Mango Leaf Webber (*Orthaga exvinacea*): Biology, Damage and Integrated Pest Management

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The mango leaf webber, *Orthaga exvinacea* (family Pyralidae, order Lepidoptera), constitutes a major constraint to mango production, causing severe yield losses under unmanaged conditions. Infestations can result in 25-100% production loss and an average yield reduction of 61.51%, accompanied by increased fruit drop (from 38.51% to 50.58%) and a decline in fruit set (from 378 to 232 fruits per tree) (Polu et al., 2022). In India, where mango is cultivated over approximately 2.29 million hectares, such damage poses a substantial threat to grower livelihoods across South Asia. However, timely implementation of integrated pest management (IPM) strategies has been shown to restore yields to 61–66 quintals per hectare with benefit-cost ratios exceeding 4.0, indicating that economic gains markedly outweigh management costs (Polu et al., 2022). In the context of climate change-driven increases in pest pressure, the adoption of integrated and sustainable management approaches is therefore imperative for mango cultivation.

Biology

Egg Stage: Females deposit oval, flattened eggs 0.84mm × 0.56mm singly or in small groups near the midrib or along leaf veins. Eggs are initially pale yellowish to green, turning light pink before hatching. Females produce an average of 58 eggs during their reproductive lifespan (Kavitha et al., 2005).

Larval Stage: First and second instars are pinkish to light green with brown heads, scraping chlorophyll and causing patchy damage in 4.80±0.92 and 4.65±0.90 days. Third and fourth instars are dark greenish, consuming webbed leaves from margins inward, leaving major veins intact in 4.65±0.90 and 4.16±0.87 days. Fifth and sixth instars are dark greenish-black to greyish-green with brown prothoracic spots, developing in 4.52±0.51 and 5.20±0.42 days. Seventh instar is stouter, lighter-colored, with reduced feeding during 6.50±0.53 days pre-pupal phase; larvae reach 2-3cm. (Shrestha et al., 2022).

Pupal stage: Mature larvae enter a non-feeding pre-pupal phase, becoming cream-colored and constructing silken cocoons. Pupation occurs within webbed leaves, producing a dark brown, obtect pupa. Female pupae were significantly larger (13.69 × 5.60 mm) and developed more slowly (14.30 ± 1.43 days) than males (12.14 × 4.25 mm; 11.80 ± 0.63 days) (Kavitha et al., 2005).

Adult stage: Adult moths are sexually dimorphic, medium sized grey-brown insects with brown forewings and dirty white hindwings. Females are larger 13.22±0.20mm and longer-lived up to 5.80±0.42 days than males 11.54±0.33mm; 4.10±0.74 days (Kavitha et al., 2005).

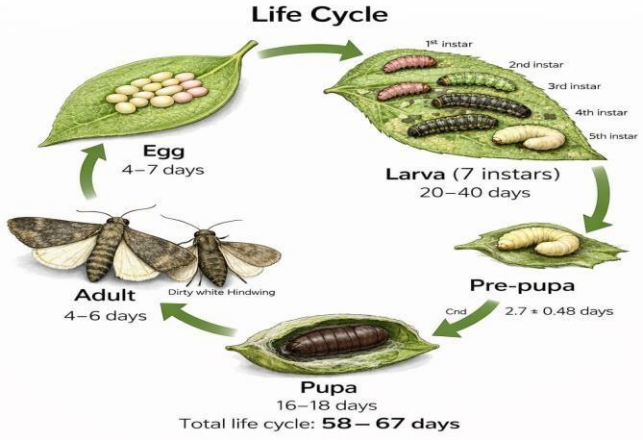

Fig 1. Life stages of mango leaf webber

Damage Symptoms

The primary damage occurs on leaves, where larvae are the economically damaging stage, feeding gregariously on soft leaf tissue by scraping the lamina while leaving midribs and vein networks intact, creating a skeletal appearance. They construct silken webs made from proteins secreted by the insect's silk glands (Gamit et al., 2022) to bind multiple leaves into cluster-like nests, within which several caterpillars feed voraciously. Infested leaves dry but remain attached due to webbing entanglement. Severe infestations cause terminal shoot webbing, giving trees a burnt appearance and prevents flowering and fruiting causing complete reproductive failure. Young trees (less than 5 years) show lower infestation levels, while mature trees with 15+ years exhibit significantly higher populations (121.61 larvae/ tree, 18.26 webs/ tree, 348.75 webbed leaves/tree).

