



A Newly Emerging Pest: Nestling Whitefly in India

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The nesting whiteflies (*Paraleyrodes bondari* and *P. minei*) have recently emerged as invasive pests of economic significance in India. Native to the Neotropics, these species have expanded their range through international trade and favorable climatic conditions. Their polyphagous nature enables them to infest diverse crops such as coconut, banana, citrus, guava, and mango, causing severe yield losses and quality deterioration. Infestation rates of 40–60% in coconut and 25–40% in banana underscore their economic impact. The absence of specific parasitoids and favorable tropical climates have facilitated their establishment. Weather patterns, particularly temperature and rainfall, strongly influence their population dynamics. Current management strategies emphasize integrated pest management (IPM), including cultural practices, yellow sticky traps, biological control with predators and entomopathogenic fungi, and eco-friendly botanical extracts. However, exclusive natural enemies are lacking, complicating control efforts. Strengthened biosecurity, early detection, and collaborative research are essential to mitigate the threat of *Paraleyrodes* spp. in India's agricultural ecosystems.

Keywords: *Paraleyrodes bondari*, *Paraleyrodes minei*, invasive pest, nesting whitefly, integrated pest management, India

Introduction

Invasive insect pests pose significant threats to agricultural ecosystems, food security, and biodiversity. Among these, the nesting whiteflies (*Paraleyrodes* spp.), particularly *Paraleyrodes bondari* (Bondar's Nesting Whitefly, BNW) and *Paraleyrodes minei*, have recently emerged as serious pests in India. Originally from the Neotropics, these whiteflies have established themselves in multiple tropical and subtropical regions across the globe, causing economic losses in important crops such as coconut, banana, citrus, and guava (Josephrajkumar *et al.*, 2019). Their rapid spread in India underscores the need for comprehensive research, monitoring, and integrated pest management (IPM) strategies.

Biology and Morphology of Nesting Whiteflies

Bondar's nesting whitefly adults are small insects, around 1.2 mm in length, often mistaken for other whitefly species due to their size and wing morphology. The species is characterized by its distinctive waxy nest structure, where eggs are laid in clusters and enveloped in woolly wax filaments. Morphological studies show that *P. bondari* has flat puparia with silvery strands, specific abdominal compound pores, and characteristic X-shaped wing markings. In contrast, *P. minei* lacks such wing markings but has ash-coated scales, further aiding in

identification (Josephrakumar *et al.*, 2023). Their life cycle includes egg, crawler, nymphal, pupal, and adult stages, with population dynamics strongly influenced by environmental factors. Whiteflies feed on phloem sap, weakening plants, causing chlorosis, and excreting honeydew, which facilitates sooty mold development, thereby reducing photosynthetic efficiency (Sani *et al.*, 2020).

Distribution and Spread

The first reports of *P. bondari* and *P. minei* in India were from Kayamkulam, Kerala, in 2018 (Josephrakumar *et al.*, 2019). Since then, their distribution has expanded to Tamil Nadu, Andhra Pradesh, Karnataka, the Andaman & Nicobar Islands, and Lakshadweep. Globally, *P. bondari* has been recorded in the Americas, Europe, Africa, and Asia, illustrating its invasive potential through international trade and plant movement. The adaptability of these species to diverse climates facilitates their colonization of new regions. Subtropical and tropical climates of southern India provide ideal conditions for establishment, further compounded by the absence of specific parasitoids.

Host Range and Economic Impact

Paraleyrodes spp. are highly polyphagous, infesting more than 20 plant species. Major host plants include coconut, banana, mango, citrus, guava, custard apple, cassava, and neem. Infestation levels of 40–60% in coconut and 25–40% in banana have been documented, causing significant yield reduction and economic losses (Selvaraj *et al.*, 2020). Globally, invasive whiteflies are estimated to incur agricultural costs exceeding \$100 billion annually. Besides direct feeding damage, nesting whiteflies act as vectors for plant pathogens, compounding their negative impact on crop health. Infestations on ornamental plants such as *Ficus* spp. also affect the horticultural and landscaping sectors (Stocks, 2012).

Influence of Weather and Climatic Factors

Climatic conditions strongly influence whitefly abundance. Temperature positively correlates with population growth, while high humidity and heavy rainfall reduce their proliferation. Increasing summer temperatures and altered monsoon patterns have triggered outbreaks of *Paraleyrodes* spp. in India (Chandrika *et al.*, 2019). Studies reveal that whiteflies thrive best between 15–35 °C, aligning with the climatic profile of most Indian states cultivating coconut, banana, and citrus (Mehta *et al.*, 2024).

Management Strategies

Managing invasive whiteflies requires integrated approaches:

- Regular pruning and sanitation to remove infested plant parts, coupled with intercropping and crop rotation, can disrupt pest life cycles.
- Yellow sticky traps are effective, with studies showing up to 46.5% population reduction in coconut plantations (Remoniya & Nelson, 2022).
- Conservation and augmentation of natural predators, use of entomopathogenic fungi, and potential introduction of specific parasitoids.
- Plant-based insecticides such as *Acorus calamus* extract have demonstrated high adult mortality against *P. bondari*, offering eco-friendly alternatives (Meenakshi *et al.*, 2022).
- Quarantine and phytosanitary protocols to prevent cross-border movement of infested plant material.

A comprehensive IPM framework integrating these measures is necessary to manage nesting whiteflies sustainably while minimizing pesticide reliance.

Conclusion

The nesting whitefly (*Paraleyrodes bondari* and *P. minei*) represents a growing threat to Indian agriculture, particularly coconut and banana cultivation. Their polyphagy, adaptability to diverse climates, and lack of specific natural enemies complicate management. Given their economic impact, urgent efforts are required to strengthen monitoring, research, and biosecurity frameworks. Integrated strategies combining cultural, biological, mechanical, and

botanical measures show significant promise. Collaboration among scientists, farmers, and policymakers is essential to mitigate the risks posed by these invasive pests and ensure agricultural sustainability.

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