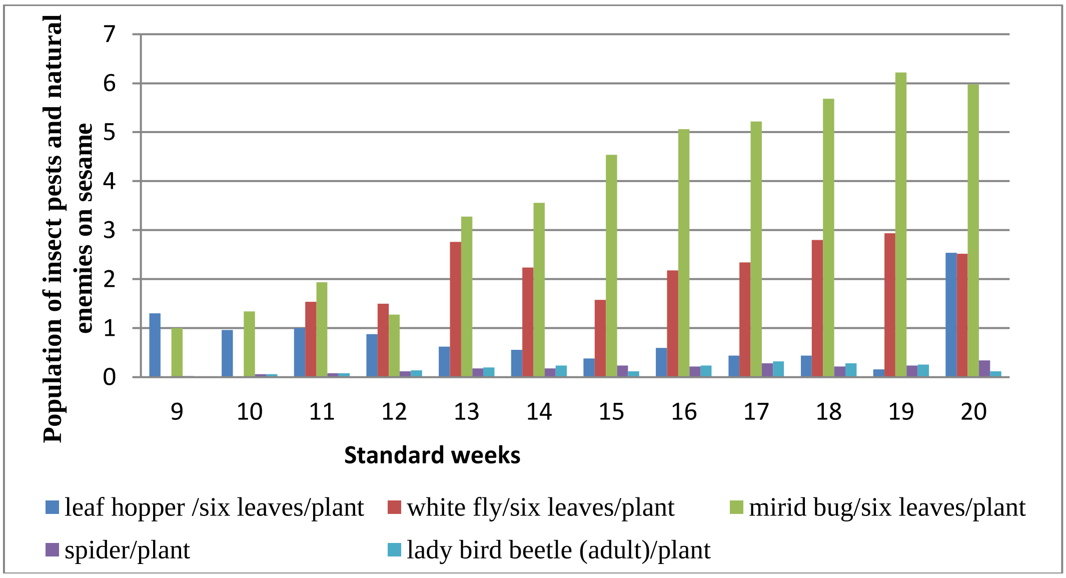

Fig. 1. Seasonal incidence of sucking insect pests of sesame and their natural enemies during summer, 2022

Table 2. Correlation coefficient of sucking insect-pests of sesame with biotic and abiotic factors

Insects pest and natural enemies	Correlation coefficient (r)											
	Rainfall (mm)	Temp.(^{0} C)		RH (%)		Sun. (hrs)	Wind speed	Vapor pr. mm		Evap pr. mm	Spider/plant	Ladybird beetle/plant
		Max.	Mini.	Mor.	Eve.			Mor.	Eve.			
Leafhopper	0.23	-0.18	0.15	0.14	0.42	-0.67	0.40	0.17	0.36	-0.01	0.049	-0.551
Whitefly	-0.59	0.90**	0.79**	-0.75	-0.59	0.10	0.36	0.60*	0.22	0.85**	0.049	0.815**
Mirid bug	-0.44	0.87**	0.89**	-0.93	-0.27	-0.01	0.66*	0.71**	0.55	0.95**	0.920**	0.718**
Spider	-0.53	0.92**	0.89**	-0.89	-0.44	-0.21	0.52	0.74**	0.41	0.89**	-	-
Ladybird beetle	-0.55	0.78**	0.52	-0.74	-0.60	0.43	0.18	0.33	0.04	0.73**	-	-

Present findings are corroborated with the findings of Ahirwar et al. [8] they reported that maximum temperature and rainfall showed significant positive correlation with the incidence of leafhopper whereas the minimum temperature and relative humidity were showed significant negative correlation with the population of leafhopper.

3.3 Mirid bug [*Nesidiocoris tenuis* (Reuter)]

Incidence of mirid bug was noticed from 9th standard week (1.00 mirid bug /six leaves/plant) and continued till maturity of the crop (5.98 mirid bug /six leaves/plant). The peak population of mirid bug (6.22 mirid bug /six leaves/plant) was recorded in 19th standard week when the maximum and minimum temperature was 40°C and 24°C, respectively with relative humidity morning and evening were 59 percent and 30 percent respectively. A similar finding is reported by Ahirwar et al. [8] they reported that mirid bug population was maximum in between 32nd to 37th meteorological weeks.

Correlation studies carried out between meteorological parameters and population of mirid bug. The population of mirid bug showed significant positive correlation with maximum temperature (r=0.87), minimum temperature(r=0.89), wind speed (r=0.66), vapor pressure morning (r=0.71) and evaporation (r=0.95). Present findings are supported by the findings of Ahirwar et al. [8] they correlated the population of mirid bug with meteorological factors and reported that maximum temperature and rainfall showed significant positive correlation with the population of pest whereas the minimum temperature and relative humidity were showed significant negative correlation with the population of mirid bug. While Neeraj et al. reported that the mirid bug *Nesidiocoris tenuis* showed a positive correlation with morning RH, and a significantly negative one with maximum temperature and evaporation [9,10].

3.4 Spider

The activity of spider was noticed in 9th standard week (0.02 spider/plant) and continued till maturity of the crop (0.34 spider /plant). The maximum population of spider (0.34 spider/plant) was recorded in 20th standard week when the maximum and minimum temperature was 41.70°C and 27.60°C, respectively with morning and evening relative humidity 52 percent and 28 percent respectively. Correlation studies carried out between meteorological parameters and population of spider. The population of spider showed significant positive correlation with maximum temperature (r=0.92), minimum temperature (r=0.89), vapor pressure morning (r=0.74) and evaporation (r=0.89) [9,10].

3.5 Ladybird beetle (*Coccinella septumpuctata* L.)

Ladybird beetle first seen on the crop in 10th standard week (0.06 adult/plant). The maximum population of ladybird beetle (0.32 adults/plant) was recorded in 17th standard week when the maximum and minimum temperature was 40.60°C and 20°C, respectively with morning and evening relative humidity 54 percent and 18 percent respectively. The population of ladybird beetle showed significant positive correlation with maximum temperature (r=0.78) and evaporation (r=0.73).

4. CONCLUSION

The peak period for the incidence of whitefly and mirid bug were recorded in 19th standard week while peak period for the incidence of leafhopper was recorded in 20 standard week. The 40°C maximum and 24°C minimum temperature and 59% morning and 30% evening relative humidity were found congenial for the multiplication of whitefly and mirid bug while 41.70°C maximum and 27.60°C minimum temperature and 52% morning and 28% evening relative humidity were found congenial for the multiplication of leafhopper.

CONFERENCE DISCLAIMER

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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