



SUCCESSION OF IMPORTANCE INSECT PESTS OF OKRA (*ABULMOSCHUS ESCULANTOUS*) UNDER WESTERN UTTAR PRADESH CLIMATE CONDITIONS

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ABSTRACT

Study was conducted on insect pests succession in okra during *Kharif* 2013 and 2014 at Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut. Observations on importance insect pests, Whitefly *Bemisia tabaci*, Leafhopper *Amrasca biguttula biguttul*, Shoot and fruit borer *Earias Vittella* and their natural enemies like green lacewing *Chrysoperla scelestes* and lady bird beetle *Coccinella septempunctata* were recorded. The incidence of sucking pests whitefly started from second week after sowing and reached peak at ninth week after sowing the crop, leafhopper third week after sowing the crop and reached peak at tenth week after sowing and borer like shoot and fruit borer started from second week after sowing the okra crop. Whereas natural enemies started from fourth week after sowing the crop and all of these insect pests and their natural enemies population varies till the harvest the okra crop.

KEYWORDS: Okra, Insect pests, Temperature, RH and Rainfall

INTRODUCTION

Okra, *Abulmoschus esculantous* (L) Moench belong to the family Malvaceae, is commercially cultivated vegetable crops of tropical and subtropical parts of the world. India ranked first in okra production in the world. In India is cultivated area is 3.58 lakh hectares with an annual production is 35.24 lakh tonnes and productivity of 9.8 tonnes/ha (Anonymous, 2013). The major okra growing states are Uttar Pradesh, Assam, Bihar, Orissa, West Bengal, Maharashtra, Andhra Pradesh and Karnataka (Anonymous, 2013). Despite large area and quite a good number of cultivars the supply of okra in Indian market is not matching to its demand. Lower productivity would be a major reason for such un-matching demand and supply. Critical analysis for such low productivity revealed that major portion of fruits produced is being damaged by dreaded insect pests. Unfortunately many of the pests occurring on cotton are found ravaging this crop. Since both cotton and okra belong to family Malvaceae, Okra crop are attacked by a number of insect pests, during their different growth stages, which are major constraints, in getting higher yields (Kumar *et al.*, 2002). The major pests of okra include of which, the sucking pests comprising of leafhopper, *Amrasca biguttula biguttula* (Ishida), whitefly, *Bemisia tabaci* (Gennadius) and borer i.e. shoot and fruit borer causes significant damage to the crop. In sucking pests Both nymphs and adults of jassids suck the cell sap usually from the ventral surface of the leaves and while feeding inject toxic saliva into plant tissues, affected

leaves turn yellowish and curl. (Singh *et al.* 2013) White flies nymphs and adults also suck the cell sap from the leaves. The affected leaves are curled and dried. The affected plants show a stunted growth. Whiteflies are also responsible for transmitting yellow vein mosaic virus. In this paper we can study the seasonal incidence and relationship between weather parameter of leafhopper, whitefly, shoot and fruit borer and their natural enemies on okra.

MATERIALS AND METHODS

Studies on insect pests of okra were undertaken during *Kharif* 2013 and 2014 at Sardar Vallabhbhai Patel University of Agriculture and Technology Meerut. The experiment was laid out in Randomized block design in three replication. The okra seeds were sown in a plots size of 5 x 3 m² with 60 cm row spacing and 30 cm plant to plant distance. Each row consisted 10 plants and each treatment plot consisted 5 rows. Observation on the pest activity were recorded in weekly interval. Observation on sucking pest and natural enemies population, five plants per plot were randomly selected and each randomly selected plant choose five leaves from two top two middle and one lower part of the plant were observed. Observation on shoot and fruit borer infestation should be recorded per pots on the basis of shoot damage and fruit damage. The data was statistically analyzed by correlation analysis between weather parameter and pest population.

RESULT AND DISCUSSION

The experiment result of investigation carried out on succession and incidence of sucking pests, borer and their natural enemies.

