# Re-invasion and bio-suppression of spiralling whitefly, *Aleurodicus dispersus* Russell on coconut in Minicoy Island

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**There is ample evidence of complementary action of the predators and parasitoids and there is a good potential for integration of both these natural enemies for a viable management of the pest. These natural predators and parasitoids need to be effectively conserved in the Minicoy Island.**

**Abstract**

Emergence of spiralling whitefly, *Aleurodicus dispersus* Russell as a pest on coconut in Minicoy Island at moderate level of infestation is reported. The typical spiralling fashion of egg laying and feeding damage by *A. dispersus* was recorded on coconut cultivars ranging from 0-6 colonies / leaflet. Dwarf cultivars of coconut were found to be relatively susceptible. Two species of lady beetles *viz., Chilocorus subindicus*, *Scymnomorphus* sp., one hump-backed nitidulid predator, *Cybocephalus* sp., and parasitoids belonging to *Encarsia* spp. were found effective in the bio-suppression of the pest in the Island. Conservation and compatible interaction of these predators and parasitoids in Island ecosystem which is absolutely free from pesticides is recommended as the major strategy for the management of the pest.

Spiralling whitefly, *Aleurodicus dispersus* Russell, is a highly polyphagous pest and a native of Caribbean region and Central America (Russell, 1965). After the first report in Hawaii in 1978, the spiralling whitefly got the status of a major economic pest by 1979 (Kum00ashiro *et al.*, 1983). It was first reported from India in 1993 on cassava from Kerala (Palaniswami *et al.*, 1995) and later from other parts of Peninsular India (David and Regu, 1995; Mani and Krishnamoorthy, 1996; Prathapan, 1996, Geetha *et al.*, 1998; Reddy and Chandurkar, 1999; Sathe, 1999) and the Lakshadweep Islands (Ramani, 2000). It was presumed to have entered India probably from Sri Lanka or the Maldives (Ramani *et al.*, 2002). The pest was reported from 481 host plants in the world and 253 hosts from India including coconut (Srinivasa, 2000). The pest commonly attacks many vegetables, ornamentals, fruit and shade trees. Survey conducted in Lakshadweep Islands for *A. dispersus*, its host plants and natural enemies during 1999 and 2000 revealed two aphelinid parasitoids *viz.*, *Encarsia guadeloupae* Viggiani and *Encarsia* sp. nr. *haitiensis* Dozier in Minicoy Island as introduced serendipitously into our country (Ramani, 2000). In

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Minicoy, the whitefly nymphs were reported more on papaya, banana, tapioca and castor and were found parasitized by the aphelinid parasitoids (Ramani, 2000).

**Hosts and coconut varieties**

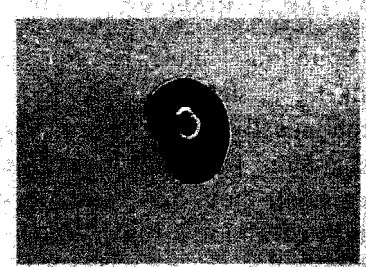
A survey was conducted during 2008 and 2010 to investigate the current level of spiralling whitefly incidence on coconut in Minicoy Island and the associated potential natural enemies. Minicoy Island is the second largest Island which is crescent-shaped under the Union Territory of Lakshadweep. It lies exactly west of *Vizhinjam* port at a distance of about 400 km (215 nautical miles) from Kochi between 8°15' to 8°20' N Latitude and 73°01' to 73°05' E Longitude with an area of 4.4 km$^2$. The pest was recorded intensely feeding on papaya, guava, banana and castor during the survey. All stages of the pests could be located on various host plants. The typical spiralling fashion of egg laying and feeding damage by *A. dispersus* was also recorded on coconut cultivars ranging from 0-6 colonies / leaflet. Dwarf coconut varieties *viz*., Laccadive Green Dwarf, Laccadive Orange Dwarf and Laccadive Yellow Dwarf evinced more number of colonies than the tall cultivars *viz*. Benaulim, Laccadive Tall and Laccadive Micro. The susceptibility of dwarf cultivars was mainly attributed due to low canopy level that is in close proximity with other host plants in the immediate vicinity, whereas, in tall accessions the canopy is well isolated from other host plants. Young palms of tall varieties were also attacked by the pest. The intensity of infestation in coconut was found to be low as compared to other host plants *viz*., papaya, guava, banana and castor. Among the tall coconut genotypes, Benaulim was found to be highly susceptible. Infestation of spiralling whitefly was observed in mild to moderate levels on coconut in Minicoy Island during March-May, but at low level during June with the onset of monsoon. Heavy rains and cool temperature result in a temporary reduction of spiralling whitefly population (Waterhouse and Norris, 1989). Adults and immature stages are highly sensitive to high and low temperatures and wet season (Cherry, 1979). *A. dispersus* colonies are mainly confined to the undersurface of mature coconut leaflets and are rarely seen on the upper surface.

