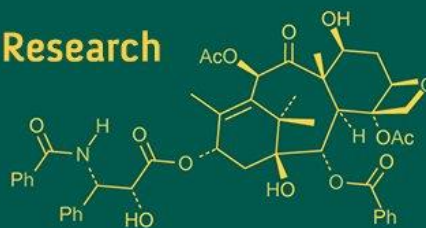
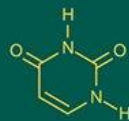
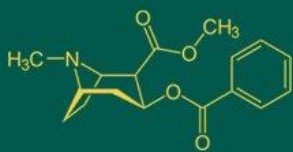


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Assessment of Insect-pest complex of brinjal (*Solanum melongena* L.) and relation to abiotic factor in western U.P

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Abstract

Brinjal (*Solanum melongena* L.) is an important vegetable crop severely affected by several insect pests, resulting in significant yield losses. The present study was conducted during Kharif 2025 at the Crop Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, to investigate the seasonal abundance of insect pests, natural enemies, and their relationship with abiotic weather parameters. Weekly observations were recorded was the 13 insect pest species, two non-insect pest species, and six natural enemy species associated with different crop growth stages. Whitefly (*Bemisia tabaci*), leafhopper (*Amrasca biguttula biguttula*), aphid (*Aphis gossypii*), thrips (*Scirtothrips dorsalis*), and brinjal shoot and fruit borer (*Leucinodes orbonalis*) were the predominant pests. The findings provide valuable information for weather-based pest monitoring and the development of location-specific Integrated Pest Management (IPM) strategies for sustainable brinjal production.

Keyword: *Leucinodes orbonalis*, insect-pest, natural enemies, IPM, Non-insect-pest

Introduction

Brinjal (*Solanum melongena* Linn.) most popular vegetable which is also known as eggplant or aubergine or guinea squash, belongs to the nightshade family Solanaceae and principally regarded as “King of the Vegetables”. Brinjal in Asia is the third most commonly cultivated vegetable plant. In Asia and the Mediterranean region, brinjal ranks among the top five most important vegetable crops (Frery *et al.*, 2007). The estimated total world production for brinjal in 2022 was 59.32 million tons. China is the largest producer, accounting for nearly 65 per cent of global production *i.e.* 38.28 million tons followed by India contributing 21.51 per cent total production *i.e.* 12.76 million tons (FAOSTAT, 2024). India ranks as the second- largest producer of fruits and vegetables globally, followed by China. The estimated cultivated areas for vegetables and fruits are 10.86 million hectares and 9.6 million hectares, respectively (APEDA, 2023). Brinjal is highly nutritive vegetable which is a rich source of various minerals like calcium, magnesium, potassium, iron, zinc and copper. One cup of cubed raw eggplant (82 g) contains 20 calories, 0.8 g of protein, 4.8 g of carbohydrates and 0.1 g of fat. (Choudhary, 2016) *L. orbonalis* infested crop shoots in late August, reached on peak during the third week of September. The second time damage to the shoot ranged from 30.23 to 36.23 per cent, while from May to July the damage to the fruit ranged from 37.51 to 42.23 per cent. Hours of maximum and minimum temperature, evaporation and sunshine had a positive association with shoot damage, whereas relative humidity had a negative effect (Singh *et al.*, 2000) [2, 3, 10].

Material and Methods

The presents investigation entitled “Assessment of Insect-pest complex of brinjal (*Solanum melongena* L.) and relation to abiotic factor in western U.P” was conducted during the Kharif 2025 season at the Crop Research Centre (CRC), Sardar Vallabhbhai Patel University of Agriculture and Technology (SVPUAT), Meerut, Uttar Pradesh, India. The experimental farm is situated at 29°01' N latitude and 77°45' E longitude, at an altitude of 237 m above mean sea level and represents the agro-climatic conditions of the Western Plain Zone of Uttar Pradesh.

