



## POPULATION DYNAMICS OF MAJOR INSECT PESTS OF OKRA, *ABELMOSCHUS ESCULENTUS* (L.) MOENCH

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### ABSTRACT

Population dynamics of major insect pest of okra, experiment was carried out at Horticulture farm, S.K.N. College of Agriculture, Jobner (Rajasthan) during *Kharif*, 2017. The incidence of leaf hopper, *Amrasca biguttula biguttula* (Ishida), whitefly, *Bemisia tabaci* (Genn.) and shoot and fruit borer *Earias* spp. was registered as major insect pests on okra crop. The incidence of leaf hopper and whitefly was recorded in 32<sup>nd</sup> standard meteorological week (SMW). The peak incidence of leaf hopper and whitefly was recorded in 37<sup>th</sup> SMW (15.60 leaf hoppers and 18.60 whiteflies) / three leaves. The infestation of shoot and fruit borer on shoot was recorded in 32<sup>nd</sup> SMW, which, reached its peak in 38<sup>th</sup> SMW (17.60 per cent) The population of leaf hopper, whitefly and lady bird beetle, *Menochilus sexmaculatus* (Fab.) had significantly positive correlation with minimum temperature ( $r = 0.67$ ,  $r = 0.65$  and  $r = 0.67$ , respectively) and relative humidity ( $r = 0.65$ ,  $r = 0.64$ ,  $r = 0.65$ , respectively), but non-significant with rainfall and maximum temperature. The shoot infestation had non-significant relation with abiotic factors. Infestation of fruits had positive significant correlation with maximum temperature ( $r = 0.74$ ) and negative significant with minimum temperature ( $r = -0.92$  on number basis and  $r = -0.93$  on weight basis) and relative humidity ( $r = -0.90$  on number basis and  $r = -0.91$  on weight basis) but non-significant with rainfall.

**Key words:** Population dynamics, insect pests, okra, *Abelmoschus esculentus*

### INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench] commonly known as Bhindi or lady's finger, belongs to family Malvaceae, is a popular vegetable crop due to its high nutritional and medicinal values. Okra crop, right from germination to harvesting is attacked by about 72 species of insect pests (Rao and Rajendran, 2003). The leaf hopper, whitefly and shoot and fruit borer are major insect pests, of okra (Singh *et al.* 2014). The leaf hopper, *A. biguttula biguttula* sucks the cell sap from lower surface of the leaves and injects toxic substance in it, resulting in yellowing and curling of leaf margins and stunted plant growth. The severe infestation causes burning of leaves which fall down later and results 40-60 per cent decrease in yield (Narke and Suryawanshi, 1987). The whitefly, *B. tabaci* also sucks the cell sap from the leaves which lowered vitality of the plants. It excretes

honeydew on which sooty mould develops, which interferes with the process of normal photosynthesis. Consequently, the growth of plant is adversely affected. This insect acts as vector of 'yellow vein mosaic' virus in the plants (Nath and Sinha, 1992). The shoot and fruit borer complex (*E. insulana* and *E. vittella*) is one of the most serious pests of okra. The larvae bore into the terminal growing shoots, floral buds, flowers and fruits of okra, resulting in cessation, withering and drying of infested shoots, tender leaves and heavy shedding of floral buds and flowers. The infested fruits become malformed and are rendered unfit for human consumption as well as for procurement of the seeds. The borer has been reported to cause 24.6 to 26.0 per cent damage to okra shoots (Pareek *et al.*, 1986 and Zala *et al.*, 1999) and 40 to 100 per cent loss to fruits (Kumawat, 1997; Pareek and Bhargava, 2003 and Shinde *et al.*, 2007).

Population dynamics of these insect pests provides not only the information of initiation of the pest but also the peak activity of the particular pest which is used as weak link for pest management strategy. Further, the impact of biotic and abiotic parameters play a vital role in population build-up of insect pest. Therefore, there is a need to understand the population dynamics and impact of various factors on population build up, which is further useful in Integrated Pest Management programme.

## MATERIALS AND METHODS

To study the population dynamics of major insect pests of okra, the variety Arka Anamika was sown on 8<sup>th</sup> July, 2017 at Horticulture farm, S.K.N. College of Agriculture, Jobner (Rajasthan) during *Kharif*, 2017. For recording the observations, five plants were randomly selected and tagged in each plot to record the pest populations. The observations of leafhopper and whitefly were recorded at weekly interval right from germination to harvesting of the crop. The population of leafhopper and whitefly was counted before 8 AM, when they remained less active by visual count on three leaves, *i.e.* one each from top, middle and bottom of tagged plants (absolute counting) (Thakkar and Rote, 2001; Sharma and Sinha, 2009). All the stages of nymphs and adults of these pests were taken into account while counting. The leaf hopper and whitefly on upper surface of leaves were counted first and then on lower surface by gentle turning, taking all possible care not to disturb them.

