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**Deevaraja**
Department of Agricultural Entomology, University of Agricultural Sciences, Raichur, Karnataka, India

**Sushila Nadagouda**
Department of Agricultural Entomology, University of Agricultural Sciences, Raichur, Karnataka, India

**Ashoka J**
Department of Agricultural Entomology, University of Agricultural Sciences, Raichur, Karnataka, India

**Sreenivas AG**
Department of Agricultural Entomology, University of Agricultural Sciences, Raichur, Karnataka, India

**Aswathanarayana DS**
Department of Plant Pathology, University of Agricultural Sciences, Raichur, Karnataka, India

**Corresponding Author:**
**Sushila Nadagouda**
Department of Agricultural Entomology, University of Agricultural Sciences, Raichur, Karnataka, India

# Seasonal incidence of insect pests of okra

**Deevaraja, Sushila Nadagouda, Ashoka J, Sreenivas AG and Aswathanarayana DS**

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**Abstract**
The field experiments were conducted during two different seasons i.e. *kharif* 2018 and *rabi* 2018 to study the seasonal incidence of insect pests of okra *viz*., leafhopper, aphid, whitefly, mite, dusky cotton bug *Helicoverpa armigera* and *Earias vittella*. The results on seasonal incidence of insect pests of okra revealed that the activity of leafhopper, aphid, whitefly and *Helicoverpa armigera* were more in *rabi* season than *kharif* season. Similarly, the activity of *Earias vittella* was more in *kharif* season than *rabi* season.

**Keywords:** Insect Pest, Okra, Seasonal incidence

## Introduction
Vegetables constitute an important item of our food, supplying vitamins, carbohydrates and minerals needed for a balanced diet. Their value is important especially in underdeveloped and developing countries like India, where malnutrition abounds (Randhawa, 1974) [12].
Among the vegetable crops grown in India, okra (*Abelmoschus esculentus* L.), also known as lady's finger or bhendi belongs to the family Malvaceae is an important crop grown throughout the year. It has good nutritional value, particularly the high content of vitamin C (30 mg/100 g), calcium (90 mg/100 g), iron (1.5 mg/100 g) and other minerals like magnesium and potassium, vitamin A and B, fats and carbohydrates (Aykroud, 1963) [4].
On the other hand, the demand for vegetable oils is rapidly increasing due to the growing human population and the expanding oil industry with health promoting oil components, the exploration of some under-utilized and newer resources of vegetable oils is of much concern (Schalau, 2002) [13].
Though okra finds its origin in South-Africa, India stands top in area and production. It is cultivated in an area of 5.11 lakh hectares with a production of 62.19 lakh tons in India and in Karnataka it is cultivated in an area of 11,140 hectares with a production of 90,270 tons (Anon., 2018) [3]. The major okra growing states includes Assam, Uttar Pradesh, Bihar, Orissa, West Bengal, Maharashtra, Andhra Pradesh and Karnataka (Anon., 2018) [3].
One of the important limiting factors in the cultivation of okra is insect pests. Many of the pests occurring on cotton are found to ravage okra crop. As high as 72 species of insects have been recorded on okra (Srinivas Rao and Rajendran, 2003) [17] Of which, the sucking pests comprising of Aphid, *Aphis gossypii* Glover, leafhopper, *Amrasca biguttula biguttula* Ishida, whitefly, *Bemisia tabaci* Gennadius and mite, *Tetranychus cinnabarinus* Boisduval caused significant damage during the early stages of the crop, while at later stage fruit borers like *Earias* spp. and *Helicoverpa armigera* (Hb.) caused considerable loss to the crop to the tune of 91.6 per cent. In general the overall damage due to insect pest amounts to 48.97 per cent loss in pod yield (Kanwar and Ameta, 2007) [7].

## Material and Methods
Investigation on seasonal incidence of insect pests of okra was carried out at the Main Agricultural Research Station (MARS) and Department of Agricultural Entomology, College of Agriculture, University of Agricultural Sciences (UAS), Raichur, during 2018-2019. The location of experimental site is situated at North Eastern dry zone (zone-II) of Karnataka between 16º 15´ latitude, 77 º 20´ longitudes and at 398.37 m above mean sea level.
The okra variety Ankur-46 was sown during August 4 (*kharif*) and October 23 (*rabi*). The crop was raised with a spacing of 60 × 45 cm in a plot size of 5 guntas under irrigated conditions

with all the agronomic practices as per the recommendation except plant protection measures (Anon., 2014) [2]. After the germination of the crop, observations were recorded at weekly intervals to determine the seasonal incidence of important insect pest of okra crop till the harvest of crop during *Kharif* and *Rabi* of 2018-19.

