

## Augmentation

Redistribution of *E. guadeloupae* was carried out in areas wherever they are absent or inadequate using the 'field insectary technique' by strategically placing the field collected parasitized insects in, on, or next to infested vegetation.



Redistribution of parasitoids

## Mass production of *Encarsia guadeloupae*

Attempts are being made at ICAR-NBAIR for the mass production of the parasitoid using *A. dispersus* as host insect on two host plants, i.e. banana and *C. indica*. The host plants were grown inside wooden cages of 5 × 5 metres which were lined with insect proof shade-net. The host insect, *A. dispersus* was established on host plants and once the whitefly reached the second instar stage, *E. guadeloupae* adults were released. When the level of parasitism reached above 60-70%, the whole plant/parts of the plant were removed from the cage and used for augmentation in the field.

## Collective efforts to success

ICAR-NBAIR has initiated research on biocontrol of this pest on a priority basis under its core programme as well as under a project funded by the Coconut Development Board, Ministry of Agriculture & Farmers' Welfare, Government of India and NBAIR has developed a biocontrol strategy using parasitoids for the efficient management of the rugose spiralling whitefly within a short span of time.

ICAR-NBAIR in collaboration with Tamil Nadu Agricultural University, Coimbatore; Central Integrated Pest management centres located in Tamil Nadu, Kerala, Andhra Pradesh and Karnataka;

Department of Agriculture, Tamil Nadu and Department of Horticulture, Karnataka popularised the biocontrol strategy through demonstrations and sensitization-cum-training programme for farmers, extension officers and representatives of industries. These concerted efforts resulted in the successful management of the rugose spiralling whitefly in coconut, banana and other crops.



Sensitization-cum-training programme on RSW



Sensitization through media

## Recommended strategies

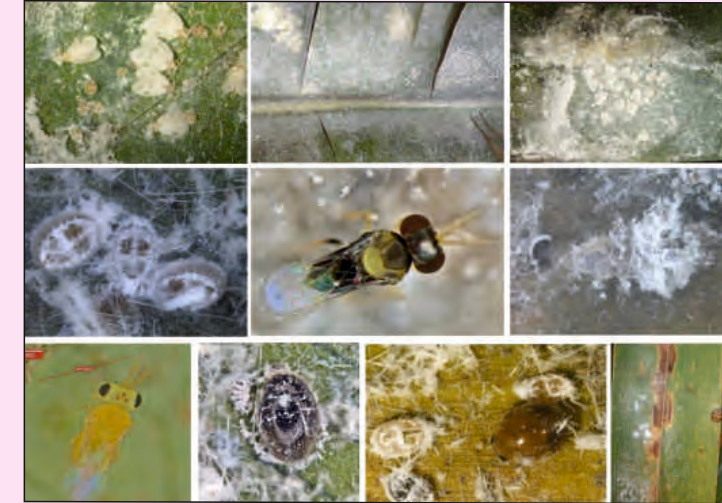
1. Continuous monitoring of RSW and its natural parasitism in field.
2. Avoid transportation of coconut seedlings or any other ornamental plants from pest infested areas.
3. Release of *Dichochrysa* sp. nr. *astur* @ 1000 eggs/ha at 15 days interval.
4. Conserve/encourage natural build-up of *E. guadeloupae* by providing reservoir plants/banker plants.
5. Redistribution of *E. guadeloupae* to affected areas by the 'field insectary technique'.
6. Declaration of pesticides holiday so that application of unwarranted insecticides can be avoided to enhance natural parasitism.
7. Application of 1% Neem oil, if the infestation is severe and natural enemies are absent.

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## Biocontrol Holds Back an Unwelcome Guest: Tackling the Menace of Rugose Spiralling Whitefly in Coconut



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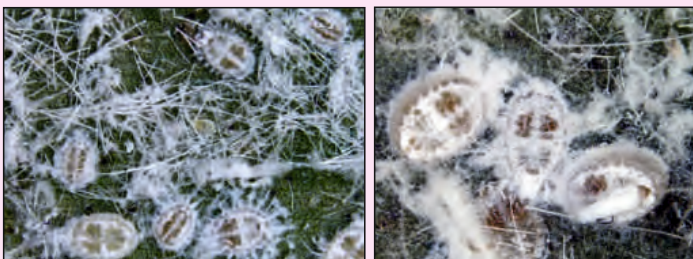
## Biocontrol Holds Back an Unwelcome Guest: Tackling the Menace of Rugose Spiralling Whitefly in Coconut

