



IMPACT OF WEATHER FACTORS ON THE INCIDENCE OF MAJOR INSECT PESTS OF OKRA (*ABELMOSCHUS ESCULENTUS* L. MOENCH)

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Received: January 13, 2016; Revised: January 24, 2016; Accepted: January 25, 2016

Abstract- An experiment was conducted to observe the "Impact of weather factors on the incidence of major insect pests of okra" during *kharif* season of 2014 at Entomological experimental field, college of agriculture JNKVV Jabalpur (M.P.). Major activity period of jassid (*Amrasca biguttula biguttula*) was observed from August 2014 to October 2014 with two distinct peaks during 36th and 37th SW (Standard Week) (131.50 and 136.00 jassid/ per 30 leaves) and *Aphis gossypii* was observed from August 2014 to 1st week October 2014 with two distinct peak 36th and 37th SW (46.50 and 44.50 Aphid/ per 30 leaves) respectively while *Bemisia tabaci* was appeared first week of August to last week of September 2014 with two distinct peak 34th and 35th SW (3.83 and 3.33 whitefly/ per 30 leaves). Shoot and Fruit borer, *Earias vittella* observed from last week of August 2014 up to crop maturity 43rd SW with three distinct peak 36th, 40th, & 41st SW (42.00, 41.33 and 41.67 % fruit infestation). Analysis of correlation regression between weather (abiotic) factors and the major insect pests of okra showed that population of *Amrasca biguttula biguttula* had a significant positive correlation with maximum temperature ($r=0.58$) and ($byx=18.15$) while *Bemisia tabaci* had a significant positive correlation with minimum temperature ($r=0.67$) and ($byx0.34$). While *Aphis gossypii* and *Earias vittella* showed that non significant relationship with weather parameter.

Keywords- Jassid, Aphid, Whitefly, Shoot and fruit borer and Weather factors.

Citation: Aarwe Rajesh, et al., (2016) Impact of Weather Factors on the Incidence of Major Insect Pests of Okra (*Abelmoschus esculentus* L. Moench). International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 8, Issue 3, pp.-981-983.

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Introduction

India is a major vegetable producing and consuming country and vegetables. Okra, *A. esculentus* L. Moench, popularly known as *Bhindi* or lady's finger belongs to family Malvaceae. Tender fruits are used as vegetables. It is also used for thickening gravies and soups, because of its high mucilage content. India stands top in area and production. In World, okra is cultivated in an area of 1.06 m/ha with a total production of 7.83 MT and average productivity of 7.4 MT/ha [1]. In India okra is cultivated 524.00 m/ha with an annual production of 6203.00 MT [2] and productivity 11.90 MT/ha in 2013-14 [3]. In Madhya Pradesh okra is cultivated in 26.51 m/ha area and production 305.90 MT/ha in 2013-14 [4]. The productivity of okra is low due to many factors and one of the most important factors of insect pests. Aphid (*A. gossypii*), shoot and fruit borer, *E. insulana* (Boisduval) and *E. vittella* and Jassid, *A. biguttula biguttula* are most serious pests of okra and cause 45.00-57.10% damage to fruits [5] and [6]. The sucking pest complex of okra consisting of aphids, leaf hoppers, whiteflies, thrips and mites causes 17.46% yield loss [7] and [8] [9] also reported that all the weather factors showed non significant effect on larval population of okra shoot and fruit borer. [10] found that minimum temperature, evening relative humidity, wind velocity, rain fall and no. of rainy days showed significant negative correlation with larval population of shoot and fruit borer. However [11] also reported that jassid population was positively correlated with maximum and minimum temperature, while [12] reported that aphid showed positive correlation with rainfall and relative humidity, while negative correlation with maximum and minimum temperature & [13] and [10] reported that all the weather factors were statistically found to be non significant.

According to [14] pest abundance and distribution changes with abiotic factors and therefore meteorological parameters play a pivotal role in the biology of any pest. The interaction between pest activity and abiotic factors helps in deriving at predictive models that aids in forecast of pest incidence. The present study was

aimed to know the seasonal occurrence of different insect pests and the effect of weather (abiotic) factors on their population in Jabalpur region of M.P. (India).