**Nature of damage**

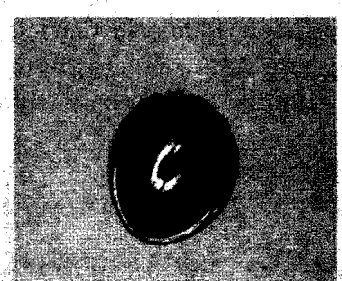
The immature and adult stages of spiraling whitefly desap coconut foliage by direct feeding through the piercing and sucking mouth parts. Feeding damage is predominantly effected by the first three nymphal stages. Direct feeding even under heavy infestations is usually insufficient to kill palms and no significant yield loss is reported.

**Natural enemies of spiralling whitefly**

Spider



*Cybocephalus* sp.



*Chilocorus subindicus*

*Scymnomorphus* sp.

*Encarsia* sp.

Indirect damage is mainly accomplished by the accumulation of honeydew and white, waxy flocculent material produced by the adult whiteflies. They produce honeydew and this sweet and watery excrement attracts ants, wasps and other insects which in turn may offer protection to whiteflies. Honeydew also serves as a substrate on which sooty mould fungus (*Capnodium* sp.) grows. Sooty mould blackens the leaf, decreases photosynthetic activity and vigour and often causes disfigurement of hosts. The flocculent material produced by the nymphs is scattered by the wind and creates an unsightly nuisance.

### Biology

Spiralling whitefly is a small sap sucking insect which is taxonomically related to mealy bugs and aphids. The adult looks like a very small moth and have a body length of about 2 mm. Wings of adults are white or occasionally have pale or dark spots on the forewings. Adults have reddish brown eyes. The males are larger than females and have elongate claspers at the distal end of the abdomen. Eggs are elliptical and yellow to tan in colour, 0.3mm long, translucent with a short stalk and are laid singly at right angles to the leaf veins and associated with irregularly spiralling deposits of white flocculent wax. The spiralling of waxy material is the feature from which this whitefly derives its common name, spiralling whitefly. The first-instar crawlers are the immature stage with functional legs and distinct antennae and are mobile. Second and third-instar larval stages are sedentary and have oval shaped soft bodies with light-green colour. The fourth immature stage is the pupa which is about 1 mm in length. This stage serves as the basis for most of the taxonomic characterization.