Experimental Crop and Field Layout

Brinjal (*Solanum melongena* L.) was grown under recommended agronomic practices throughout the cropping season. A 10 × 10 m experimental plot was maintained exclusively for recording observations on insect pests and natural enemies. Weekly observations were initiated immediately after the first appearance of insect pests and continued until crop maturity.

Recording of Insect Pest Incidence

Observations on major sucking pests recorded from 10 randomly selected plants at weekly intervals, aphid (*Aphis gossypii*), leafhopper (*Amrasca biguttula biguttula*), and whitefly (*Bemisia tabaci*), both nymphs and adults were counted on two leaves each from the upper, middle and lower canopy of each selected plant. The average population was expressed on a per-plant basis.

The incidence of the brinjal shoot and fruit borer (*Leucinodes orbonalis*) was assessed on the same set of plants. Shoot infestation was determined by counting healthy and infested shoots, whereas fruit infestation was assessed by recording the number of healthy and damaged fruits. After each observation, infested shoots and damaged fruits were removed to prevent repeated observations of the same plant parts during subsequent sampling.

Assessment of Shoot and Fruit Infestation

$$\% \text{ Shoot infestation} = \frac{\text{Number of infested shoot}}{\text{Total number of shoots}} \times 100$$

$$\% \text{ Fruit infestation by number} = \frac{\text{Number of infested fruits}}{\text{Total number of fruits}} \times 100$$

$$\% \text{ Fruit infestation by weight} = \frac{\text{Weight of infested fruit}}{\text{Total weight of fruits}} \times 100$$

Weather Data

Weekly meteorological data, including maximum temperature (°C), minimum temperature (°C), morning relative humidity (%), evening relative humidity (%) and rainfall (mm) were obtained from the Agro-meteorological Observatory of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut. Weather parameters corresponding to each Standard Meteorological Week (SMW) were used to study their relationship with the seasonal incidence of insect pests.

Statistical Analysis

The experimental data were compiled and analysed using standard statistical procedures. Seasonal pest incidence was expressed as mean values and the relationship between pest incidence and abiotic weather parameters was determined using Pearson's correlation coefficient (r). The strength and direction of the association between insect pest population and individual weather variables were interpreted based on correlation values. Graphical representations were prepared to illustrate seasonal population trends and their association with prevailing meteorological conditions.

Result

Studies on succession of insects on the basis of field incidence revealed that thirteen species of insect pests, six

species of natural enemy and two species of non-insect-pest were observed associated with various stages of the brinjal crop after transplanting at Modi Puram, Meerut, Uttar Pradesh in India during Kharif 2025 growing season till the harvesting of the crop. The first major group of insect pests attacking the crop during the vegetative stage were jassid, aphid and whitefly and thrips were available till maturity of the crop. Shoot and fruit borer was the dominant pest from fruiting to maturity. Natural enemies were observed from vegetative stage to reproductive stage of the crop.

1. Jassid, *Amrasca biguttula biguttula* (Ishida) (Hemiptera: Cicadellidae)

In the present study jassid first observed when the crop age was about 31st days old after transplantation till the crop during the entire cropping season and remained available till the crop maturity stage up to mid-week of November.

2. Aphid, *Aphis gossypii* (Glover) (Hemiptera: Aphididae)

In the present study aphid first recorded when the crop was about 31st days old after transplantation till the crop up to the fruiting stage of the crop, up to last week of October.

3. Whitefly, *Bemisia tabaci* (Genn.) (Hemiptera: Aleyrodidae)

In the present study incidence of whitefly first observed when the crop age was about 38th days after transplantation till the crop during the entire cropping season and remained available up to the crop maturity stage up to last week of October.

4. Thrips, *Scirtothrips dorsalis* (Hood) (Thysanoptera: Thripidae)

First appearance of thrips observed when the crop age was about 45th days, vegetative stage till the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to last week of October.