India has witnessed the invasion of 118 exotic species of insects so far which included several economically important whiteflies. Presently, 442 species of whiteflies belonging to 63 genera are known from India, out of which, two species are recent invasives. The solanum whitefly, *Aleurothrixus trachoides* and rugose spiralling whitefly (RSW), *Aleurodicus rugioperculatus* made their intrusion to India in 2014 and 2016, respectively. ICAR-NBAIR has recorded the incidence and infestation of RSW on coconut in India and the oriental region for the first time. RSW is a highly polyphagous pest which is reported to feed on about 120 plant species among which many are economically important. The incidence of RSW was recorded on coconut, oil palm, fruit trees and ornamental plants in the states of Karnataka, Tamil Nadu and Kerala.

Nymphs and adults of this whitefly damage the plants by sucking sap, especially from underside of the leaves. Adults produce prodigious quantities of honeydew which in turn gets darkened by the



RSW infestation on coconut Sooty mould development on coconut



Nymphs of RSW

Pupae of RSW

development of sooty mould on the upper surface of leaves. The sooty mould interferes with photosynthesis and results in drastic reduction of yield. The characteristic concentric waxy spiralling symptoms are noticed on several parts of the host plants. The hybrid and dwarf varieties of coconut like Chowghat Orange Dwarf, Malayan Orange Dwarf and Ganga Bondam are preferred by the rugose spiralling whitefly for colonization.

### Failure of chemical pesticides

Alarmed by the invasion of a pest unknown to them, farmers resorted to spraying of chemical pesticides to control RSW. But the efforts were in vain as the chemicals turned out to be a temporary fix. Moreover, other ill effects like environmental pollution, killing of natural enemies and health risks to the people involved in spraying operations made the insecticide application a risky business apart from being uneconomical.

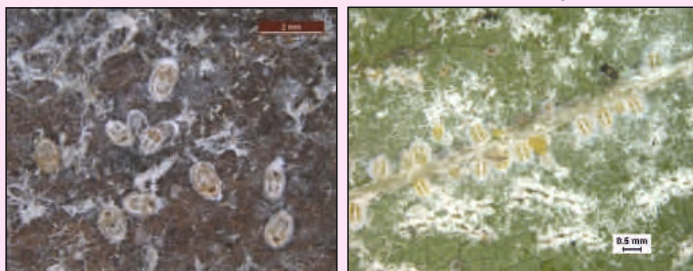
### Biological control - the most reasonable solution

Explorations were carried out so that biological control of the pest could be accomplished through insect predators and parasitoids, which are economically feasible, ecologically compatible and environmentally benign.



*Encarsia guadeloupae*

*Encarsia dispersa*



Parasitized RSW nymphs

### Identification of natural enemies

Among the natural enemies encountered, two aphelinid parasitoids, *Encarsia guadeloupae* and *Encarsia dispersa* were found to have colonized the RSW infested coconut, banana, custard apple, sapota and many ornamental plants and were found to be naturally suppressing the pest. These parasitoids are believed to be fortuitously introduced to India along with *Aleurodicus dispersus*. *Encarsia guadeloupae* emerged to be the dominant one among the parasitoids which recorded maximum natural parasitism of 40–80%, while it was 5–10% for *E. dispersa*. Apart from the parasitoids, several predators like *Dichochrysa astur* (Chrysopidae), *Jauravia pallidula*, *Cheilomenes sexmaculata*, *Stethorus* sp. (Coccinellidae), *Cybocephalus* sp. (Nitidulidae) were also observed to be feeding on RSW.

### Conservation

Since natural enemies, particularly, *Encarsia guadeloupae* was found to be suppressing the population of RSW effectively, farmers were advised not to apply chemical pesticides. In areas where chemicals were not applied, parasitoids were observed to have multiplied rapidly and natural parasitism increased phenomenally thus preventing severe outbreaks. Therefore, frequent monitoring of the pest occurrence was done and pesticide holidays were declared so as to conserve the natural enemies. Banana and *Canna indica* were found to be harbouring maximum parasitoid population at field as well as in net house condition. The growers were advised to grow these plants as banker plants (refugia for parasitoids) in coconut gardens for conservation and augmentation.



Monitoring of RSW and its natural enemies

*Canna indica* and banana as banker plants