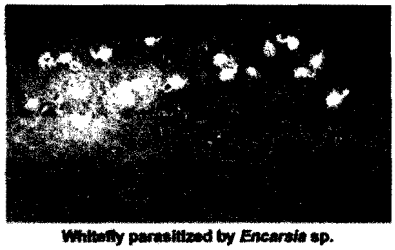
### Biological control

The occurrence of spiralling whitefly in mild to moderate levels on coconut is not causing any economic damage to coconut. This is mainly attributed to the natural presence of effective bio-suppression agents in the Island ecosystem due to organic farming and complete ban on pesticide application. More than 40 indigenous predators, mostly generalists and a few host specific species have been recorded in India. In addition to the accidentally introduced aphelinids, *viz.*, *Encarsia guadeloupae* Viggiani and *Encarsia* sp. nr. *haitiensis* Dozier, several natural enemies have expanded their host range to this invading pest in India. *Encarsia guadeloupae* was first reported from Minicoy Island in 1999 presumed to have migrated from Maldives into Minicoy (Ramani, 2000). It is most likely that the parasitoids were found only after their numbers increased phenomenally through breeding for several years on the expanding host population although they had been introduced along with host. Parasitism levels were found to be highly density dependent and also varied with the host plants.

At least two different species of lady beetles *Chilocorus subindicus* Booth (Coccinellidae : Coleoptera) and *Scymnomorphus* sp. (Coccinellidae : Coleoptera) were found predatory on spiraling whitefly as well as on coconut scale insects. The former is a sibling species of *Chilocorus nigritus* whereas the latter is one of the smallest types of lady beetles measuring <1mm. Conservation of these lady beetles is therefore required for the natural suppression of the spiralling whitefly in the Minicoy island. These lady beetles can also be introduced in the mainland where spiralling whitefly pose a concern to various crops. In addition to that, a nitidulid predator *Cybocephalus* sp. (Cybocephalidae / Nitidulidae : Coleoptera) identified by its hump-backed appearance is

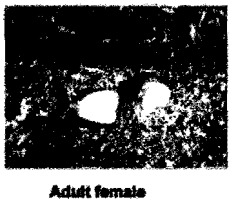
**Spiralling whitefly damage on coconut leaflet**

Spiralling whitefly on coconut leaflet



Whitefly parasitized by *Encarsia* sp.

Spiralling egglaying by adult



Adult female

Adult male

associated with bio-suppression of the pest. Apart from these natural bioagents, an unidentified spider species was in close approximation with the spiralling whitefly in the Island. There is ample evidence of complementary action of the predators and parasitoids and there is a good potential for integration of both these natural enemies for a viable management of the pest. These natural predators and parasitoids need to be effectively conserved in the Minicoy Island. The phenomenal success obtained in the Island in checking the build up of the population of *A. dispersus* by compatible interaction of parasitoids and predators could be better simulated in mainland conditions during phases of epidemic outbreak of the pest.

**Acknowledgment**

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# Add Coconut, Cut Fat

A diet rich in coconut oil keeps fat away and also protects against insulin resistance, a new study shows.The study also helps explain how people who incorporate medium chain fatty acids found in coconut oil into their diets can lose body fat. Obesity and insulin resistance are major factors leading to the development of Type 2 diabetes. Insulin resistance is an impaired ability of cells to respond to insulin.

Stephen Turner and Jiming Ye from Sydney's Garvan Institute of Medical Research compared fat metabolism and insulin [illegible] in mice fed coconut oil and lard based diets. "The medium chain fatty acids like those found in coconut oil are [illegible] because they behave very differently to the fats normally found in our diets," said study leader Turner. [illegible] long chain fatty acids contained in animal fats, medium chain fatty acids are small enough to enter mitochondria [illegible] energy burning powerhouses - directly where they can then be converted to energy."

"Unfortunately the downside to eating medium chain fatty acids is that they can lead to fat build up in the liver, an important fact to be taken into consideration by anyone considering using them as a weight loss therapy."

Fat storage is determined by the balance between how much fat is taken in by cells and how much of this fat is burned for energy. When people eat a high fat diet, their bodies attempt to compensate by increasing their capacity to oxidise fat, said a Garvan release. Obese humans usually eat 40-50 percent of their calories as fat. Our mice were fed 45 percent of their calories as fat," Turner said. (http://www.zeenews.com)

*Source: The Cocommunity*