**Original Research Article**

**Population Dynamics of Insect Pests on Okra During the *Kharif* Season**

**ABSTRACT**

The field trial on the population dynamics of insect pests in okra during the Kharif season was conducted at the Organic Research Farm Karguaji, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Uttar Pradesh) during the *Kharif* season (July to October 2022). Based on the observations, the population results are as follows, the White fly, *Bemisia tabaci* (Genn.), started in the 28th standard week (the second week of July) with an average of 1.83 white flies per plant and gradually increased, with a peak of 25.56 white flies per plant in the 37th standard week (the second week of September). Jassid, *Amrasca biguttula biguttula*, began in the third week of July, the 29th standard week, with an average of 1.45 jassids per plant and gradually increased, peaking at 11.09 jassids/plant during the 34th standard week (the third week of August). Infestations of the red cotton bug, *Dysdercus cingulatus*, began in the 33rd standard week (the third week of August) and gradually increased peaking at 16.53 adults/plant in the 39th standard week (the fourth week of September). *Earias vitella*, a shoot and fruit borer, was first observed in the 34th standard week (the third week of August), with an average of 0.83 larvae per plant. And gradually increased and peaked at 5.92 larvae per plant during the 37th standard week (September second week).

**Keywords –** shoot and fruit borer, *Earias vitella,* White fly, *Bemisia tabaci***,** okra

1. **Introduction**

Okra (*Abelmoschus esculentus* L.) belongs to the family Malvaceae, which is locally known as Bhendi and Lady's Finger worldwide. It is a very popular summer and *kharif* vegetable for home gardening, and it is also grown commercially throughout the world, especially in the Indo-Pakistan subcontinent (Yadav *et al.,*2024). Okra is a popular vegetable crop grown widely in India, primarily for its immature fruits, and holds a significant position among other vegetable crops. It is crucial for human nutrition and a good source of total minerals, vitamins, calcium, potassium, enzymes, and other nutrients that are frequently lacking in the diets of developing countries. Okra is a more consistent source of income for farmers, but the crop's ability to be successfully grown and yield is restricted by the attack of various insect pests at different stages of its growth. (Choudhary and Sharma 2020).

The incidence of insect pests is one of the prime factors in the production of okra. Major insects include the jassid (*Amrasca biguttulla bigutulla*; Ishida); aphid (*Aphis gossypii*; Glover); and okra shoot and fruit borers (*Earias spp*.); whitefly (*Bemisia tabaci*) severely damages the okra crop (Genn.), in particular, the fruit borer *Earias vittella* (Fab.). (Rajput and Tayde 2017).

The key sucking pests of okra are whiteflies, aphids, jassids, thrips and mites. Among the sucking pests, whitefly, *Bemisia tabaci* Gennadius causes economic damage to okra by feeding on phloem sap, and also transmits the yellow vein mosaic disease. As compared to healthy plants, diseased plants showed a reduction of 24.9% in plant height, a 15.5% decrease in root length, and 32.1% in the number of fruits per plant, whereas stem girth was reduced by 16.3% (Yadav *et al.,*2024). The incidence of insect pests is one of the prime factors in the production of okra. The crop is attacked by several insect pests, among which shoot and fruit borers, *Earias vittella* (Fabricius) and *Earias Insulana,* are the most serious as they take the upper hand by causing direct damage to tender fruits (Yadav *et al.,*2024).

1. **MATERIAL AND METHODS**

The current research was done on "Population dynamics of insect pests on okra crop during *Kharif* season" was carried out at the Karguaji Organic Research Farm Experimental Field, Bundelkhand University, Jhansi (Uttar Pradesh), during the *Kharif* season 2022. The Kashi Lalima variety of okra was planted in plots measuring 3.20 × 2.15 m2 with a row-to-row and plant-to-plant distance of 60 cm and 45 cm, respectively, to record the seasonal abundance of the major insect pests. The information and procedures to be used for the current investigations are listed below.

**2.1** **Monitoring of insect pests**

Sucking insect pests on okra were recorded by counting the number of insects per plant from three leaves (top, middle, and bottom) on five randomly selected plants per plot at weekly intervals. On the same tagged plants, observations of shoot and fruit borers were made. Fruit infestation was determined by counting the infested fruits at each picking (on a numerical basis), and shoot infestation was determined by counting the total number of damaged shoots at weekly intervals. On the same randomly selected and marked plants, the natural enemy population was counted. For statistical analysis, the information gathered on the main insect pests and meteorological parameters was used. A simple correlation between the insect pest population, their natural enemies, and abiotic parameters, such as maximum and minimum temperatures, relative humidity, and rainfall, was established to infer the results of seasonal incidence.

* 1. **The observation of the paper bag on per plant.**

Insect Density (ID) =$ \frac{I}{P}$

Where:

*I =* Total number of insects collected using paper bags.