To assess the incidence of sucking insect pests, *viz*., leafhopper, aphid, whitefly, mites and dusky cotton bug were recorded on top three leaves at weekly interval on randomly selected fifty plants.

The per cent damage of *Helicoverpa armigera* and *Earias vittella* were estimated by counting both damaged and total number of fruits. The observations were recorded at weekly intervals starting from 30 days after sowing up to maturity of the crop. The per cent fruit damage was calculated as below;

$$\text{Per cent fruit damage} = \frac{\text{Number of damaged fruits}}{\text{Total Number of fruit}} \times 100$$

## Results and Discussion

Studies on the seasonal incidence of insect pests of okra was carried out during *Kharif* and *rab*i, 2018-19 and results of the observations recorded at weekly intervals on insect pests of okra are presented below.

### Aphid, *A. gossypii* (Glover)

Both nymphs and adults aphids were found sucking the sap from ventral surface of the leaves and the affected leaves curled downwards and became inverted cup shaped.

During *kharif* 2018, the activity of the aphid was noticed throughout the cropping season and varied between zero to 29.20 per top three leaves with mean population of 16.33 per top three leaves. The zero incidence was recorded in first and second week of August. However, the incidence started from third week of August (8.36/top three leaves) and there was a gradual increase from August forth week to October second week with a maximum population of 29.20 aphids per top three leaves. Later, population gradually decreased from third week of October (26.10/top three leaves) and there was no incidence from last week of October (Table 1). The present findings are in line with the findings of Slosser *et al.* (1998) [15] who reported that population of *A. gossypii* increased during August and October. But Damasia *et al.* (2013) [6] and Singh *et al.* (2013) [14] reported that aphid population gradually increased and reached its peak during the first fortnight of October. During *rabi* 2018, the population of aphid varied from zero to 28.55 per top three leaves, with mean population of 16.90 per top three leaves. The zero incidence was recorded during first and second week of November. Later, the incidence started from third week of November (12.50/top three leaves) and there was a gradual increase from fourth week of November to first week of January with a maximum population of 28.55 per /top three leaves. However, population gradually decreased from second week of January (23.40/top three leaves) and there was no incidence from last week of January onwards (Table 2). The present findings are in line with Anitha and Nandihalli (2008) [1] who reported, on *rabi* crop, sown during last week of November, the incidence of aphid started from 49$^{th}$ standard week and reached its peak during first week of January with 24.91 aphids per top three leaves.

### Leafhopper, *A. biguttula biguttula* (Ishida)

Adults were green with two black spots on either side of forewings at the posterior region of the body. Both nymphs and adults were found sucking the sap from the leaves and caused serious hopper burn and drying of leaves, resulting in stunted growth. The affected leaves became yellow, crinkled, curled and showed marginal browning.

During *kharif* 2018, the activity of the leafhoppers was noticed throughout the cropping season and varied between zero to 20.20 per top three leaves with mean population of 8.17 per top three leaves. There was no incidence recorded during first and second week of August. However, the incidence started from third week of August (5.10/top three leaves) and there was a gradual increase from August fourth week to September fourth week (39$^{th}$ SMW) with a maximum population of 20.20 leafhoppers per top three leaves. Further, the population of leafhoppers gradually decreased from second week of October (10.90/3 leaves) and population declined from last week of October (Table 1). Present findings are in line with the findings of Srinivasa (1993) [18] who reported that *kharif*, September and October months are very much congenial for leafhopper population buildup. Similarly, Damasia *et al.* (2013) [6] also reported peak population of leafhoppers in fourth week of September (19.43/top three leaves).

During *rabi* 2018, the population of leafhopper varied from zero to 15.47 per top three leaves, with mean population of 8.90 per top three leaves. There was no incidence during first week of November. However, the incidence started from second week of November (13.43/top three leaves) and there was a gradual increase from third week of November to last week of December (52$^{nd}$ SMW) with a maximum population of 15.47 per top three leaves. Later, population gradually decreased from third week of January (9.55/top three leaves) and there was no incidence from fourth week of January onwards (Table 2). The current findings are in line with the findings of Anitha and Nandihalli (2008) [1] who reported leafhopper on *rabi* crop (November sown) during 49$^{th}$ SW and its peak during first week of January. The activity of the pest might be related to the crop growth stage irrespective of the sowing time.