Fig 2. Damage caused by leaf webber in mango plant

Ecology and Occurrence

Peak populations of mango leaf webber occur in early-to-mid November during the August-December active season (Kasar et al., 2017). High humidity and rainfall favor pest proliferation, while host cultivar susceptibility significantly influences infestation severity. Minimum temperature negatively correlates with pest abundance in resistant varieties, though susceptible varieties maintain high populations regardless of temperature. Populations collapse after late December as conditions become unfavorable, and from January through April, no webber populations are observed on foliage, providing a predictable ecological pattern for targeted management strategies. (Parameshwar et al., 2024). Two Orthaga species i.e. Orthaga exvinacea and O. euadrusalis are major mango pests in South and Southeast Asia. O. exvinacea is primarily distributed in southern India including Tamil Nadu, Andaman Islands, Kerala and has been recorded in West Bengal and Odisha.

Integrated Pest Management

Cultural Control

- ***Orchard Management:*** Mango leaf webber infestations are more severe in old, unmanaged orchards with dense canopies thus; replace older plantings with dwarf, resistant varieties that are easier to manage. Infestation intensity is significantly higher on the western and southern tree aspects, so prioritize surveillance and management on these sides. Prune overcrowded and overlapping branches to reduce webber habitat, improve air circulation, and facilitate pest monitoring.
- ***Sanitation and Field Hygiene***: Regularly collect and burn fallen leaves to remove protective microhabitats where pupae overwinter. Deep ploughing during November-December disrupts soil pupae and exposes them to direct sunlight, thermal stress, and predatory natural enemies, significantly reducing survival rates.
- *O. exvinacea* being an oligophagous pest, is primarily specific to mango, with cashew recorded as a secondary host. Remove nearby cashew and Anacardiaceae plants from orchards to eliminate pest reservoirs.

Mechanical Control

- Web Removal and Destruction: Manually break and remove webbed leaf clusters to expose larvae and caterpillars to lethal desiccation and heat. Throughout the growing season, regularly prune and burn infested shoots to eliminate all developmental stages and prevent population buildup.
- ***Trunk Banding:*** Wrap tree trunks with alkathene sheets (400 gauge) at 30 cm above ground level with 25 cm width and apply grease barriers to prevent larvae from crawling up the trunk and establishing new feeding sites on canopy foliage.

Biological Control

Entomopathogenic Fungal Application: Spray *Beauveria bassiana* at 5 ml/liter of water two to three times during high humidity periods to suppress webber larvae effectively. Apply during early morning or late evening when environmental conditions favor fungal spore germination and infection.

Botanical Pesticides: Apply nimbicidine at 0.2% concentration 2 ml/liter of water as a safe botanical pesticide to effectively manage webber populations without harming beneficial organisms. Use at the initial stage of infestation for optimal results (Shrestha et al., 2022).

Legal and Regulatory Control: Enforce strict quarantine on movement of mango plant parts, propagules, fruits, and fodder to prevent pest dispersal to new regions. Monitor intra-national mango plant movement for early detection and rapid response. Originally from India, this pest has invaded Sri Lanka, Indonesia, and Japan,

necessitating urgent preventive measures across mango-growing nations (Shrestha et al., 2022).

Table 1: Natural enemies for management of mango leaf webber populations

Natural Enemy	Type	Dose/ha	Life Stage Attacked
Brachymeria lasus	Parasite	5,000-10,000 pupae	Larvae
Hormius sp.	Parasite	5,000-8,000 individuals	Larvae
Pediobius bruchicida	Parasite	4,000-6,000 individuals	Larvae
Tetrastichus sp.	Parasite	4,000-6,000 individuals	Larvae
Hormiusa sp.	Parasitoid	3,000-5,000 individuals	Larvae
Goniozus sp.	Parasitoid	3,000-5,000 individuals	Larvae
Parena lacticincta	Predator	----	Larvae
Oecama sp.	Predator	---	Larvae
Beauveria bassiana	EPF	10%WP 5000 ml	Larvae
Serratia marcescens	EPB	--	Larvae
Bacillus thuringiensis	EPB	5%WP 1500 ml	
Aspergillus flavus	EPF	--	General suppression

Source: Adapted from Shrestha et al., 2022

Chemical Control

Chemical control of mango leaf webber should be undertaken only after crossing the economic threshold level following CIBRC guidelines, applied at the prescribed dose and timing. Sprays should be need-based, well-targeted to early larval stages, and rotated among different modes of action to avoid resistance development. Care must be taken to observe pre-harvest intervals, ensure proper coverage, and protect natural enemies, thereby promoting judicious and sustainable pesticide use.

Conclusion

Mango leaf webber causes severe damage to mango orchards by feeding gregariously on leaf tissue and constructing silken webs that bind multiple leaves, resulting in 25-100% production loss if unmanaged. Effective management of this pest requires combining multiple strategies in a coordinated manner. Integrated management combining cultural practices, biological controls, quarantine, mechanical removal, and selective pesticides outperforms individual methods for leaf webber control while minimizing pesticide dependence and maintaining economic productivity and environmental sustainability.

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