5. Shoot and fruit borer, *Leucinodes orbonalis* (Guen.) (Lepidoptera: Pyralidae)

First incidence of the shoot and fruit borer infestation observed during the reproductive stage of the crop about 102nd days after transplantation pest present on the crop during the fruiting stage and remained available up to the crop maturity stage, up to mid-week of December.

6. Treehopper, *Leptocentrus taurus* (Fab.) (Hemiptera: Membracidae)

First appearance of treehopper observed when the crop age about 38th days, i.e., vegetative stage pest present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to last week of November.

7. Brown Plant Hopper, *Cestius phycitis* (L.) (Hemiptera: Cicadellidae):

First appearance of brown plant hopper observed when the crop age about 45th days, i.e., vegetative stage pest present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to mid-week of November.

8. Lace wing bug, *Urantius hystricallus* (L.) (Homoptera: Tingidae):

First appearance of lace wing bug observed when the crop age was about 45th days, i.e. vegetative stage pest present on the crop during the vegetative stage and remained

active up to the fruiting stage of the crop up to last week of October.

9. Hadda beetle, *Henospilachna vigintioctopunctata* (Fab.) (Coleoptera: Coccinellidae)

First appearance of hadda beetle observed when the crop age was about 52nd days, i.e., vegetative stage pest present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to last week of October.

10. Capid butterfly, *Luthrodus pandava* (Hors.) (Lepidoptera: Lycaenidae)

First appearance of capid butterfly observed when the crop age was about 59th days, i.e., vegetative stage pest present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to mid-week of October.

11. Grasshopper, *Melanoplus differentialis* (Thoms.) (Orthoptera: Acrididae)

First appearance of grasshopper observed when the crop age was about 45th days, i.e., vegetative stage (Table 4.1), (Figure 4.2). From the figure it is evident that the pest present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to last week of November.

12. Leaf Miner, *Trachys herilla* (Obenberger) (Coleoptera: Buprestidae)

First appearance of leaf minor was observed when the crop age was about 31st days, i.e., vegetative stage (Table 4.1), (Figure 4.2). From the figure it is evident that the pest was present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to last week of October.

13. Leaf Roller, *Eublemma olivacea* (Walker.) (Lepidoptera: Noctuidae)

First appearance of leaf roller observed when the crop age about 45th days, i.e., vegetative stage (Table 4.1), (Figure 4.2). From the figure it is evident that the pest present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to mid-week of November.

14. Mole Cricket, *Gryllotalpa gryllotalpa* (Orthoptera: Gryllotalpidae)

First appearance of Mole cricket observed when the crop age was about 59th days, i.e., vegetative stage (Table 4.1), (Figure 4.2). From the figure it is evident that the pest was present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop, up to mid- week of October.

B.1. Red Spider Mite, *Tetranychus urticae* L. (Acari: Tetranychidae): First appearance of thrips observed when the crop age about 52 days vegetative stage (Table 4.1), (Figure 4.2). From the figure it is evident that the pest present on the crop during the vegetative stage and remained active up to the fruiting stage of the crop up to last week October.

C.1. Lady bird beetle, *Menochilus sexmaculatus* (Fabricius) (Coleoptera: Coccinellidae)

First incidence of lady bird beetle observed when the crop age about 66 days (Table 4.1), (Figure 4.2). From the figure it is evident that the predator present on the crop during the

vegetative stage and remained available up to the maturity stage of the crop up to last week of November.