Materials and Methods

The present investigation entitled, was carried out in the experimental field of Department of Entomology, Live Stock, Farm, Adhartal, JNKVV, Jabalpur, Madhya Pradesh during *Kharif* season 2014. Seasonal incidence of major insect pests of okra in relation to weather parameters were studied during the season. Population of Aphids, Jassids and Whiteflies (total nymphs + adults) were recorded on six leaves per plant viz., each from 2 upper, 2 middle and 2 lower plant canopy. Shoot and fruit borer (*Earias spp.*) was recorded on the basis of per cent of fruit damage. These observations were recorded in untreated plots. Observations of weather data (Maximum & Minimum temperature, morning & evening relative humidity, wind speed, sun shine hours, total rainfall per week, no. of rainy days per week, morning & evening vapor pressure and evaporation etc.) were recorded on daily basis from JNKVV meteorological observatory.

Statistical analysis of Correlation and regression of the weather (abiotic) factors on major insects were worked out by using the formula as suggested by [15].

$$\text{Correlation 'r'} = \frac{\sum xy - \frac{\sum x \cdot \sum y}{n}}{\sqrt{\left\{ \sum x^2 - \frac{(\sum x)^2}{n} \right\} \left\{ \sum y^2 - \frac{(\sum y)^2}{n} \right\}}}$$

Regression $\hat{Y} = a + bx$ (R^2) +
A = Intercept.
b = Regression coefficient.

R² = Coefficient of multiple determination.

Test of significance 'r'

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

Results and Discussion

Incidence of major insect pests of okra during Kharif 2014 and correlation of insect pests population with weather (abiotic) factors.

Jassid, *Amrasca biguttula biguttula* (Ishida)

Jassid was first recorded during the 31st SW on okra. The activity period of jassid was observed from 31st SW to 43rd SW. with two distinct peaks during 36th & 37th SW (131.50 and 136.00 jassid/ per 30 leaves). During this period maximum and minimum temperature were 30.2°C and 23.4°C respectively, whereas, morning and evening relative humidity were 91 and 72 percent respectively. Further, wind

velocity, sunshine, morning & evening vapor pressure and evaporation were 4.8 km/hrs, 3.8 per hrs., 21.1 mm, 22.5 mm and 2.6 mm respectively and 50.4 mm rainfall was recorded in 6 days during this period. After 39th SW there was a decline in the jassid population and it was available up to harvest of the crop. In conformity with the present findings [16] also reported the activity of *A. biguttula biguttula* from August to October; While [17] reported its activity up to third week of September at Kanpur.

Correlation between various weather parameter and jassid were found non-significant except maximum temperature, which exhibited a significant and positive correlation ($r=0.58^*$). Regression expressed that with every unit increase in maximum temperature there was positive increase of (byx=18.15) jassid population per 30 leaves. In contrary to this [18] reported that average sunshine and wind speed showed significantly positive correlation, whereas total rainfall showed a negative correlation with jassid population in okra.

Table-1 Incidence of insect pest complex of okra at Jabalpur during kharif 2014

Month	Standard Week	Mean population (nymph + adult) per 30 leaf			% Fruit infestation by shoot and fruit borer
		Jassid	Aphid	Whitefly	
August	31	6.66	8.00	3.00	0.00
	32	6.00	14.00	2.50	0.00
	33	45.00	21.00	3.33	0.00
	34	104.66	37.83	3.83	0.00
	35	118.50	36.50	3.33	40.33
September	36	131.50	46.50	3.33	42.00
	37	136.00	44.50	3.00	37.33
	38	131.00	40.16	2.33	39.67
	39	127.50	38.50	2.50	37.17
October	40	124.00	18.00	0.00	41.33
	41	68.00	6.00	0.00	41.67
	42	24.00	0.00	0.00	40.17
	43	14.00	0.00	0.00	40.67

Table-2 Correlation (r) and regression coefficient (byx) of abiotic factors on insect pest complex on okra crop during kharif 2014

Weather factors	Name of insects							
	Jassid		Aphid		Whitefly		Shoot and fruit borer	
	r	byx	r	byx	r	byx	r	byx
Max. temp.(°C)	0.58*	18.15	0.26 NS	-	0.22 NS	-	-0.20 NS	-
Min. temp.(°C)	0.31 NS	-	0.30 NS	-	0.67*	0.34	-0.19 NS	-
Morning Relative Humidity (RH) (%)	-0.16 NS	-	0.04 NS	-	-0.16 NS	-	0.14 NS	-
Evening RH (%)	-0.04 NS	-	-0.14	-	0.22 NS	-	0.09 NS	-
Wind velocity (km/hr)	-0.29 NS	-	-0.42 NS	-	-0.22 NS	-	-0.02 NS	-
Sunshine(hrs)	0.18 NS	-	0.001 NS	-	-0.31 NS	-	-0.07 NS	-
Rainfall (mm)	-0.32 NS	-	-0.34 NS	-	0.05 NS	-	0.28 NS	-
No. of rainy days	0.02 NS	-	0.03 NS	-	0.00 NS	-	0.06 NS	-
Morning Vapour Pressure (VP) (mm)	0.28 NS	-	0.21 NS	-	0.62 NS	-	-0.11 NS	-
Evening VP (mm)	0.29 NS	-	0.30 NS	-	0.50 NS	-	-0.06 NS	-
Evaporation (mm)	0.23 NS	-	-0.16 NS	-	-0.002 NS	-	-0.22 NS	-