Whitefly *Bemisia tabaci*

The activity of whitefly on okra crop recorded early as last week of July (26th Standard week) during the years 2013 and 2014. During both the years under study the whitefly populations went to increasing till it reached the peak i.e. 11.33 and 12.07 whitefly/5 leaves in third week of August (33rd Standard week) in the year 2013 and 2014, respectively. In can further be seen from the data that whitefly populations declined in fourth week of August (34th Standard week) and reached low i.e. 2.93 and 3.07 whitefly/5 leaves in the last week of September (39th Standard week) in 2013 and 2014, respectively. Similar findings have been reported by Purohit *et al.* (2006) recorded the incidence of whitefly, (*B. tabaci*) on crop which started in the first fortnight of July during both the years. The whitefly attained its peaks in the 2nd week of August and 3rd week of September during respective years. The minimum temperature, morning and evening relative humidity and rainfall showed positive coefficient of correlation ($r = 0.095$, $r = 0.352$, $r = 0.450$ and $r = 0.269$) with incidence of whitefly while with maximum temperature showed negative coefficient of correlation ($r = 0.390$) in the year 2013 (table 3). Almost similar correlation was recorded during the year 2014 (table 4), showed significant positive correlation ($r = 0.181$, $r = 0.449$ and $r = 0.397$) with minimum temperature morning and evening relative humidity and negative correlation with maximum minimum temperature and rainfall ($r = -0.599$, $r = -0.351$, $r = -0.057$) with white fly populations. Singh *et al.* (2013) reported that whitefly and leafhopper population showed negative correlation with maximum, minimum and mean temperature and maximum and minimum relative humidity whereas positive correlation with rainfall.

Leafhopper (*Amrasca biguttula biguttula*)

The incidence data of leafhopper on okra crop was presented in table 1 and 2 of both the years 2013 and 2014. The first appearance of populations of leafhopper on crop was recorded during first week of July (27th Standard week) with 5.20 and 5.33 leafhopper/5leaves when crop was three week old. Peak incidence was noticed during fourth week of August (34th Standard week) with the populations 25.40 and 26.73 leafhopper/5leaves in the year 2013 and 2014, respectively. The populations of leafhopper was quickly declined at end of at end of crop season, it was 2.53 and 2.80 leafhopper/5leaves in the respective years of 2013 and 2014. Yadav *et al.* (2009) reported that the incidence of jassid, *Amasca biguttula biguttula* which began from July on okra crop. The minimum temperature, morning and evening relative humidity and rainfall showed positive correlation ($r = 0.113$, $r = 0.256$, $r = 0.536$ and $r = 0.231$) ($r = 0.275$, $r = 0.411$, $r = 0.491$ and $r = 0.112$) with leafhopper populations while maximum temperature showed negative correlation ($r = -0.384$) ($r = -0.416$) in the respective years of 2013 and 2014. Similar findings have been reported by Patel *et al.* (1997) Gogoi and Dutta (2000)

Shoot and fruit borer (*Earias vittella* Fab.)

On the basis shoot damage

Shoot damage was started from last week of June (26th Standard week) and continued throughout the crop period during both the years and it was varied from 5.60 shoot damage / plot in last week of June (26th Standard week) at the temperature ranged 23.82-34.16 °C and RH 79.92 % to the range 24.14 shoot damage/plots in the third week of August (33rd Standard week) the year 2013, it was varied 6.0 shoot damage / plot in last week of June (26th Standard week) to 26.19 shoot damage / plot in the third week of August (33rd Standard week) in the year 2014, respectively. Devasthali and Saran (1997) reported that the okra was infested by fruit borer (*Earias vittella* Fab.) from the age of 11 days till maturity. The data on per cent shoot damage showed positive coefficient of correlation ($r = 0.553$, $r = 0.847$, $r = 0.659$), with morning, evening relative humidity and rainfall, while with the maximum and minimum temperature showed negative coefficient of correlation i.e. $r = -0.598$, $r = 0.622$ in the year 2013. Similarly, it also showed positive coefficient of correlation with minimum temperature, morning and evening relative humidity and rainfall ($r = 0.509$, $r = 0.304$, $r = 0.548$, $r = 0.108$) while with the maximum temperature showed negative coefficient of correlation ($r = -0.278$) during the year 2014. Almost same trend was observed during both years.