*P =* Number of plant parts or plants sampled

 Population Dynamics % =$\left(\frac{Number of Insect Pests per Plant}{Total Number of Insect Pests}\right)$ × 100

1. **RESULTS AND DISCUSSION**

The present investigation aimed to study the population dynamics trends of major insect pests infesting okra, with particular attention to their correlation with prevailing weather conditions. Observations recorded during the 2022 *Kharif* season revealed distinct patterns in the occurrence and population buildup of four major insect pests: white fly (*Bemisia tabaci* Genn.), jassid (*Amrasca biguttula biguttula*), red cotton bug (*Dysdercus cingulatus*), and shoot and fruit borer (*Earias vitella*).

The infestation of white fly (*Bemisia tabaci*) commenced in the 28th standard meteorological week (SMW), corresponding to the second week of July. At the onset, the mean population was recorded at 1.83 white flies per plant. A progressive increase in population was observed in subsequent weeks, reaching a peak density of 25.56 white flies per plant during the 37th SMW (second week of September). The rise in population may be attributed to favourable environmental conditions during this period, particularly high temperatures and relative humidity.

The jassid (*Amrasca biguttula biguttula*) infestation began a week later, during the 29th SMW (third week of July), with an average of 1.45 jassids per plant. The population showed a gradual increase, attaining a peak of 11.09 jassids per plant by the 34th SMW (third week of August). This trend suggests that mid-season climatic conditions were conducive for jassid multiplication and survival.

The red cotton bug (*Dysdercus cingulatus*) appeared relatively later in the season, with its first occurrence noted during the 33rd SMW (third week of August). The initial population was recorded at 0.75 adults per plant. The population gradually escalated and reached a maximum of 16.53 adults per plant in the 39th SMW (fourth week of September), indicating a preference for late-season conditions, possibly due to the maturation of okra pods that offer a suitable feeding and breeding site.

The shoot and fruit borer (*Earias vitella*) was first observed during the 34th SMW (third week of August) with an initial population of 0.83 larvae per plant. The pest population continued to rise and peaked at 5.92 larvae per plant in the 37th SMW (second week of September). This period coincided with the flowering and fruiting stages of the crop, providing an ideal host environment for larval development.

These findings are in agreement with those reported by Rawat *et al*. (2019), affirming the seasonal occurrence and population buildup trends of major insect pests of okra. The results underline the importance of regular pest monitoring and timely pest management interventions tailored to the specific peak infestation periods of each pest species.

**Table 1. Population dynamics of insect pests on okra during the *kharif* season in 2022.**

|  |
| --- |
| **NO OF INSECTS / PLANT ON OKRA** |
| **SMW** | **JASSID** | **WHITE FLY** |  **RED COTTON BUG** | **OKRA SHOOT AND FRUIT BORER** |
| 26 | 0.00 | 0.00 | 0.00 | 0.00 |
| 27 | 0.00 | 0.00 | 0.00 | 0.00 |
| 28 | 0.00 | 1.83 | 0.00 | 0.00 |
| 29 | 1.45 | 3.79 | 0.00 | 0.00 |
| 30 | 3.85 | 7.12 | 0.00 | 0.00 |
| 31 | 5.14 | 7.97 | 0.00 | 0.00 |
| 32 | 7.60 | 8.17 | 0.00 | 0.00 |
| 33 | 9.12 | 9.59 | 0.75 | 0.00 |
| 34 | 11.09 | 16.38 | 1.53 | 0.83 |
| 35 | 10.22 | 19 | 4.17 | 1.76 |
| 36 | 8.16 | 23.18 | 8.66 | 3.89 |
| 37 | 6.83 | 25.56 | 12.78 | 5.92 |
| 38 | 4.45 | 19.59 | 15.73 | 5.44 |
| 39 | 2.74 | 14.89 | 16.53 | 4.17 |
| 40 | 2.55 | 8.15 | 12.23 | 3.26 |
| 41 | 1.37 | 5.22 | 9.11 | 2.78 |
| 42 | 1.17 | 3.43 | 5.43 | 1.44 |

**Fig. 1. Graphical representation of population dynamics of insect pests on okra during the *Kharif* season.**

**Table 2. Meteorological data of Organic Research Farm, Karguaji, Bundelkhand University, Jhansi (U.P.) during *Kharif* season.**