The data on shoot and fruit borer, *Earias* spp. were recorded on five randomly selected and tagged plants throughout the crop period by visual count of the plant in which the top portion was infested, started after two week of sowing to last picking of the fruits. The per cent shoot infestation was calculated by counting the total number of shoots and the number of infested shoots. In case of fruit borer, the observations were recorded on infestation of fruits both on number and weight basis at each picking starting from 1<sup>st</sup> week of September 2017 to till last picking of fruits. The per cent infestation of fruits on number basis was calculated by counting the infested and healthy fruits separately from

selected tagged plants. The weight of both healthy and infested fruits was taken separately and level of infestation was worked out in per cent.

The observations on populations of natural enemies *viz.*, Coccinellids (*Menochilus sexmaculatus*) corresponding to the populations of insect pests were recorded on the same tagged plants at the same time interval. The observations on natural enemies of pests were recorded soon after their appearance till harvesting of the crop. The crop were remain free from any pesticidal application.

To interpret the results of seasonal incidence of major insect pests, the simple correlation was computed between population of insect pests, predator and abiotic factors (maximum and minimum temperature, relative humidity and rainfall) by using the formula for calculating correlation coefficient (Gupta, 1996).

## RESULTS AND DISCUSSION

During the course of investigation, leaf hopper, *A. biguttula biguttula*, whitefly, *B. tabaci* and shoot and fruit borer, *Earias* spp were noticed as major insect pest of okra.

The data presented in Table 1 indicates that the leaf hopper population commenced in the first week of August (32<sup>nd</sup> SMW) with a mean population of 3.20 leaf hoppers/ three leaves. The population increased gradually and reached to its peak with a mean of 15.60 leaf hoppers/ three leaves during second week of September (37<sup>th</sup> SMW). Thereafter, pest population reduced gradually and reached to a level of 1.80 leaf hoppers/ three leaves in the in the fourth week of October (41<sup>st</sup> SMW). The data presented in Table 2 indicates that the infestation of leaf hopper on okra crop showed non-significant correlation with maximum temperature ( $r = -0.05$ ) and rainfall ( $r = 0.56$ ), while significant correlation with minimum temperature ( $r = 0.67$ ), relative humidity ( $r = 0.65$ ) and ladybird beetle, *M. sexmaculatus* ( $r = 0.96$ ). The whitefly population started in the 32<sup>nd</sup> SMW with a mean population of 4.40 whiteflies/ three leaves. The population gradually increased and reached the peak in 37<sup>th</sup> SMW (18.60 whiteflies/ three leaves). A gradual

Table 1. Population dynamics of major insect pests of okra

S. No.	SMW	Date of observation	Temperature (°C)		Mean relative humidity (%)	Total rainfall (mm)	Mean population/ three leaves		Population of <i>M. sexmeculatus</i> / five plants	Mean per cent infestation		
			Max.	Min.			Leaf hopper	Whitefly		Shoots	Fruits No. basis	Weight basis
1	32	07/08/2017	32.6	24	71	000.0	3.20	4.40	0.20	3.60	0.00	0.00
2	33	14/08/2017	34.1	21.7	59	000.0	5.00	5.66	1.20	4.50	0.00	0.00
3	34	21/08/2017	34.8	24.7	71	028.6	9.40	10.40	2.40	6.13	0.00	0.00
4	35	28/08/2017	32.8	24.5	75	009.8	10.80	11.93	3.00	7.90	0.00	0.00
5	36	04/09/2017	33.3	23.2	65	000.0	11.40	13.20	3.80	10.43	6.18	5.27
6	37	11/09/2017	36.0	23.9	69	017.6	15.60	18.60	4.00	12.40	10.13	8.19
7	38	18/09/2017	36.6	21.2	53	000.0	7.93	8.60	1.60	17.60	15.20	13.18
8	39	25/09/2017	36.0	18.4	52	000.0	7.46	8.00	1.20	9.15	23.46	20.65
9	40	02/10/2017	35.6	15.6	37	000.0	2.00	3.00	0.20	6.30	27.55	25.19
10	41	09/10/2017	36.2	15.4	39	000.0	1.80	2.86	0.00	4.00	30.20	31.22

