Short Communication

ISAH INDIAN JOURNAL OF ARID HORTICULTURE
2019, Vol. 1 (1):73-75

Influence of weather parameter on the seasonal incidence of major sucking insect pests of okra during *Kharif* season

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(Received: 26.06.2019; Accepted: 7.08.2019)

Okra [*Abelmoschus esculentus* (L.) Moench] commonly known as Bhendi or lady's finger, belongs to family Malvaceae is an important vegetable crop grown in India. Besides India, it is grown in many tropical and subtropical parts of the world. Tender fruits of okra are used as vegetables or in culinary preparations as sliced and dried pieces. It is also used for thickening gravies and soups, because of its high mucilage content. The roots and stems of okra are used for cleaning cane juice (Chauhan, 1972). It is the best source of iodine and calcium and also good source of proteins, vitamins, minerals, carbohydrates, iron, potassium and acids *viz*., rhamnose (22%), galacturonic acid (27%) and amino acid (11%). In India, the crop occupies an area of 511 thousand hectares with annual production of 6219 thousand metric tonnes. In Rajasthan, it is grown in 3.40 thousand hectares with an annual production 10.50 thousand metric tonnes and productivity of 3090 kg ha^{-1} (Anonymous, 2018).

As many as 72 species of insect-pests have been recorded to infest this crop (Rao and Rajendran, 2003). The sucking pests cause significant damage to the crop. Among these leafhopper and whitefly are more serious (Atwal, 1994) and transmit certain viral diseases. Moreover, they cause a great damage by sucking the plant sap. Pests cause 35 to 40 per cent crop yield losses and ultimately increase the level of damage up to 60 to 70 per cent in optimal conditions (Salim, 1999).The leafhopper, *Amrasca biguttula biguttula* (Ishida) 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 to 60 per cent decrease in yield (Narke and Suryawanshi, 1987).The whitefly, *Bemisia tabaci* (Genn.) 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 transmits viral diseases and acts as vector of 'yellow vein mosaic' virus in the plants (Nath *et al,* 1992).The prevalence and build up of these pests in mostly governed by weather parameters like temperature, relative humidity and rainfall. For effective management of sucking pest, study on the influence of the various factors responsible for population fluctuation on a crop might assist in prediction of its occurrence in a given area. Thus the knowledge of the influence of weather parameter on sucking pest will have to develop a forecasting system and to implement timely plant protection measures. Therefore, the present investigation was undertaken on incidence of major sucking insect pests of okra.

Field experiment was conducted on incidence of major sucking insect pests of okra during *Kharif* 2018 at Horticulture farm of S.K.N. College of Agriculture, Jobner (Rajasthan). The seeds of okra crop were sown at the rate of 10 kg ha^{-1} in all experimental plots. Before sowing seeds were treated with Thiram @ 2.0 g kg^{-1} seed. Okra variety, Arka Anamika was sown in five plots of 2.25 x 1.8 m^2 size keeping row to row and plant to plant distance of 45 cm and 30 cm, respectively. The crop was raised under normal recommended of practices and left for natural infestation of desired pest. No plant protection measures were taken throughout the crop season.The population of insect pests and natural enemies were recorded at weekly interval right form their appearance to last picking of fruits of the crop. The population of sucking insect pests, *viz*., leafhopper and whitefly were recorded in early morning hours by visually counting (absolute counting). For this, five plants were randomly selected and tagged in each plot. The population of leafhopper, *Amrasca biguttula biguttula* (Ishida) was recorded by counting both nymphs and adults as per method described by (Rai and Satpathy, 1999). Counting of the leafhopper was done on three leaves, *i.e.* top, middle and bottom of each tagged plant.The population of Whitefly, *Bemisia tabaci (Genn.)* were recorded by counting both nymphs and adults visually on three leaves selected from the top, middle and bottom of each tagged plant. For counting the whitefly population, the leaf was held at the petiole by thumb and fore finger and thumbed until the entire underside of leaf was clearly visible. With the help of magnifying lens, the whitefly present on the lower side of leaf was counted. The weather parameters, *viz*., weekly maximum and minimum temperatures, relative humidity and rainfall in different standard weeks during the crop season were recorded at meteorological observatory, Department of Agronomy, S.K.N. College of agriculture, Jobner. The relationship between leafhopper and whitefly with weather parameter were worked out.