**Table 1:** Seasonal incidence of insect pests of okra during *Kharif*, 2018

| SMW | No. of aphids/ top 3 leaves | No. of leafhopper/ top 3 leaves | No. of whitefly/ top 3 leaves | No. of *Helicoverpa* larvae/ plant | No. of *Earias spp* larvae/ plant |
|---|---|---|---|---|---|
| 32 | 0 | 0 | 0 | 0 | 0 |
| 33 | 0 | 13.43 | 0 | 0 | 0 |
| 34 | 8.36 | 5.10 | 0 | 0 | 0 |
| 35 | 15.20 | 6.74 | 1.25 | 0 | 0 |
| 36 | 14.50 | 8.89 | 2.41 | 1.57 | 0.62 |
| 37 | 26.10 | 10.20 | 8.84 | 0.90 | 0.81 |
| 38 | 28.10 | 10.90 | 13.50 | 2.40 | 1.67 |
| 39 | 28.20 | 20.20 | 9.83 | 2.30 | 3.21 |
| 40 | 25.30 | 17.70 | 11.60 | 3.45 | 2.58 |

| | | | | | |
|---|---|---|---|---|---|
| 41 | 29.20 | 11.30 | 11.90 | 2.77 | 3.73 |
| 42 | 26.10 | 10.90 | 8.88 | 2.25 | 2.36 |
| 43 | 11.20 | 4.30 | 3.39 | 0 | 1.72 |
| 44 | 0 | 0 | 0 | 0 | 0 |
| Mean | 16.33 | 8.17 | 5.51 | 1.25 | 1.30 |
| Max | 29.20 | 20.20 | 13.50 | 3.45 | 3.73 |
| Min | 0 | 0 | 0 | 0 | 0 |
| SD ± | 11.59 | 6.40 | 5.30 | 1.34 | 1.33 |

**Table 2:** Seasonal incidence of insect pests of okra during *rabi*, 2018

| SMW | No.of Aphids/top 3 leaves | No. of Leafhopper/top 3 leaves | No. of Whitefly/top 3leaves | No. of *Helicoverpa* larvae/plant | No. of *Erias* spp larvae/plant |
|---|---|---|---|---|---|
| 45 | 0 | 0 | 0 | 0 | 0 |
| 46 | 0 | 0 | 0 | 0 | 0 |
| 47 | 12.50 | 9.33 | 5.31 | 0 | 0 |
| 48 | 15.45 | 7.21 | 5.24 | 0 | 0 |
| 49 | 20.22 | 10.26 | 6.47 | 0.84 | 0.74 |
| 50 | 24.60 | 11.48 | 5.89 | 1.52 | 0.65 |
| 51 | 25.52 | 10.20 | 8.27 | 1.79 | 0.93 |
| 52 | 27.32 | 15.47 | 8.52 | 2.10 | 1.70 |
| 01 | 28.55 | 14.55 | 9.67 | 2.55 | 1.64 |
| 02 | 23.40 | 14.20 | 10.90 | 3.64 | 2.34 |
| 03 | 24.62 | 9.55 | 10.40 | 4.53 | 2.55 |
| 04 | 17.50 | 0 | 7.60 | 0 | 3.40 |
| 05 | 0 | 0 | 0 | 0 | 0 |
| Mean | 16.90 | 8.90 | 6.02 | 1.31 | 1.07 |
| Max | 28.55 | 15.47 | 10.90 | 4.53 | 3.40 |
| Min | 0 | 0 | 0 | 0 | 0 |
| SD± | 10.68 | 5.59 | 3.87 | 1.55 | 1.15 |

**Whitefly, *Bemisia tabaci.***

Both nymphs and adults of whitefly, *B. tabaci* were found feeding on ventral surface of leaves. During *kharif* 2018, the activity of the whiteflies was noticed throughout the cropping season and varied between zero to 13.50 per top three leaves with mean population of 5.51 per top three leaves. There was no incidence recorded in first, second and third week of August. Later, the incidence started from fourth week of August (1.25/top three leaves) and there was a gradual increase from September first week to October first week with a maximum population of 13.50 whiteflies per top three leaves. Later, population gradually decreased from third week of October (11.90/top three leaves) and there was no incidence from last week of October (Table 1). These results are in line with Singh *et al.* (2013) [14] who reported peak population of whitefly (12.40/leaf) during 39th standard week (fifth week of September). Similarly, Damasia *et al.* (2013) [6] also reported peak population of whitefly during third and fourth week of September.

