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SEASONAL INCIDENCE OF SAP SUCKING INSECT PESTS OF COTTON

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ABSTRACT

A field experiment to record the seasonal incidence of sap sucking insect pests of cotton was carried out during May to November, 2012 at the Instructional Farm, Rajasthan College of Agriculture, Udaipur (Rajasthan). The study revealed that the incidence of sap sucking insect pests started at 26th SMW and the peak population of aphids (52.80 aphids/plant) and thrips (41.60 thrips/plant) was recorded in 41st and 40th SMW, respectively; whereas, the population of jassids and whitefly reached the peak with mean 19.80 jassids /plant and 31.87 whiteflies/plant during the 31st and 30th SMW, respectively. The jassid and whitefly population was significantly and positively correlated to mean atmospheric temperature and mean relative humidity. Aphid population was positively correlated to mean atmospheric temperature and mean relative humidity. The mean relative humidity had significant positive correlation with the population of thrips.

Key words: Seasonal incidence, sap sucking insect pests, cotton.

INTRODUCTION

Cotton (*Gossypium spp.*), an important commercial crop in Indian agriculture, is cultivated in varied agro-climatic conditions across nine major states of India covering an area of 12.19 m ha with the production and productivity of 34.70 m bales and 484 kg per hectare, respectively. India continues to maintain the largest area under cotton and is the second largest producer of cotton next to China with 34 per cent of world area and 21 per cent of world production. The important sap sucking insect pests are cotton aphid (*Aphis gossypii* Glover; Aphididae, Hemiptera); green leaf hopper, *(Amrasca biguttula biguttula* Ishida; *Empoasca* spp., Jassidae: Hemiptera); whitefly (*Bemisia tabaci* Gennadius; Aleyrodidae: Hemiptera); thrips (*Thrips tabaci* Linnman, Thripidae: Thysanoptera); red cotton bug *(Dysdercus koenigii* Fabricius, Pyrrhocoreidae: Hemiptera) and dusky cotton bug (*Oxycarenus laetus* Kirby, Lygaeidae: Hemiptera).

The sap sucking pests; jassids, *Amrasca biguttula biguttula* (Ishida); thrips, *Thrips tabaci* (Linn.); aphids, *Aphis gossypii* (Glover); and whiteflies, *Bemisia tabaci* (Genn.) cause heavy losses (Kulkarani *et al*., 2003; Satpute *et al*., 1990 and Dhawan *et al*., 1988); besides, being vectors for a number of viral diseases (Serader *et al*., 1999). The heavy infestation by nymphs and adults of sucking pests results in leaf yellowing, wrinkled leaves, leaf distortion, oily spots on leaves and retarded growth and development of plants. They also secrete honey dew which helps development of sooty mould fungus on leaves.

MATERIALS AND METHODS

The seasonal incidence of insect pests of cotton was studied for which an experiment was laid out in uniformly sized plots measuring 5m × 5m replicated six times. Variety GH-8 was grown under natural conditions in untreated plots at 90cm x 90cm row to row and plant to plant spacing during *kharif* 2012. Five plants per plot were selected randomly and tagged to record the population of insect pests during the experimental period. Observations were recorded for initiation of pest incidence and the peak period of infestation; later, the influence of abiotic factors of the environment on the pest population was studied.

Population of jassids, thrips, white flies and aphids were recorded after 30 days of germination at weekly intervals from the 5 tagged plants selected at random during morning hours between 6:30 a.m. to 8:00 a.m., when most of the insect pests are less active. The population was recorded from three leaves, one each from the basal, middle and upper portion of the 5 tagged untreated plants. The population was estimated by gently holding the leaf between the halves of petriplate (10 cm diameter) and then counting adults and the nymphs within the petriplate. However, when the nymphal stage existed direct counting of the population was done with the help of magnifying lens.

The population of aphids was counted from the five tagged plants from each plot. The counting of aphids was done on three leaves chosen from the top, middle and bottom of each plant. The marked leaf was grasped at the

petiole by thumb and four fingers and turned until the entire under surface of leaf was clearly visible. The aphid population was counted with the help of magnifying lens and was expressed on per plant basis.

Statistical analysis

Population data of different insect pests thus obtained were subjected to statistical analysis to find out the influence of abiotic factors on population computing the coefficient of correlation with the abiotic factors of the environment. Following formula was used for calculating correlation coefficient:

$$r_{xy} = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left[\sum X^2 - \frac{(\sum X)^2}{n}\right]\left[\sum Y^2 - \frac{(\sum Y)^2}{n}\right]}}$$

Where,

r_{xy} = Simple correlation coefficient

X = Variable i.e. abiotic component

(Average temperature, relative humidity and rainfall)

Y = Variable i.e. mean number of insect pests

n = Number of paired observations

The correlation coefficient (r) values were subjected to the test of significance using t-test:

$$t = \frac{r}{\sqrt{1 - r^2}} \times \sqrt{n-2}$$

The calculated t-value obtained was compared with the tabulated t-value at 5 per cent level of significance.

RESULT AND DISCUSSION

The incidence of aphids was first recorded in the 26th SMW (standard meteorological week) being 5.60 aphids/ plant that reached the peak (52.80 aphids/ plant) during the 41st SMW when the mean atmospheric temperature was 25.1 °C, relative humidity 48.30 per cent but no rainfall; however, the population decreased gradually and reached a minimum level of 5.40 aphids/plant in 47th SMW (Table: 1). In earlier studies, Soujanya *et al.* (2010) recorded the peak incidence from 39th SMW to 46th SMW, while, Bhute *et al.* (2012) observed the peak incidence of aphids (86.45/ 3 leaves) during 37th SMW.