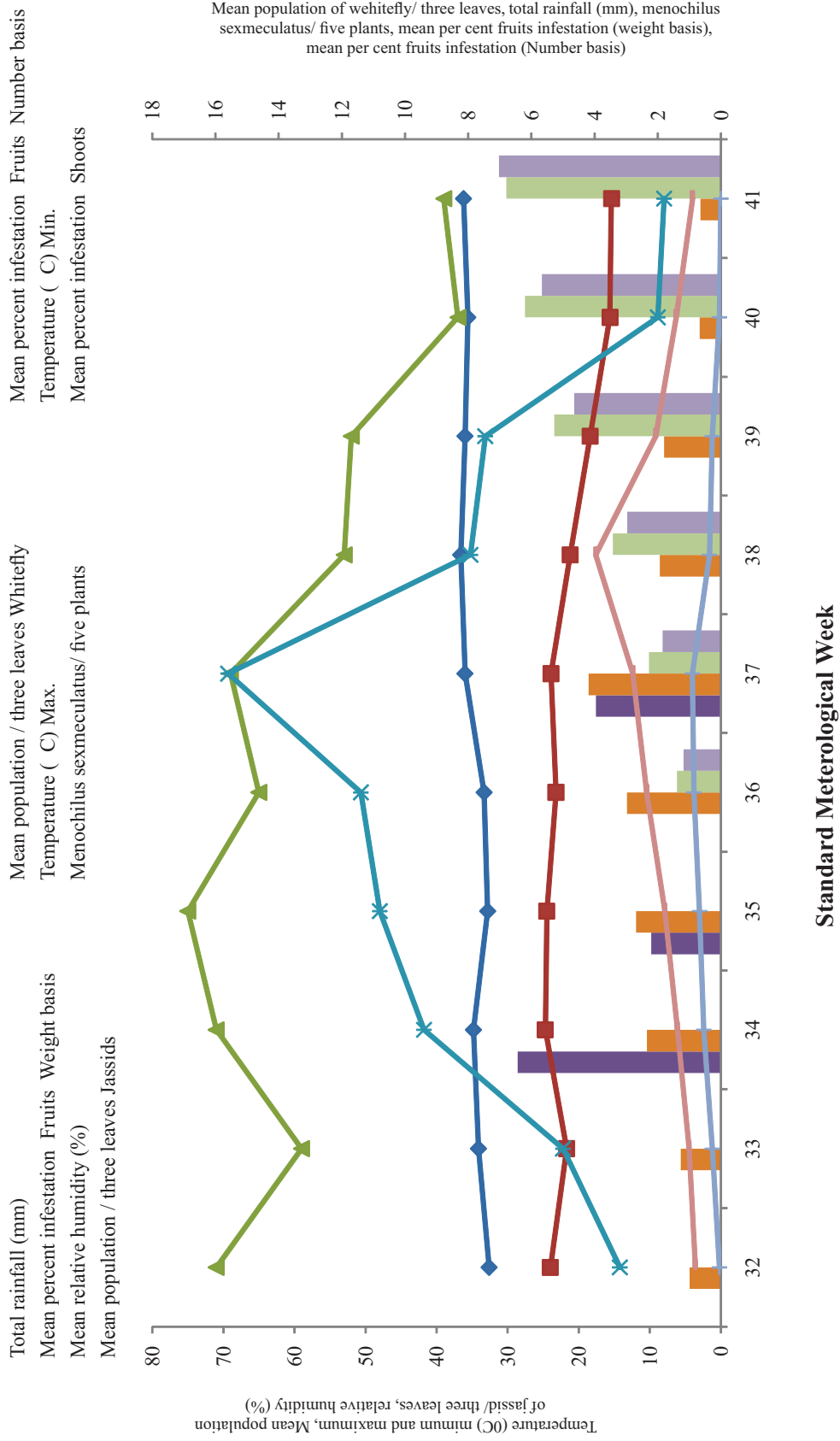


Figure 1. Population dynamics of major insect pests of okra

**Table 2. Correlation matrix between population of major insect pests, *M. sexmaculatus* and abiotic factors**

Particulars	Correlation Coefficient (r)					
	Leaf		<i>M.</i> <i>sexmaculatus</i>	Infestation of Shoot and fruit borer		
	hopper	Whitefly		Shoots	Fruits	
			Number Basis		Weight Basis	
Maximum temperature (°C)	-0.05	-0.05	-0.18	0.43	0.74*	0.74*
Minimum temperature (°C)	0.67*	0.65*	0.67*	0.17	-0.92*	-0.93*
Relative humidity (%)	0.65*	0.64*	0.65*	0.06	-0.90*	-0.91*
Rainfall (mm)	0.56	0.56	0.52	0.02	-0.41	-0.41
<i>M. sexmaculatus</i> (Nos.)	0.96*	0.96*				