During *rabi* 2018, the population of whiteflies varied from zero to 10.90 per top three leaves, with mean population of 6.02 per top three leaves. The zero incidence was recorded in first and second week of November. However, the incidence started from third week of November (5.31/top three leaves) and there was a gradual increase from fourth week of November to second week of January with a maximum population of 10.90 per top three leaves. Later, population gradually decreased from third week of January (7.60/top three leaves) and there was no incidence from fourth week of January onwards (Table 2). The results of the present investigations are in close agreement with the observations made by Mani and Singh (2012) [10] who reported peak incidence of whiteflies during 1st standard week (first week of January).

**Fruit borer, *Helicoverpa armigera* (Hubner)**

The larvae of *H. armigera* were found feeding on the fruits. During *kharif* 2018, the activity of the *H. armigera* larvae was noticed throughout the cropping season and varied between zero to 3.45 larvae per plant with mean population of 1.25 larvae per plant. There was no incidence in August month. However, the incidence started from first week of September (1.57 larvae/ plant) and there was a gradual increase from September second week to October first week with a maximum population of 3.45 larvae per plant. Later, population gradually decreased from second week of October (2.77 larvae/ plant) and there was no incidence from fourth week after October (Table 1). The present studies are supported by the observations recorded by Nath *et al.* (2011) [11] from Uttar Pradesh. They reported that infestation of larvae of *H. armigera* appeared on the crop between third and fourth week of August reaching its peak densities on second and third week of September. Similarly, Kumaranag (2015) [9] reported that the larvae were noticed between third and fourth week of September, with the highest larval densities observed on 40th SMW.

During *rabi* 2018, the population of *H. armigera* larvae varied from zero to 4.53 larvae per plant, with mean population of 1.31 larvae per plant. The zero incidence was recorded in November month. However, the incidence started from first week of December (0.84 larvae/ plant) and there was a gradual increase from second week of December to fourth week of January with a maximum population of 4.53 larvae per plant and there was no incidence from fourth week of January onwards (Table 2). The present findings are in line with Kumaranag (2015) [9] who reported that the larvae of *H. armigera* noticed between third and fourth week of September, with the highest larval densities observed on 40th SMW.

**Shoot and fruit borer, *Earias spp*. Fabricus**

The larvae of *Earias spp.* were found feeding on the shoots and fruits. During *kharif* 2018, the activity of the *Earias spp.* was noticed throughout the cropping season and varied between zero to 3.73 larvae per plant with mean population of 1.30 larvae per plant. There was no incidence in August month. However, the incidence started from first week of September (0.62 larvae/ plant) and there was a gradual increase from September second week to October second week with a maximum population of 3.73 larvae per plant. Later, population gradually decreased from third week of October (2.36 larvae/ plant) and there was no incidence from last week of October onwards (Table 1). The observations are in accordance with findings of Yadav *et al.* (2009) [19] who noticed the larval infestation on okra crop from the third week of August with its peak densities between the first and third week of September with slightly higher densities (24.70 to 20.50 larvae/ 5 plant). The probable reason for the low pest density during the present study could be due to differences in the agro-ecological conditions and cultivar used for the study. However, Bajad and Patil (2014) [5] observed the initial infestation of okra shoot and fruit borer from 34$^{th}$ SMW and peak at 38$^{th}$ SMW.

During *rabi* 2018, the population of *Earias spp.* varied from zero to 3.40 larvae per plant, with mean population of 1.07 larvae per plant. The zero incidence was recorded in November month. However, the incidence started from first week of December (0.74 larvae/ plant) and there was a gradual increase from second week of December to fourth week of January with a maximum population of 3.40 larvae per plant and there was no incidence from last week of January onwards (Table 2). The present findings are in accordance with Kumar and Devaraj (1988) [8] who studied the seasonal incidence of *E. vittella* (Fab.) and revealed that the infestation on okra shoots and fruits started in the second and sixth week after germination.

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