2. Zig zag beetle, *Cheilomenes sexmaculata* (Coleoptera: Coccinellidae)

First incidence of zig-zag beetle observed when the crop age was about 73rd days (Table 4.1), (Figure 4.2). From the figure it is evident that the predator was present on the crop during the vegetative stage and remained available up to the maturity stage of the crop i.e. last week of October

3. Damslefly, *Epiophlebia laidlawi* (Odonata: Epiophlebiidae)

First incidence of damslefly was observed when the crop age was about 59th days (Table 4.1), (Figure 4.2). From the figure it is evident that the predator present on the crop during the vegetative stage and remained available up to the maturity stage of the crop up to last week of October

4 Ant, *Lasius niger* (Hymenoptera: Formicidae)

First incidence of Ant was observed when the crop age about 45 days (Table 4.1), (Figure 4.2). From the figure it is evident that the predator was present on the crop during the vegetative stage and remained available up to the maturity stage of the crop up to last week of November

5. Wasp, *Vespula vulgaris* (Hymenoptera: Vespidae)

First incidence of Wasp was observed when the crop age about 66 days (Table 4.1), (Figure 4.2), (Plate-5 and 6). From the figure it is evident that the predato present on the crop during the vegetative stage and remained available up to the maturity stage of the crop up to mid-week of November

6. Honeybee, *Apis cerana indica* (Hymenoptera: Apidae)

First incidence of Honeybee was observed when the crop age about 45 days (Table 4.1), (Figure 4.2), (Plate-5 and 6). From the figure it is evident that the predator was present on the crop during the vegetative stage and remained available up to the maturity stage of the crop up to last week of November. The present findings agree with those of Choudhury et al. (2016), Gangwar and Singh (2014), Kumar et al. (2019), Kumari et al. (2023), and Manoj et al. (2024) ^[1, 4], who also reported diverse insect pest complexes and associated natural enemies in brinjal ecosystems under different agro-climatic regions of India ^[6, 7, 8, 10].

Discussion

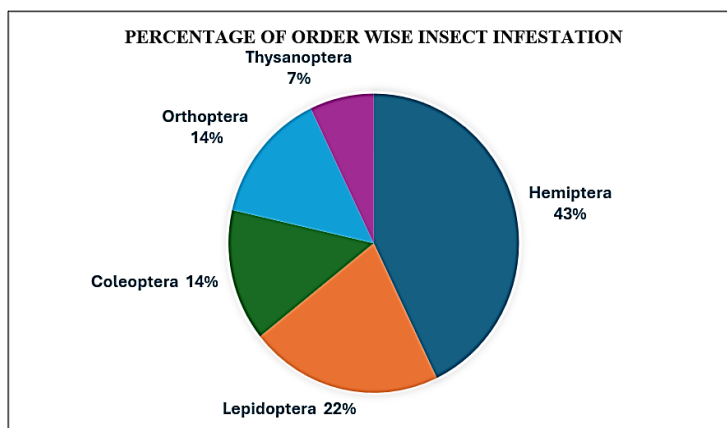
The current study revealed that the brinjal ecosystem had a diverse mix of insect pest species, natural enemies and pollinators. This finding is supported by Dar et al. (2015) who reported 13 species of harmful arthropods belonging to six different orders, including twelve species of foliage feeders was observed. The brinjal shoot and fruit borer (*L. orbonalis*), epilachna beetle (*Epilachna* sp.), eight white fly (*B. tabaci*), leaf hoppers (*A. biguttulabiguttula*) and aphids were dominant and major insect pests of the brinjal. Choudhary et al. (2016) reported total fourteen arthropod species. Gangwar and Singh (2014) reported total number of eight insect species were found associated with brinjal crop at different crop growth stages. Kumar et al. (2019) recorded ten insect species, during the brinjal crop season, Jaiswal et al. (2018) reported the presence of seven species of insect pests and three species of predator. Kumari et al. (2023) observed nine insect pest species, with jassid, whiteflies, aphids, brinjal

shoot and fruit borers, and hadda beetles being the most frequently occurring pests. Manoj et al. (2024) reported six insect pest species and four natural enemies on brinjal crop. Mishra and Tripathi (2017) [5, 6, 7, 8, 9, 10] observed total of twelve species of insect pests, namely *L. orbonalis*, *E. perticella*, *E. vigintioctopunctata*, *U. sentis*, *A. biguttula*

biguttula, *B. tabaci*, *A. dispursus*, *L. erysimi*, *A. destructor*, *A. auranti*, *T. palmi* and ants have been recorded damaging brinjal crop. Out of which *L. orbonalis*, *A. biguttula*, *A. dispursus*, *A. destructor*, *L. erysimi* and ants were found throughout the year.