|  |  |
| --- | --- |
|  | **METEROLOGICAL DATA** |
| **SMW** |  **Temperature (0C)** |  **RH (%)** | **Total****Rainfall** |
|  | **Max.** |  **Min.** | **Max.** | **Min.** | **(mm)** |
| 23 | 46.5 | 44.0 | 67.0 | 30.0 | 00.0 |
| 24 | 45.0 | 40.5 | 54.0 | 32.0 | 15.8 |
| 25 | 40.0 | 37.0 | 93.0 | 54.0 | 28.8 |
| 26 | 41.4 | 37.0 | 95.0 | 47.0 | 00.0 |
| 27 | 39.0 | 33.0 | 93.0 | 58.0 | 00.0 |
| 28 | 38.0 | 36.5 | 93.0 | 54.0 | 59.4 |
| 29 | 38.2 | 29.5 | 95.0 | 57.0 | 91.0 |
| 30 | 34.2 | 31.8 | 97.0 | 79.0 | 51.4 |
| 31 | 34.5 | 31.0 | 97.0 | 79.0 | 3.6 |
| 32 | 36.5 | 32.0 | 95.0 | 41.1 | 24.3 |
| 33 | 34.0 | 30.0 | 100.0 | 78.0 | 55.8 |
| 34 | 35.0 | 29.0 | 94.2 | 73.0 | 120.0 |
| 35 | 37.0 | 34.0 | 100.0 | 73.0 | 100.6 |
| 36 | 34.5 | 29.0 | 100.0 | 73.0 | 00.0 |
| 37 | 34.5 | 26.0 | 100.0 | 72.0 | 164.0 |
| 38 | 36.5 | 29.0 | 100.0 | 62.0 | 59.0 |
| 39 | 36.0 | 25.0 | 97.0 | 60.0 | 24.0 |
| 40 | 36.2 | 20.0 | 94.0 | 57.0 | 18.0 |
| 41 | 33.0 | 19.0 | 93.0 | 56.0 | 48.4 |
| 42 | 34.0 | 18.0 | 80.0 | 60.0 | 00.0 |
|  **Total rainfall (mm) = 864.1** |

Source of meteorological data KVK Jhansi (U. P.)

**Fig. 2. Graphical Representation of Meteorological data at Organic Research Farm, Karguaji Bundelkhand University, Jhansi (U.P.) during *Kharif* season.**

1. **CONCLUSION**

 The study revealed distinct seasonal patterns in the population dynamics of major insect pests of okra during the 2022 *Kharif* season. Each pest species— white fly (*Bemisia tabaci*), jassid (*Amrasca biguttula biguttula*), red cotton bug (*Dysdercus cingulatus*), and okra shoot and fruit borer (*Earias vitella*) showed specific periods of peak infestation, closely aligned with crop growth stages and prevailing weather conditions. These results emphasize the need for timely and targeted pest management strategies based on pest phenology and environmental factors to effectively reduce crop damage and improve yield. Future research should focus on integrating pest management strategies with weather forecasting models to enhance the effectiveness of pest control in okra cultivation.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**REFERENCES**

Choudhary, S. and Sharma, A. (2020). Population dynamics of shoot and fruit borer, *Earias* spp. infesting Okra. *Journal of Entomology and Zoology Studies*, 8(6): 499-501.

Kaveri, G., & Kumar, A. (2020). Field efficacy of certain biopesticides against okra shoot and fruit borer, *Earias vittella* (Fabricius) on okra, *Abelmoschus esculentus* (Linn.) Moench. *Journal of Entomology and Zoology Studies, 8*(6), 1279-1281.

Panbude, C. U., Neharkar, P. S., Hemant, P., & Raut, A. R. (2019). Seasonal incidence and biorational management of fruit and shoot borer (*Earias vitella*) (Fab.) on okra. *Journal of Pharmacognosy and Phytochemistry, 8*(5), 1574-1576.

Rajput, G. S., & Tayde, A. (2017). Population dynamics and comparative efficacy of certain novel insecticides, botanicals, and bioagents, against shoot and fruit borer (*Earias vitella* Fabricius) of okra crop [*Abelmoschus esculentus* (L.) Moench]. *Journal of Entomology and Zoology Studies, 5*(4), 1667-1670.

Rawat, N., Karnatak, A. K., & Srivastava, R. M. (2020). Population dynamics of major sucking insect pests of okra in agro-climatic condition of Pantnagar. *Journal of Entomology and Zoology Studies*, *8*(1), 540–545.

Yadav, A. K., Chaudhary, A. K., Gangwar, B., Kumar, P., Yadav, A. K., Yadav, M., Yadav, K., & Harsoliya, J. (2024). Management of white fly (*Bemisia tabaci* Genn.) by different bio pesticides on red okra crop. *Uttar Pradesh Journal of Zoology, 45*(18), 242-247. http://dx.doi.org/10.56557/upjoz/2024/v45i184443.

Yadav, A. K., Choudhary, A. K., Gangwar, B., Kumar, P., Yadav, A. K., Yadav, M., Harsoliya, J., & Yadav, K. (2024). Management of okra shoot and fruit borer *Earias vitella* (Fab.) by different insecticides on okra. *Uttar Pradesh Journal of Zoology, 45*(17), 701-706. http://dx.doi.org/10.56557/upjoz/2024/v45i174415.

Yadav, M., Gangwar, B., Choudhary, A. K., Yadav, A. K., Yadav, A. K., Chawla, G., Hariyana, K., Dhabhai, S. K., Yadav, K., & Bajroliya, S. (2024). Seasonal incidence of okra (*Abelmoschus esculentus* L.) insect pests. *International Journal of Advanced Biochemistry Research, SP-8*(8), 681-683. <http://dx.doi.org/10.33545/26174693.2024.v8.i8Sj.1898>.