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Emerging insect pests problems in basil (*Ocimum basilicum*) and their management

Basil (*Ocimum basilicum* L.) also known as *'Tulsi'*, is an important medicinal and aromatic plant, widely cultivated in India for its essential oil, used in pharmaceuticals, cosmetics, food, and traditional medicine. However, increased cultivation has led to rising insect pest problems, causing significant yield and quality losses. Basil is attacked by leaf-eating insect pests, such as leaf folder, perilla leaf moth, *Helicoverpa armigera,* tobacco caterpillar, and Bihar hairy caterpillar, as well as sap-sucking pests like lace bugs, aphids and thrips. These pests damage foliage, shoots, buds, and flowers, resulting in reduced photosynthesis, stunted growth, and lower essential oil yield. Climate variability and intensive monocropping have further aggravated pest incidences. Timely diagnosis of pest problems, regular monitoring, and preventive measures are essential for effective management. Integrated Pest Management (IPM) strategies involving neem based formulations, biological control, mechanical removal, pheromone and light traps, and conservation of natural enemies ensure sustainable and residue free basil production. This article provides practical guidelines for farmers and extension personnel to manage key insect pests and safeguard basil cultivation.

Keywords: Basil, Tulsi, *Ocimum basilicum*, emerging insect pest, management, IPM

OCIMUM BASILICUM L., commonly known as Basil or Tulsi, is a highly valued medicinal and aromatic plant (MAP) belonging to the family Lamiaceae. It is widely cultivated in India for its essential oil, which is rich in compounds such as linalool, methyl chavicol, eugenol, and cineole. These bioactive constituents make basil an important raw material for pharmaceutical, cosmetic, perfumery, and food industries, while also giving it a prominent place in traditional systems of medicine like Ayurveda, Siddha, and Unani. With the growing demand for natural products, the cultivation of *O. basilicum* has expanded rapidly across different agro-climatic regions of India. However, this increased cultivation has led to the emergence of several insect pest problems that significantly affect crop health, yield, and oil quality. Among the major pests reported are leaf folders, leaf eating caterpillars, lace bugs, aphids, and thrips which cause extensive damage to foliage and flowers, thereby reducing the plant's photosynthetic efficiency and overall biomass. In recent years, the challenges have been further compounded by climate variability and intensive monocropping, which have altered pest dynamics and facilitated the incidence of secondary pests. Insecticide misuse to control these pests not only raises production costs but also leads to pesticide residues in the essential oil, threatening its export potential. Hence, there is a growing emphasis on adopting integrated pest management (IPM) strategies, combining cultural, biological, mechanical, and need-based chemical control measures to ensure sustainable and residue-free production. This article highlights the key insect pests of *O. basilicum* in India, their nature of damage, and practical management strategies to help farmers and stakeholders safeguard this economically important aromatic crop.

Ocimum leaf folder, *Orphanostigma abruptalis*

Ocimum leaf folder larva Infested shoot

Nature of damage: It is a major pest of *O. basilicum.* The larvae fold tender leaves and bind them with silken threads, feeding inside the folds and causing skeletonization of leaf tissues. Severe infestations lead to defoliation, reduced photosynthesis, stunted growth, and

loss of biomass and essential oil yield, especially during warm and humid conditions from July to October.

Management: The Ocimum leaf folder can be effectively managed by spraying 5% NSKE or 2 ml neem oil per litre, or 2 ml pongamia oil per litre of water. Regular monitoring and early application during the July-August infestation period help reduce damage and protect crop yield.

Perilla leaf moth, *Pyrausta panopealis*

Pyrausta panopealis larva

Nature of damage: *Pyrausta panopealis*, commonly known as the Perilla leaf moth, is an important pest of basil. The larvae feed on young shoots, tender stems, and flower buds, causing shoot wilting, bud drop, and poor flowering. Heavy infestations lead to reduced plant growth, decreased leaf area, and significant loss in essential oil yield. The damage is most noticeable during the active growing season, especially from July to October, when the crop is tender and lush.

Perilla leaf moth infested plant

Management: The pest can be effectively managed by spraying Azadirachtin 1500 ppm (1%). For enhanced control, Spinosad 45 SC (150 ml/ha) can be applied. The first spray is recommended 15 days after transplanting, followed by a second spray 45 days after transplanting.

