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Sonawane ST
Department of Agricultural Entomology, College of Agriculture, V.N.M.K.V. Parbhani, Maharashtra, India

Patil BV
Department of Agricultural Entomology, College of Agriculture, V.N.M.K.V. Parbhani, Maharashtra, India

Suradkar AL
Department of Agricultural Entomology, College of Agriculture, V.N.M.K.V. Parbhani, Maharashtra, India

Shelar DR
Department of Agricultural Entomology, College of Agriculture, V.N.M.K.V. Parbhani, Maharashtra, India

Corresponding Author:
Suradkar AL
Department of Agricultural Entomology, College of Agriculture, V.N.M.K.V. Parbhani, Maharashtra, India

Population dynamics of sucking insect pests of okra

Sonawane ST, Patil BV, Suradkar AL and Shelar DR

Abstract
The population of sucking insect pest aphids, leafhoppers and thrips ranged between 4.0-34.7, 5-33.1, 3.3-28.6 pests/ 3 leaves respectively. The attack of pests commenced from 29th SMW in second fortnight of July. The peak level of sucking pests viz, aphids, leafhoppers and thrips recorded 34.7, 33.1 and 28.6 pests/ 3 leaves, respectively and peak level reached on 37 SMW, 33.7 SMW and 36 SMW, respectively. During entire study period, maximum temperature showed non-significant negative correlation with sucking pest, minimum temperature exhibited negative correlation with aphid & leafhoppers and positive with thrips, morning humidity and minimum humidity showed positive correlation with sucking pests, rainfall showed negative correlation with aphids & leafhoppers and positive with thrips.

Keywords: sucking pests, seasonal incidence, aphids, leafhoppers, thrips, population dynamics and okra

Introduction
Okra (*Abelmoschus esculentus*) or ladies finger is one of important vegetable of the tropical countries and most popular in India, Cameroon, Nigeria, Pakistan, Iraq and Ghana. Though, it is virtually not grown in Europe and North America, yet, lot of people in these countries have started liking this vegetable because of good source of vitamin A and folic acid, besides phosphorus, carbohydrates and magnesium (www.apeda.gov.in). Krishnaiah (1980) [5] estimated that leafhopper caused upto 40 to 56 per cent yield losses in okra. There is a reduction of 49.8 and 45.1 per cent in height and number of leaves, respectively due to attack of leafhopper (Rawat and Sadu, 1973) [9]. Aphids and leafhoppers are major pests during the early stage of the crop, which suck the sap from plant leaves, make them weak and reduce the fruit yield. The incidence and spread of insect pests and their natural enemies are controlled by different weather parameters viz., temperature, rainfall, wind direction and relative humidity. Data on interaction of weather parameters with insect development can play vital role in pest surveillance, forecasting, monitoring and management of pest population by timely taking management practices. Hence, an attempt have been made to study the population dynamics of insect pests and their natural enemies in relation to prevailing weather parameters, which would give an idea about peak period of pests activity so that the information can effectively be utilized in formulating pest management programme.

Material and Methods
Field experiment was conducted to study the population dynamics of major pests of okra in relation to weather Parameters. The susceptible variety of okra was sown in 100 m^2 for conduct a field trail on population dynamics. The periodical observation on okra crop for the population dynamics of insect pests were recorded throughout the growing season of crop. It was initiated at seedling emergence of crop and continued till the final harvest of crop. Randomly ten selected plants excluding the border row were selected from 100 m^2 area and number of nymph and adult of aphids, leafhopper and thrips were recorded from three leaves *i.e.* one from upper, middle and lower portion of plant. The observations were recorded since from germination to final harvest at weekly interval.

Results and Discussion
Recorded observation on population dynamics of sucking complex of okra are presented in following heads.

Aphid (*Aphis gossypii*)

The data presented in Table 1 pertaining to population dynamics of *A. gossypii* nymphs and adults and their population was observed from 29th SMW to 43rd

The population increased continuously and reached 31.7 aphids/ 3 leaves in 34th SMW and declined thereafter to 15.5 aphids/ 3 leaves in 35th SMW. The peak population 34.7 aphids/ 3 leaves noticed in 37th SMW. Findings of present investigation are in conformity with earlier work carried out by. Aarwe *et al.,* (2016) [1] who reported that *A. gossypii* was observed with 2 distinct peak level at 36 and 37 SW recorded 46.50 and 44.50 aphids/ 3 leaves. Potai and chandrakar (2018) [8] reported peak of *A. gossypii* in 40 SMW (39.24 aphid/ plant).