The data presented in Table 1 and Fig. 1, revealed that the infestation of leafhopper commenced from 23rd July (3.60 leafhoppers/ three leaves). The population gradually increased and reached to peak (28.60 leafhoppers/ three leaves), in the

10th September (37th SMW) when the maximum temperature, minimum temperature, relative humidity and rainfall was 30.0°C, 21.0°C, 74.0 per cent and 1.6 mm, respectively. A gradual decline in the pest population was evident thereafter. The present findings are collaborates with that of Kumawat *et al*. (2000) and Khating *et al*. (2016) who reported that the population of leafhopper commenced from the fourth week of July and reached to maximum in second week of September. The findings are partially collaborate with Mohanasundaram *et al*. (2011) and Davada *et al*. (2016) who reported that the population of leafhopper commenced from the second week of July and reached to maximum in first week of September. The correlation studies indicated that the infestation of leafhopper on okra crop showed significant positive correlation with relative humidity (r = 0.583) and significant negative correlation with maximum temperature (r = -0.681) while, non-significant correlation with minimum temperature (r = 0.139) and rainfall (r = 0.205). The present findings are conformating with that of Davada *et al*. (2016), Nagar *et al*. (2017), Nimbalkar *et al*. (2017) and Siddartha *et al*. (2017) who reported that the population of *A. biguttula biguttula* showed positive significant correlation with relative humidity. Further, Khating *et al*. (2016) and Nagar *et al*. (2017) reported that the population of leafhopper showed non-significant correlation with minimum temperature and rainfall which also corroborates with the present findings.

The data revealed that the whitefly population was also initiated from fourth week of July (30th SMW). The first observation, recorded on 23rd July the population of whitefly was low (3.40 whiteflies/ three leaves). The population gradually increased and reached to the peak (27.00 whiteflies/ three leaves) on 10th September (37th SMW). A gradual decline in the pest population was seen thereafter *i.e.* 3.80 whiteflies per three leaves in last observation *i.e.* on 1st October (40th SMW) and observed in traces thereafter. The present findings are corroborates with that of Khating *et al*. (2016) who reported that the population of whitefly commenced from the fourth week of July and its population reached to maximum in second week of September. The findings are partially collaborate with Kumawat *et al*. (2000) who reported that the population of whitefly commenced from the fourth week of July and reached to maximum in fourth week of September. The correlation studies indicated that the infestation of whitefly on okra crop showed significant positive correlation with relative humidity (r = 0.568) and significant negative correlation with maximum temperature (r = -0.682) while, non-significant correlation with minimum temperature (r = 0.125) and rainfall (r = 0.215). The present findings are conformating with that of Nagar *et al*. (2017) and Potai *et al*. (2018) reported that the population of *B. tabaci* showed positive significant correlation with relative humidity. Further, Pachori *et al*. (2016), Pandey and Koshta (2017) and Patel *et*

Table 1. Seasonal incidence of major sucking insect pests of okra in relation to abiotic factors

S. No.	Date of observation	Standard Meteorological Week (SMW)	Temperature (^{0}C)		Average relative humidity (%)	Total Rainfall (mm)	Mean population	
			Maximum	Minimum			Leafhoppers / 3 leaves	Whiteflies / 3 leaves
1	23.07.2018	30	31.4	24.0	79	39.8	3.60	3.40
2	30.07.2018	31	34.0	24.2	62	0.00	5.00	5.80
3	06.08.2018	32	32.8	24.9	77	13.6	12.40	11.00
4	13.08.2018	33	34.4	24.7	72	14.6	15.20	14.20
5	20.08.2018	34	31.2	23.8	80	48.4	18.60	18.40
6	27.08.2018	35	31.5	24.0	77	34.0	22.80	21.60
7	03.09.2018	36	30.5	22.9	81	33.0	25.20	24.20
8	10.09.2018	37	30.0	21.0	74	01.6	28.60	27.00
9	17.09.2018	38	34.2	20.2	63	00.0	14.40	13.20
10	24.09.2018	39	32.8	19.1	64	19.8	8.00	8.20
11	01.10.2018	40	36.7	18.9	51	00.0	3.20	3.80
Correlation Coefficient with Leafhopper			-0.681*	0.139NS	0.583*	0.205NS	-	-
Correlation Coefficient with Whitefly			-0.682*	0.125NS	0.568*	0.215NS	-	-

* Significant at 5% level of significance NS= Non-significant

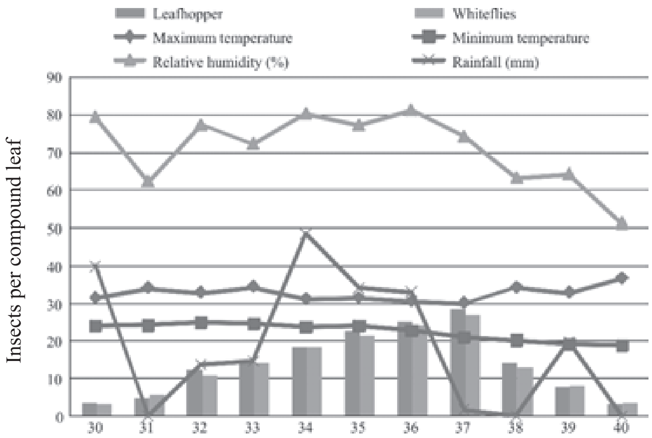

Fig. 1: Seasonal incidence of major sucking insect pests of okra in relation to abiotic factors

al. (2018) reported that the population of whitefly showed non-significant correlation with minimum temperature and rainfall which also support with the present findings.

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