Helicoverpa armigera larva

Helicoverpa armigera

Nature of damage: *Helicoverpa armigera* is an important pest of basil, primarily acting as a defoliator. The larvae feed on leaves and flowers, causing skeletonization of foliage and damage to flower buds. Heavy infestations seen from August to October lead to reduced plant growth and poor flowering.

Management: Infestations can be controlled by spraying 5% NSKE or neem oil 2%, or Pongamia oil 2%. Installation of pheromone traps for monitoring and release of egg parasitoid *Trichogramma chilonis* is effective in controlling pest at early stage of infestations. Early intervention during August-October helps to protect the crop.

Tobacco caterpillar, Spodoptera litura

Nature of damage: *Spodoptera litura* larvae cause severe damage to basil by scraping leaf surfaces in early stages, while the later stages defoliate the leaves completely. In heavy infestations, they cut tender shoots and reduce biomass and essential oil yield.

Tobacco caterpillar

Management: For effective organic management, regularly monitor the crop and collect and destroy egg masses and early stage larvae. Use pheromone traps (12-15/ha) to monitor and mass-trap adult moths. Spray neem-based formulations (Neem oil 3% or Azadirachtin 1500 ppm @ 2-3 ml/L) to deter feeding and oviposition.

Bihar hairy caterpillar, Spilarctia obliqua

Bihar hairy caterpillars

Infested plant

Nature of damage: This pest occasionally attacks basil. The larvae feed voraciously on leaves, often consuming the entire lamina and leaving only midribs. Severe infestations lead to defoliation, reduced plant growth, and lower essential oil yield, particularly during July to October when the crop is tender.

***Management*:** During early stages, collect and destroy gregarious larvae and egg masses to prevent spread. Install

light traps to catch adult moths and spray neem-based formulations (neem oil 3% or Azadirachtin 1,500 ppm@ 2-3 ml/L).

Lacebug, *Cochlochila bulita*

Adult and nymphs of lacebug Infested plant

Nature of damage: Lace bugs are sap-sucking pests of basil. Both nymphs and adults feed on the underside of leaves, causing yellowing, stippling, and a speckled appearance. Infestation initiates in June and severe infestations can lead to leaf curling, reduced photosynthesis, and stunted plant growth, affecting overall biomass and essential oil yield.

Management: Lace bug infestations can be managed by using Azadirachtin 1.5% or neem oil 2%, or NSKE 5%. Regular monitoring, removal of infested leaves, and encouraging natural predators like geocorid bugs, ladybird beetles, and spiders help reduce populations in organic basil cultivation.

Aphids, *Aphis gossypii*

Aphids Infested plants

Nature of damage: Aphids are sap-sucking pests that feed on young shoots, leaves, and tender stems of basil. Nymphs and adults feeding causes leaf curling, yellowing, and stunted growth, and heavy infestations can lead to reduced leaf area and lower essential oil yield. Additionally, aphids excrete honeydew, which promotes sooty mould growth on leaves, further affecting plant health.

Management: Non-chemical management of aphids in basil includes regularly removal of infested shoots, conservation of natural enemies like ladybird beetles and lacewings, and spraying 5% neem seed kernel extract (NSKE) or 2% neem oil.

Thrips, *Scirtothrips* sp., *Thrips* sp.

Thrips infested plant

Nature of damage: Thrips infest young leaves, buds, and flowers of basil, sucking cell sap and causing silvery streaks, curling, and distortion of leaves. Heavy infestation leads to reduced photosynthesis, poor flowering, and lower essential oil yield, particularly during warm and dry conditions.

Management: For managing thrips in basil, use blue sticky traps for monitoring and mass trapping, apply neem oil (Azadirachtin 0.03%) as a botanical spray, and conserve lacewings, ladybird beetles, or predatory mites for natural control.

Spider Lady bird beetle Geocorid bug

SUMMARY

Effective management of insect pests in basil is essential to maintain plant health, optimize biomass production, and ensure high quality essential oil yield. Timely diagnosis, regular monitoring, and preventive measures are vital to minimize crop losses. Adopting eco-friendly Integrated Pest Management (IPM) strategies provides a sustainable approach for residue free basil production, benefiting both farmers and the aromatic industry.

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