Table 1 : Seasonal incidence of sucking complex of okra

MW	Sucking pests/ 3 leaves			Weather parameters				
	Aphids	Leaf hopper	Thrips	Temperature (^{0}C)		Rainfall (mm)	R.H (%)	
				Max.	Min.		Morn.	Even.
29	4.0	5	0	33.85	24.15	0.00	83.64	61.27
30	9.1	7.6	3.3	29.52	23.53	0.00	87.44	76.43
31	16.2	9.9	10.2	27.35	22.85	36.40	91.14	86.02
32	25.6	11.2	16.6	28.78	22.49	17.40	90.86	80.91
33	27.5	18.8	20.9	31.10	22.47	22.50	89.70	69.27
34	31.7	26.9	23.5	32.00	22.88	0.00	85.68	67.19
35	15.5	15.9	27.9	30.56	22.90	48.00	90.03	73.98
36	25	22.6	28.6	28.52	22.79	0.00	91.60	83.05
37	34.7	33.1	24.6	29.00	22.52	2.74	91.22	80.65
38	19.6	20	20.9	30.65	22.92	55.00	91.95	77.91
39	16.2	18	16.3	30.11	22.53	0.00	91.62	72.20
40	20.7	20.5	11.2	32.71	21.91	31.60	90.06	73.63
41	8.7	17.1	9.8	31.57	21.71	23.60	87.48	63.77
42	15.1	14.2	8.3	29.55	21.11	0.00	87.36	68.73
43	12	16.2	6.6	28.15	21.47	0.00	92.74	83.24

Leaf hopper (*Amrasca biguttula bigutulla*) :

The data regarding leafhopper (Table 1) shows incidence commenced from 29th SMW 5 leafhopper/ 3 leaves and population increased gradually. Pest population reached to peak during the second week of September (37th SMW) with 33.1 leafhopper/ 3 leaves. Hedge *et al.,* (2004) [2] noticed the incidence of jassids in cotton during 2nd fortnight of August and peaked during the first fortnight of September and declined later. Yadav *et al*., (2007) [13] recorded that the jassids activity started from first week of August on 3 week old crop and continued until the third week of September on 12 week crop during 2005. The present findings are in conformity with the earlier workers.

Thrips (*Thrips tabaci*)

The incidence of thrips (Table 1) was first noticed during the last week of July (30th SMW) 3.3 thrips/ 3 leaves and reached to its peak 28.6 thrips/ 3 leave during first week of September (36th SMW). The present study are supports findings of Panickar and Patel (2001) [7] recorded the activity of thrips and noticed that the infestation of thrips was initiated in the August and continued till removal of cotton crop. The peak activity of thrips recorded in 4th August and 2nd week of September during first & second year respectively.

Correlation coefficient between sucking pest complex of okra with weather parameters.

Aphid (*Aphis gossypii*)

Data presented in Table 2 revealed that aphid population had negative non-significant correlation with maximum minimum temperature and rainfall i.e. (r= -0.205), (r= -0.112) and (r= -0.010) respectively. Whereas non-significant positive correlation with morning RH (r= 0.332), evening RH (r= 0.304). Present findings are in close agreement with the findings of Shah *et al.* (2009) [10] reported that non-significant negative correlation with rainfall. Konar *et al.,* (2013) [4] reported that the aphid population is non-significant negatively correlated with maximum and minimum temperature. Shukla (2014) [11] reported that aphid showed positive correlation with relative humidity, while negative correlation with maximum and minimum temperature.

Leaf hopper (*Amrasca biguttula bigutulla*)

It is evident from the data (Table 2) leaf hopper population had non-significant, negative correlation with maximum temperature (r = - 0.048), minimum temperature (r = -0.291) and non-significant positive correlation with morning R.H. (r= 0.324) and evening R.H. (r = 0.131), while rainfall impact was negative (r= -0.041) but it was non-significant. These findings are in agreement with Khating *et al.,* (2016) [3] who reported that the incidence of leafhoppers was negatively non-significant (r = -0.060) with maximum temperature. According to Singh *et al.,* (2013) [12] leafhopper showed negative correlation with maximum and minimum temperatures. Kumaranag (2015) [6] revealed that leafhopper population had a significant positive correlation with evening relative humidity and rainfall**.**

Thrips (*Thrips tabaci*)

The data incorporated in the Table 2 was evident of thrips population correlation between maximum temperature (r= -0.153) is negative non-significant and positive non-significant correlation with minimum temperature (r = 0.005). Morning R.H. (r = 0.425) and evening R.H. (r = 0.263) had positive impact but it was non-significant. Rainfall had also non-significant but positive correlation (r = 0.268) with thrips population. Potai and Chandrakar (2018) [8] recorded negative non-significant correlation with maximum temperature (r= -0.05) and positive significant correlation with minimum temperature (r= 0.82**) and positive significant correlation with rainfall (r= 0.76**) and positive significant correlation with morning RH (r=0.67*) and evening RH (r= 0.68) in okra.

Table 2: Correlation between sucking pest complex of okra with weather parameters.

Name of pests	Correlation coefficients (r)				
	Temperature ºC		Humidity %		Rainfall
	Maximum	Minimum	Morning	Evening	
Aphids	-0.205	-0.112	0.332	0.304	-0.010
Leaf hopper	-0.048	-0.291	0.324	0.131	-0.041
Thrips	-0.153	0.005	0.425	0.263	0.268

**(r= 0.716) is significant at 1%

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