Significant at 5% level NS=Non-significant

Shoot and Fruit borer, *Earias vittella* (Fab.)

Shoot and fruit borer was first recorded during the 35th SW on okra. The activity period of shoot and fruit borer was observed from 35th SW to 43rd SW with three distinct peaks during 36th, 40th & 41th SW (42.00, 41.33 & 41.67 % fruit infestation). During this period maximum and minimum temperature were 30.1°C and 23.7°C respectively, whereas, morning and evening relative humidity were 91 and 71 percent respectively. Further, wind velocity, sunshine, morning & evening vapor pressure and evaporation 4.1 km/hrs, 2.4 per hrs., 22 mm, 22.4 mm and 2 mm respectively and 100.2 mm rainfall was recorded in 7 days during this period. After 41st SW there was a decline in the fruit borer population and was available up to 43rd SW (i.e. 22th to 28th October 2014).

Correlation between all the weather parameter and shoot and fruit borer were found non-significant

Whitefly, *Bemisia tabaci* (Genn.)

Whitefly was first recorded during the 31st SW on okra. The activity period of whitefly was observed from 31st SW to 39th SW with two distinct peaks during 34th & 35th SW (3.83 and 3.33 whitefly/ per 30 leaves). During this period maximum and minimum temperature were 34.1°C and 25.1°C respectively, whereas, morning and evening relative humidity were 83 and 58 percent respectively. Further, wind velocity, sunshine, morning & evening vapor pressure and evaporation 3.1 km/hrs, 6.7 per hrs., 22 mm, 22.2 mm and 4 mm respectively. However, no rainfall was recorded during this period. After 37th SW there was a decline in the whitefly population and it was disappeared after 39th SW (i.e. 24th to 30th September, 2014). [13] reported the peak activity of *B. tabaci* was recorded 33rd SW. In contrary to the present findings [13] and [10] reported that all the weather factors were statistically found to be non-significant.

Correlation between various weather parameter and whitefly were found non-significant except minimum temperature, which exhibited a significant and positive correlation ($r=0.67^*$), regression expressed that with every unit increase in

minimum temperature there was an increase of ($byx = 0.34$) whitefly population per 30 leaves.

Aphid, *Aphis gossypii* (Glover)

Aphid was first recorded during the 31st SW on okra. The activity period of aphid was observed from 31st SW to 41st SW with two distinct peaks during 36th & 37th SW (46.50 and 44.50 aphid/ per 30 leaves). During this period maximum and minimum temperature were 30.1°C and 23.7°C respectively, whereas, morning and evening relative humidity were 91 and 71 percent respectively. Further, wind velocity, sunshine, morning & evening vapor pressure and evaporation 4.1 km/hrs, 2.4 per hrs., 22 mm, 22.4 mm and 2 mm respectively and 100.2 mm rainfall was recorded in a 7 days during this period. After 39th SW there was a decline in the aphid population and it was available up to 41st SW (i.e. 8th to 14th October, 2014). Present findings are in accordance with those of [19], [20] and [21], they also reported aphid to be an important sucking pest of okra, which was present up to the reproductive stage of the crop.

Correlation between various weather parameter and aphid were found non-significant.

Acknowledgement

Thanks to most esteemed guide and my advisory Dr. Rajesh Pachori (Professor), Dr. A. S. Thakur (Scientist), Dr. A. K. Sharma (Assistant Professor), and especially thanks to Dr. A. K. Sharma (Assistant Professor) for his cheerfully advice during thesis period, Department of Entomology, College of Agriculture, JNKVV, Jabalpur for his most valuable and inspiring guidance, close supervision, constant encouragement and constructive criticism coupled with valuable suggestions during the course of this investigation and in preparation of this manuscript.

Conflict of Interest: None declared

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