

Invasion and Establishment of Invasive Whiteflies on Coconut

Introduction: As many as 467 whiteflies belonging to 71 genera are known to breed on many agricultural, horticultural & forestry crop plants in India, which include several invasive species. Since 2015, four invasive whiteflies viz., rugose spiralling whitefly, *Aleurodicus rugioperculatus* during 2016; Bondar's nesting whitefly, *Paraleyrodes bondari*, nesting whitefly, *P. minei* during 2018 and palm infesting whitefly *Aleurotrachelus atratus* during 2019 were invaded India.

Origin and Distribution: Native of these whiteflies believed to be Neotropical region. *P. bondari* was first described on citrus from Brazil whereas *P. minei* from Syria. Similarly, *A. atratus* described from Brazil and widely distributed in the tropics and subtropics.

In India, first incidence of *P. bondari* and *P. minei* was reported on coconut palms from Kerala during 2018, Subsequently it was found in Karnataka, Tamil Nadu, Andhra Pradesh, Andaman & Nicobar Islands and Lakshadweep Islands. The occurrence of *A. atratus* was found on coconut in Mandya district of Karnataka during 2019. Further spread to Mysore, Ramanagara, Hassan, Tumkur, Bengaluru Urban and Bengaluru Rural districts of Karnataka.

Host plants: *Paraleyrodes bondari* and *P. minei* are polyphagous in nature and feed on 15 and 35 host plants, respectively. Similarly, *A. atratus* is also polyphagous in nature but prefer to colonize on palm plants such as coconut, arecanut, oil palm and ornamental areca palm.

Co-occurrence with other whiteflies: *A. atratus* are in co-existence with *P. bondari*, *P. minei*, *A. dispersus* and *A. rugioperculatus* on coconut.

Diagnostic characteristics of invasive whiteflies infesting coconut



Nesting whiteflies symptoms of damage



Co-occurring of *P. bondari* with *A. rugioperculatus*

***Paraleyrodes bondari* and *P. minei*:** Presence of woven waxy nests on lower surface of coconut leaves. One to five adults whiteflies residing in each nest and other life stages in and around the colony. Presence of black sooty mold on upper surface of infested palms.

***Aleurotrachelus atratus*:** Presence of group of blackish nymphal stages and eggs covered with white mealy waxy substance on lower surface of leaves. Black sooty mold on lower as well as upper surface of infested palms. Under severe infestation, yellowing, drying and drooping of fronds.

Symptoms of damage:

Nesting whiteflies: Nymphs and adults suck phloem sap from host plants and indirectly causing damage by excretion of honey dew which attracts and supports the development of the sooty mould.



Palm infesting whitefly symptoms

Palm infesting whitefly: Both nymphs and adults suck the sap continuously and deplete nutrients from host plants resulting in necrosis, loss of vigour, drying and drooping of leaflets. Indirect damage is caused through black sooty mould development on infested palms.

Biology and description:

<i>Paraleyrodes bondari</i>	<i>Paraleyrodes minei</i>
Constructs nests with densely woven, irregular layer of woolly wax.	Constructs nest by loosely woven with woolly wax.
Lays yellowish stalked eggs in clusters in the nest without wax covering.	Creamish eggs in clusters with short stalks without wax covering.
Crawlers are creamy yellow, transparent, absolutely flat. Nymphal margin is covered with a band of white wax and short setae all around.	Crawlers are creamish, sub-elliptical with flocculent wax on the dorsum.
Later instar nymphs are translucent yellowish and the lateral margin is fringed with short filaments (1mm long).	Late instar nymphs are flat and creamish with fringe of short hyaline wax rods with fibreglass-like wax rods.
Adults are in dull yellow body with two oblique grey bands on each forewing and converge to form an "X"-pattern.	Adults are in dull yellow body with whitefly wings without any marking and spread wings wider.
Total life span: 22 -34 days	Total life span: 21-32 days

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Life stages of *Paraleyrodes bondari* (a) and *P. minei* (b)

Biology of *Aleurotrachelus atratus*

- Eggs are stalked and laid in semicircular pattern in groups, initially creamy white and turn to black before hatching.
- The first instars are pale black, motile for a day, then settle the feeding site and have four pairs of wax plumes excreted by glands at the base of dorsal setae.
- Each dorsal seta has curving longitudinal grooves that guide the wax flakes as they are secreted from the setal base and all the nymphal instars are black in colour.
- Puparia are elliptical, black, covered with a long marginal white wax fringe and dorsal wax filaments that often completely cover the pupae.
- Total life span is about 36-41 days on coconut.



Life stages of palm infesting whitefly

Natural enemies: No natural parasitoids were recorded on these nesting whiteflies; however predators viz., *Pseudomallada (Dichochrysa) astur* and *Cybocephalus indicus* was associated with these whiteflies.



Natural enemies of invasive whiteflies

Management strategies:

1. Avoid transportation of infested seedling/ plant materials from pest infested areas to non infested areas.
2. Continuous monitoring on pest and natural parasitism on different host plants.
3. Install yellow sticky traps @ 15 number /ha for monitoring the pest population.
4. Apply water forcefully along with sticker if water available in plenty.
5. Avoid excess irrigation and nitrogenous fertilizers, apply/follow only recommended dose and maintain palm health
6. Release of *Pseudomallada (Dichochrysa) astur* @ 1000 eggs/ha at 15 days interval.
7. Two spray entomopathogenic fungus *Isaria fumosorosea* (Pfu-5) at 5 g/litre at 15 days intervals.
8. Avoid usage of any synthetic pesticides, apply neem @1% if severe outbreak situation prevails.
9. Follow community based approach to manage these whiteflies in coconut garden.



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2020



Published by:

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