Volume 3, Issue 11
November I 2025

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Distribution and Control of Shoot and Fruit Borer (*Leucinodes orbonalis*)

ARTICLE ID: 0288

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The shoot and fruit borer (*Leucinodes orbonalis*) is one of the most devastating insect pests affecting brinjal (eggplant), a staple vegetable crop in many parts of Asia and Africa. Known for its aggressive larval feeding behavior, *L. orbonalis* causes extensive damage to both vegetative and reproductive parts of the plant, leading to significant yield losses and economic hardship for farmers. Despite decades of research and control efforts, this pest remains a persistent challenge due to its rapid life cycle, high reproductive capacity, and adaptability to various agro-climatic conditions.

II. Taxonomy and Morphology

- **Scientific Name:** *Leucinodes orbonalis* Guenée
- **Order:** Lepidoptera
- **Family:** Crambidae
- **Common Name:** Brinjal shoot and fruit borer

Morphological Features

- **Adult Moth:** Small, white moth with pinkish-brown markings on the wings. Wingspan ranges from 20–30 mm.
- **Eggs:** Oval, creamy-white, laid singly or in small groups on tender shoots, leaves, or fruits.
- **Larvae:** Creamy-white caterpillars with a pinkish tinge and dark head capsule; grow up to 20 mm in length.
- **Pupae:** Brown, cylindrical, found in plant debris or soil.

III. Geographic Distribution

Global Distribution

Leucinodes orbonalis occurs primarily in tropical and subtropical regions. Its presence has been confirmed in:

- **South Asia:** India, Bangladesh, Nepal, Sri Lanka, Pakistan
- **Southeast Asia:** Myanmar, Thailand, Malaysia, Indonesia, Philippines

- **Africa:** Democratic Republic of Congo, South Africa, Kenya
- **Middle East:** Sporadic reports from Iran and Saudi Arabia

Distribution in India

India is one of the worst-affected countries, with *L. orbonalis* prevalent in nearly all brinjal-growing states. Major hotspots include:

- **Northern India:** Uttar Pradesh, Punjab, Haryana
- **Eastern India:** Bihar, West Bengal, Odisha
- **Western India:** Maharashtra, Gujarat
- **Southern India:** Tamil Nadu, Andhra Pradesh, Karnataka

The pest thrives in warm, humid climates and is active throughout the year in tropical zones, with peak infestations during the flowering and fruiting stages.

IV. Host Range

While brinjal is the primary host, *L. orbonalis* can infest other solanaceous crops and wild relatives:

- **Primary Host:** Brinjal (*Solanum melongena*)
- **Secondary Hosts**

- Tomato (*Solanum lycopersicum*)
- Potato (*Solanum tuberosum*)
- *Solanum nigrum* (Black nightshade)
- *Solanum torvum* (Turkey berry)

However, the pest shows a strong preference for brinjal due to its tender shoots and fleshy fruits.

V. Life Cycle and Biology

Leucinodes orbonalis undergoes complete metamorphosis with four distinct stages: egg, larva, pupa, and adult.

1. Egg Stage

- **Duration:** 3–5 days
- Eggs are laid on the lower surface of leaves, flower buds, and young fruits.
- A single female can lay 200–250 eggs during her lifespan.

2. Larval Stage

- **Duration:** 12–20 days
- Newly hatched larvae bore into shoots or fruits and feed internally.
- Larvae pass through 5–6 instars before pupation.
- This stage causes the most severe crop damage.

3. Pupal Stage

- **Duration:** 7–10 days
- Pupation occurs in plant debris, soil, or within damaged plant parts.
- Pupae are brown and cylindrical.

4. Adult Stage

- **Lifespan:** 5–10 days
- Adults are nocturnal and mate soon after emergence.
- Females begin laying eggs within 24 hours of mating.

Generations

- *L. orbonalis* completes 5–8 generations per year depending on climate.
- In tropical regions, overlapping generations occur year-round.

VI. Symptoms of Damage

1. Shoot Damage

- Wilting of young shoots (“dead hearts”)
- Drooping and drying of terminal shoots
- Reduced plant vigor and branching

2. Fruit Damage

- Entry holes on the fruit surface with visible frass (excreta)
- Internal feeding leads to rotting and premature fruit drop
- Fruits become unmarketable due to structural and cosmetic damage

3. Yield Loss

- Infestation can lead to 30–70% yield loss under moderate conditions
- In severe cases, losses may reach up to 100% if left unmanaged

VII. Economic Impact

Brinjal is a high-value crop grown by small and marginal farmers across Asia. The economic implications of *L. orbonalis* infestation include:

- **Reduced Market Value:** Damaged fruits are rejected by consumers and traders.
- **Increased Production Costs:** Frequent pesticide applications raise input costs.
- **Loss of Export Potential:** Infested produce fails to meet phytosanitary standards.
- **Farmer Distress:** Crop failure leads to financial instability and indebtedness.