The incidence of jassids was first noticed during the 26th SMW (2.80 jassids/ plant) that increased gradually and touched the peak (19.80 jassids/ plant) in the 31st SMW when the mean atmospheric temperature, relative humidity and total rainfall during the peak period of incidence were 25.60Ê%C, 70.40 per cent and 10.60 mm, respectively. Thereafter, the population decreased gradually and reached to a minimum level of 0.67 jassids/ plant during last week of November (47th SMW). The pest had a positive and significant correlation with temperature ($r_1 = 0.45$) as well as with relative humidity ($r_2 = 0.82$) (Table: 1). The present findings are similar to those of Dhaka and Pareek (2008) who reported that the incidence of jassids started from the last week of June (26th SMW) and reached its peak (90 jassids/30 leaves) in August, besides the relative humidity showed positive significant correlation with jassids.

Whitefly appeared from the last week of June (26th SMW) and remained active up to November (47th SMW) and the peak population (31.87 whiteflies/ plant) was observed during 30th SMW of July. The population exhibited positive correlation with mean temperature, mean relative humidity but a negative correlation with total rainfall during 2012. On the basis of data obtained under the investigation it can be concluded that the atmospheric temperature range 19.6 to 30.5 ^{0}C provides favourable conditions for the multiplication of whiteflies (Table: 1). Shanab and Awad-Allah (1982) showed that the pest reached at peak during July to October, when the weekly mean temperature varied from 20.86 to 27.58 °C and relative humidity varied from 58.30 to 66.66 per cent. Other workers observed that the peak activity of whitefly from second week of June with the peak (29.50 whiteflies/ leaves) during fourth week of July. The population showed significant and positive correlation with atmospheric temperature (Dhaka and Pareek 2008, Shivanna *et al.,*2009, Selvaraj and Ramesh 2012).

Thrips were first noticed in the last week of June (2.47 thrips/ plant) in the 26th SMW that increased gradually and touched the peak (41.60 thrips/ plant) in the 40 SMW when the mean atmospheric temperature was 26.50 Ê%C, relative humidity 52.90 per cent and zero total rainfall; thereafter, the population decreased gradually and reached a minimum level of 7.20 thrips/ plant in the 47th SMW. The pest exhibited significant positive correlation with relative humidity ($r_2 = 0.45$); whereas, with temperature the positive correlation recorded was not significant (Table: 1). These results are in conformity with findings of (Prasad *et al.,*2008, Sitaramaraju *et al.,*2010, Soujanya *et al.,*2010 and Bhute *et al.,*2012) who recorded that the major activity of thrips was during 35th to 40th SMW which reached its peak level (110.10 thrips/3 leaves) during 40th SMW, besides having a positive correlation with atmospheric temperature and relative humidity.

Table 1. Seasonal incidence of sap sucking insect pests on cotton during *kharif*, 2012

Standard Meteorological Weeks (SMW)	Abiotic Factors			Insect Pest Population (No/Plant)			
	Mean Temp. (°C)	Mean R.H. (%)	Total Rainfall (mm)	Aphids	Jassids	Whitefly	Thrips
26	30.5	49.4	0.0	5.60	2.80	1.87	2.47
27	29.6	58.9	27.7	21.40	5.20	7.17	11.33
28	26.9	68.8	104.6	17.80	8.60	15.33	26.20
29	27.7	65.4	0.0	31.20	13.80	28.33	33.67
30	27.3	67.2	4.0	35.80	16.40	31.87	32.17
31	25.6	70.4	10.6	37.20	19.80	27.00	31.87
32	26.2	79.6	65.9	38.40	18.60	17.67	29.00
33	24.3	78.0	57.4	39.80	18.20	25.17	24.43
34	26.0	75.5	16.4	43.20	17.00	29.67	26.50
35	26.8	80.4	72.4	42.00	16.00	28.33	30.75
36	25.7	84.8	162.6	36.40	12.80	12.83	23.67
37	25.7	82.6	86.4	40.80	11.20	16.87	28.70
38	26.2	73.5	0.4	46.60	9.80	26.20	38.8
39	25.7	62.9	34.0	45.20	8.40	24.87	36.83
40	26.5	52.9	0.0	49.20	9.20	13.33	41.60
41	25.1	48.3	0.0	52.80	7.60	9.17	34.87
42	24.6	48.9	0.0	48.00	5.00	5.87	27.33
43	22.7	42.9	0.0	43.40	3.80	4.00	18.67
44	20.5	48.2	0.0	29.00	2.00	2.17	15.70
45	20.2	48.1	0.0	17.60	1.60	2.00	11.00
46	20.5	45.5	0.0	11.20	1.40	1.47	9.50
47	19.6	52.1	0.0	5.40	0.67	1.33	7.20
Coefficient of correlation (r) for population and mean atm. temperature				0.19	0.45*	0.46*	0.33
Coefficient of correlation (r) for population and mean relative humidity				0.32	0.82*	0.74*	0.45*
Coefficient of correlation (r) for population and total rainfall-0.02				0.09	-0.22	-0.12	

*: Significant (p= 0.05)

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