Table 1: List of insect-pest complex associated with brinjal in western U.P

S.No	Common Name	Scientific Name	Family	Order	Crop Stage	Status of the pest
A. Insect-Pest						
1.	Whiteflies	<i>Bemisia tabaci</i> (Gennadius)	Aleyrodidae	Hemiptera	Vegetative to maturity	High
2.	Aphid	<i>Aphis gossypii</i> (Glover)	Aphididae	Hemiptera	Vegetative to maturity	Moderate
3.	Leafhopper	<i>Amrasaca biguttula biguttula</i> (Ishida)	Cicadellidae	Hemiptera	Vegetative to maturity	High
4.	Treehopper	<i>Leptocentrus taurus</i> (Fabricius)	Membracidae	Hemiptera	Vegetative to maturity	Low
5.	Brinjal shoot and Fruit Borer	<i>Leucinodes orbonalis</i> (Gunee.)	Pyalidae	Lepidoptera	Flowering to maturity	High
6.	Brown plant hopper	<i>Cestius phycitis</i> L.	Cicadellidae	Hemiptera	Vegetative to maturity	Low
7.	Thrips	<i>Thrips tabaci</i>	Thripidae	Thysanoptera	Vegetative to maturity	Low
8.	Lace wing bug	<i>Urantius hystricallus</i> L.	Tingidae	Homoptera	Vegetative to maturity	Low
9.	Hadda Beetle	<i>Henosepilachna vigintioctopunctata</i> Fabricius	Coccinellidae	Coleoptera	Vegetative to maturity	Low
10.	Capid Butterfly	<i>Luthrodes pandava</i> Hors.	Lycaenidae	Lepidoptera	Vegetative to maturity	Low
11.	Grasshopper	<i>Melanoplus differentialis</i> Thoms.	Acrididae	Orthoptera	Vegetative to maturity	Low
12.	Leaf Miner	<i>Trachys herilla</i> Obenberger	Buprestidae	Coleoptera	Seedling stage	Low
13.	Leaf roller	<i>Eublemma olivacea</i> Walker.	Noctuidae	Lepidoptera	Vegetative to maturity	Low
14.	Mole Cricket	<i>Gryllotalpa gryllotalpa</i>	Gryllotalpidae	Orthoptera	Vegetative to maturity	Low
B. Non-Insect-Pest						
15.	Red Spider Mite	<i>Tetranychus urticae</i> L.	Tetranychidae	Acari	Seedling and vegetative stage	Low
C. Natural enemies						
16.	Lady bird beetle	<i>Coccinella septempunctata</i> L.	Coccinellidae	Coleoptera	Vegetative to maturity	Low
17.	Zig Zag Beetle	<i>Cheilomenes sexmaculata</i>	Coccinellidae	Coleoptera	Vegetative to maturity	Low
18.	Damselfly	<i>Epiophlebia laidlawi</i>	Epiophlebiidae	Odonata	Vegetative to maturity	Low
19.	Ant	<i>Lasius niger</i>	Formicidae	Hymenoptera	Vegetative to maturity	Low
20.	Wasp	<i>Vespula vulgaris</i>	vespidae	Hymenoptera	Vegetative to maturity	Low
21.	Honey Bee	<i>Apis cerana indica</i>	Apidae	Hymenoptera	Vegetative to maturity	Low