VIII. Control Measures

A. Cultural Control

1. Field Sanitation

- Remove and destroy infested shoots and fruits regularly.
- Uproot and burn crop residues after harvest.

2. Crop Rotation

- Avoid continuous brinjal cultivation in the same field.
- Rotate with non-host crops like legumes or cereals.

3. Intercropping

- Plant brinjal with trap crops such as marigold to divert adult moths.

4. Timely Sowing

- Adjust planting time to avoid peak pest activity.

B. Mechanical Control

1. **Hand Picking:** Manual removal of infested parts during early infestation.

2. Pheromone Traps

- Use sex pheromone traps (e.g., *L. orbonalis* lure) to monitor and mass trap adults.
- Recommended density: 12–15 traps per hectare.

3. Light Traps

- Install solar or electric light traps to attract and kill nocturnal moths.

C. Biological Control

1. Parasitoids

- *Trichogramma chilonis*: egg parasitoid
- *Bracon hebetor*: larval parasitoid
- *Chelonus blackburni*: egg-larval parasitoid

2. Predators

- Ladybird beetles (*Coccinellidae*)
- Lacewings (*Chrysoperla* spp.)

3. Microbial Agents

- *Bacillus thuringiensis* (Bt): effective against early instar larvae
- Nuclear Polyhedrosis Virus (NPV) – specific to lepidopteran pests

4. Entomopathogenic Fungi

- *Beauveria bassiana* and *Metarhizium anisopliae* infect larvae and pupae

D. Chemical Control

1. Insecticides

- Carbaryl (0.1%)
- Chlorpyrifos (0.05%)
- Spinosad (0.015%)
- Emamectin benzoate (0.0025%)
- Lambda-cyhalothrin (0.005%)

2. Application Guidelines

- Begin spraying at flowering stage and repeat every 10–15 days.
- Rotate chemicals to prevent resistance development.
- Follow recommended pre-harvest intervals to ensure food safety.

3. Safety Measures:

- Use protective gear during spraying.
- Avoid spraying during pollination to protect bees.

E. Biotechnological Control

1. Bt Brinjal

- Genetically modified brinjal expressing *Cry1Ac* protein from *Bacillus thuringiensis*.
- Provides resistance against *L. orbonalis* larvae.
- Approved for commercial cultivation in Bangladesh since 2013.
- Under regulatory review in India.

2. Advantages

- Reduces pesticide use by up to 80%.
- Improves yield and farmer income.
- Environmentally safe with targeted action.

3. Challenges

- Regulatory hurdles and public perception.
- Need for stewardship and resistance management.

IX. Integrated Pest Management (IPM)

An effective IPM strategy combines multiple control methods to sustainably reduce pest pressure.

Key IPM Components

- **Monitoring:** Use pheromone traps and field scouting.
- **Threshold-Based Action:** Initiate control when infestation exceeds 10% of fruits.
- **Biological Agents:** Release parasitoids and apply microbial pesticides.
- **Selective Chemicals:** Use eco-friendly insecticides judiciously.
- **Farmer Training:** Promote awareness of IPM practices and safe pesticide use.

Conclusion

The shoot and fruit borer (*Leucinodes orbonalis*) is a major pest that severely affects brinjal productivity across tropical and subtropical regions. Its continuous infestation from the seedling to fruiting stage causes substantial yield and quality losses. Effective management requires an integrated approach combining cultural, mechanical, biological, and chemical control strategies. Regular monitoring, the use of pheromone traps, resistant varieties, and the adoption of integrated pest management (IPM) practices can significantly reduce pest incidence while maintaining environmental safety. Sustainable control of *L. orbonalis* ultimately depends on farmer awareness, timely interventions, and region-specific management practices.

References

1. Alam, S.N., Rashid, M.A., Rouf, F.M.A., Jhala, R.C., Patel, J.R., Satpathy, S., Shivalingaswamy, T.M., Rai, S., Wahundeniya, I., Cork, A., and Talekar, N.S. (2003). *Development of an integrated pest management strategy for eggplant fruit and shoot borer in South Asia.* Technical Bulletin No. 28, AVRDC – The World Vegetable Center, Taiwan, 56 p.
2. Srinivasan, R. (2008). Integrated pest management for eggplant fruit and shoot borer (*Leucinodes orbonalis*) in South and Southeast Asia: Past, present and future. *Journal of Biopesticides*, 1(2), 105–112.