On the basis of fruit damage

The fruit damage was recorded for the first time in fourth week of July (30th Standard week) and it was presented in table 1 and 2 of both the years. It was varied from 10.78 damage fruit /plot in last week of June (26th Standard week) to the ranged 32.89 fruit damage/plot in third week of September (38th Standard week) during the first year of experiment, while it was recorded 11.30 fruit damage/plot in second week of August (37th Standard week) at the temperature ranged fruit damage/plot in the second week of August (33rd Standard week) in the year of 2014. Significant positive coefficient of correlation ($r = 0.026$ and $r = 0.266$) with maximum and minimum temperature while negative coefficient of correlation ($r = -0.192$, $r = -0.054$, $r = -0.149$) with morning evening relative humidity and rainfall, with fruit damage per cent in the year 2013 and in the year 2014 showed significant positive coefficient of correlation ($r = 0.525$ and $r = 0.329$) with morning and evening relative humidity while with maximum minimum temperature and rainfall showed negative coefficient of correlation ($r = -0.599$, $r = -0.351$, $r = -0.057$) with per cent fruit damage. Similar findings have been reported by Aziz *et al.* (2011), Kadam and Khaire (1995).

Incidence natural enemies

Coccinella septempunctata

The populations build up of coccinellid presented in the table 1 and 2 of both the years. It was first appeared in second week of July (28th Standard week) during both the year after the appearance of aphids on crop. The coccinellid populations was increasing till it reached the peak i.e. 2.27 and 2.30 coccinellid/plant in fourth week of August (34th Standard week) in the year 2013 and 2014, respectively. The data revealed that coccinellid populations declined in last week of August (35th Standard week) and reached at low i.e. 0.40 and 0.27 coccinellid/plant in the last week of September (39th Standard week) in 2013 and 2014, respectively as the

populations of aphid declined on okra crop. Meena *et al.* (2010) reported that the appearance of the beetles started from the first week of August (1.8 and 1.7 beetles / plant) and reached its maximum (6.2 and 6.4 beetles / plant) in the first week of October in both the years. A significant positive correlation was recorded with minimum temperature, morning and evening relative humidity and rainfall ($r= 0.012$, $r= 0.378$, $r= 0.605$ and $r= 0.285$) ($r= 0.335$, $r= 0.401$, $r= 0.476$ and $r= 0.122$) whoever maximum temperature showed negative correlation ($r= 0.357$) ($r= 0.384$) as per incidence of coccinella in the year 2013 and 2014, respectively.

Chrysoperla carnea

The first time populations of *Chrysoperla*, was recorded during the second week of July (27th Standard week) during the year 2013 while it was appeared in third week of July (28th Standard week) in the year of 2014. The maximum populations of 0.87 adult/plant was recorded in the fourth week of August (34th Standard week) during 2013. Similarly, it was 1.13 adult/plant during 2014 in the same standard week. It did not show any definite trends during respective years. Populations remained in the field up to last week of August (39th Standard week) i.e. 0.13 and 0.27 adult/plant in the year 2013 and 2014, respectively. Hegde *et al.* (2004) also reported that Coccinellids, spiders and *Chrysoperla carnea* (Stephens) were found throughout the year. Minimum temperature, morning and evening relative humidity and rainfall showed positive correlation ($r= 0.032$, $r= 0.240$, $r= 0.565$ and $r= 0.254$) ($r= 0.218$, $r= 0.478$, $r= 0.481$ and $r= 0.109$) while maximum temperature showed negative correlation ($r= -0.332$) ($r= -0.388$) with *Chrysoperla* populations during both the year 2013 and 2014, respectively. Meena *et al.* (2010) reported that Weather parameters (minimum temperature and relative humidity) showed significant negative correlation with coccinellid population, whereas, maximum temperature had non-significant positive and rainfall had nonsignificant negative correlation with coccinellid population in both the years.

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