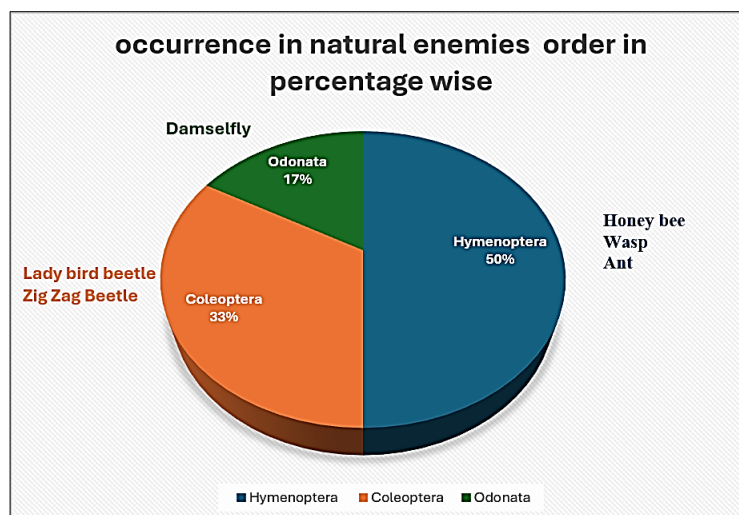


Plate 1: Different insect-pest infestation in brinjal

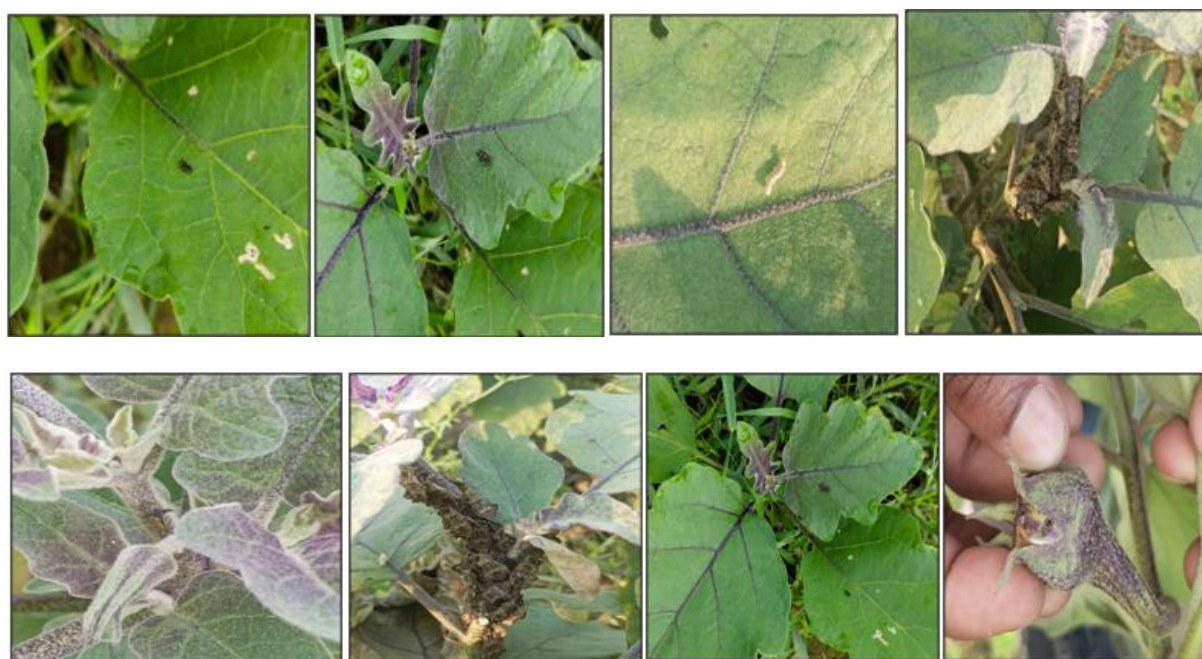


Plate 1: Different insect-pest infestation in brinjal

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