\*Significant at 5 per cent level

decline in the pest population was evident thereafter. The population was 2.86 whiteflies/ three leaves in the 41<sup>st</sup> SMW. The infestation of whitefly population showed non-significant correlation with maximum temperature ( $r = -0.05$ ) and rainfall ( $r = 0.56$ ) while, significant positive correlation with minimum temperature ( $r = 0.65$ ), relative humidity ( $r = 0.64$ ) and ladybird beetle, *M. sexmaculatus* ( $r = 0.96$ ). Yadav *et al.* (2007), Meena *et al.* (2010), and Nagar *et al.* (2017), reported that the population of leaf hopper and whitefly commenced from the first week of August and the population reached to maximum in third week of September. Nagar *et al.* (2017) reported that the population of *A. biguttula biguttula* and *B. tabaci* showed positive significant correlation with relative humidity and predatory lady bird beetle, while non-significant correlation with maximum temperature and rainfall. Further, Verma *et al.* (2010) and Iqbal *et al.* (2010) reported that the population of leaf hopper and whitefly showed significant positive correlation with minimum temperature which also corroborates with the present findings.

The population of predatory ladybird beetle, *M. sexmaculatus* was in the range of 0.2 to 4.0/ five plants. A gradual decline was observed after the 40<sup>th</sup> SMW. The peak population of 4.0 individuals/ five plants the predator was recorded on 11<sup>th</sup> September

when the minimum and maximum temperature was 23.9°C and 36.0°C, respectively, and 69 per cent relative humidity. The population of lady bird beetle on okra crop showed non-significant correlation with maximum temperature ( $r = -0.18$ ) and rainfall ( $r = 0.52$ ), while significant correlation with minimum temperature ( $r = 0.67$ ) and relative humidity ( $r = 0.65$ ). The population of lady bird beetle showed a significant effect on sucking insect pests, *viz.*, leaf hopper and whitefly. The finding got support from the findings of Nagar *et al.* (2017) who reported that the peak population of lady bird beetle in the third week of September and the population of lady bird beetle on okra crop showed significant correlation with minimum temperature and relative humidity, while non-significant correlation with maximum temperature and rainfall.

The infestation of *Earias* spp. on shoots of okra started in the 32<sup>nd</sup> SMW and the first observation was recorded on 7<sup>th</sup> August. Initially, infestation of *Earias* spp. on shoot was low (3.60%). The infestation gradually increased and reached the peak in 38<sup>th</sup> SMW (17.60 %). A gradual decline in the shoot infestation was 4.0 per cent in the 41<sup>st</sup> SMW. The correlation studies revealed that the infestation of *Earias* spp. on shoot of okra showed non-significant correlation with all abiotic factors.

The infestation of *Earias* spp. on fruits of okra started in the 36<sup>th</sup> SMW and the first observation was recorded on 4<sup>th</sup> September. Initially, infestation of *Earias* spp. on fruit was low (6.18 % on number basis and 5.27 % on weight basis). The infestation gradually increased and reached the peak in 41<sup>st</sup> SMW (30.20 % on number basis and 31.22 % on weight basis). The infestation of *Earias* spp. on fruit of okra both on number and weight basis showed significant positive correlation with maximum temperature ( $r = 0.74$  on number and weight basis). There was significant negative correlation with minimum temperature ( $r = -0.92$  and  $r = -0.93$  on number and weight basis, respectively) and relative humidity ( $r = -0.90$  and  $-0.91$  on number and weight basis, respectively), while non-significant negative correlation with rainfall ( $r = -0.41$  on number and weight basis). In a study Yadav (2015) as well as Yadav *et al.* (2007) reported that the infestation of pest on shoot started in the second week of August and gradually increased and reached to its peak in the third week of September corroborates with the present investigations. The correlation studies revealed that the infestation of *Earias* spp. on shoot of okra showed non-significant correlation with all abiotic factors. Further, Yadav (2015) also reported that the correlation was non-significant between the shoot infestation and maximum, minimum temperature and relative humidity corroborates with the present findings.

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Received: 00.00.0000

Accepted: 00.00.0000