



First report of the invasive rugose spiraling whitefly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) from the Old World

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ABSTRACT: Occurrence of the Rugose spiraling whitefly (RSW), *Aleurodicus rugioperculatus* Martin is reported for the first time from the Old World. *Aleurodicus rugioperculatus* is compared with *A. dispersus* Russell, the only con-generic species known from India. *Encarsia guadeloupae* Viggiani (Hymenoptera: Aphelinidae) parasitises *A. rugioperculatus*. Host range of the RSW is discussed and ten new host records are provided. © 2016 Association for Advancement of Entomology

KEY WORDS: Rugose spiraling whitefly, *Aleurodicus rugioperculatus*, *Encarsia guadeloupae*, host plants, India

The whitefly genus *Aleurodicus* Douglas encompasses 35 species, of which only the spiralling whitefly *Aleurodicus dispersus* Russell was so far known to occur in India (Martin, 2008). The Rugose Spiraling Whitefly (RSW) (*Aleurodicus rugioperculatus*) was described by Martin from Belize in Central America in 2004 based on puparia collected under the leaves of Coconut. It invaded Florida in the United States in 2009 and Guatemala (Stocks, 2012) and since then its range expanded considerably within the United States (Antonio *et al.*, 2016). The RSW is highly polyphagous with 118 hosts belonging to 43 plant families including economically important crops in the United States (Antonio *et al.*, 2016).

A severe outbreak of the RSW, so far confined to the Americas, was noticed on Coconut palms, Mango and Guava at Changanassery, Kottayam

District, Kerala in India following accidental introduction (Fig.3A to 3D). The females lay wax covered eggs in a spiral fashion usually on the abaxial surface of leaves. Prolific feeding by the nymphs and adults on coconut trees resulted in copious honeydew that covered the undergrowth of plants which in turn became black due to the development of sooty mould.

Five field surveys were carried out in Kottayam district, Kerala covering 15 locations based on distress calls received from farmers growing rice and coconut. Pieces of coconut leaves bearing puparia were collected in 70% ethyl alcohol. Permanent microscopic slides were prepared following Martin, 2004. Parasitised puparia were kept in insect breeding dishes for the emergence of parasitoids which were then transferred to 95% ethyl alcohol. Microphotographs were taken using

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Leica MC170 HD digital camera mounted on Leica DM2000 LED compound microscope and a Canon EOS 1100D digital camera mounted on Leica M205C stereo microscope. The images were stacked using CombineZP and edited using Adobe Photoshop.

The slides of *Aleurodicus rugioeperculatus* will be deposited in the Natural History Museum, London and the Travancore Insect Collection, Department of Agricultural Entomology, Kerala Agricultural University, Vellayani.

Diagnosis: The Rugose spiralling whitefly adults (Figs. 4 & 5) are much larger than the common silver leaf whitefly, *Bemisia tabaci* G. (Fig. 6).

Both *A. rugioeperculatus* and *A. dispersus* possess four large compound pores on the abdominal segments III to VI. However, they can be easily differentiated based on the following characters of the puparia given in Table 1.

Host plants of *Aleurodicus rugioeperculatus*: Stocks and Hodges (2012) reported about 95 host plants of *A. rugioeperculatus* in Florida, USA. Further, Antonio *et al.* 2016 reported a broader host range of 118 species in 43 families. In the present study, a total of 17 plant species in 11 families were recorded as hosts of *A. rugioeperculatus* (Table 2), of which 10 are new.

Table 1. Distinguishing puparial characters of Rugose spiralling whitefly and spiralling whitefly

No.	Puparial character	<i>Aleurodicus rugioeperculatus</i>	<i>Aleurodicus dispersus</i>
1.	Cuticle on Dorsum	Reticulated (Fig. 1A, 1B)	Smooth (Fig. 2A)
2.	Compound pores on abdominal segments VII & VIII	Present (Fig. 1A, 1C)	Absent (Fig. 2A, 2C)
3.	Corrugations / rugosity on the surface of operculum	Present (Fig. 1D)	Absent (Fig. 2A, 2C)
4.	Shape of the apex of lingula	Acute (Fig. 1D)	Oval (Fig. 2D)

Table 2. Host plants of *A. rugioeperculatus* in Kerala

Sl. No.	Scientific Name	Family	Common Name
1.	<i>Cocos nucifera</i> L.	Arecaceae	Coconut
2.	<i>Musa</i> sp.	Musaceae	Banana
3.	* <i>Artocarpus hirsutus</i> Lam.	Moraceae	Wild Jackfruit
4.	<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Jackfruit
5.	* <i>Ficus exasperata</i> Vahl.	Moraceae	Brahma's Banyan
6.	<i>Mangifera indica</i> L.	Anacardiaceae	Mango
7.	<i>Psidium guajava</i> L.	Myrtaceae	Guava
8.	* <i>Acacia mangium</i> Willd.	Fabaceae	Brown salwood
9.	* <i>Garcinia gummi-gutta</i> (L.)	Clusiaceae	Malabar tamarind
10.	<i>Thespesia populnea</i> (L.)	Malvaceae	Portia tree
11.	* <i>Sida acuta</i> Burm. f.	Malvaceae	Wire weed
12.	<i>Terminalia catappa</i> L.	Combretaceae	Indian Almond
13.	* <i>Combretum indicum</i> (L.)	Combretaceae	Rangoon creeper
14.	* <i>Allamanda cathartica</i> L.	Apocynaceae	Golden trumpet
15.	* <i>Nerium oleander</i> L.	Apocynaceae	Oleander
16.	* <i>Codiaeum verigatum</i> (L.)	Euphorbiaceae	Garden croton
17.	* <i>Euphorbia milii</i> Des Moul.	Euphorbiaceae	Crown of thorns

* New Host Record

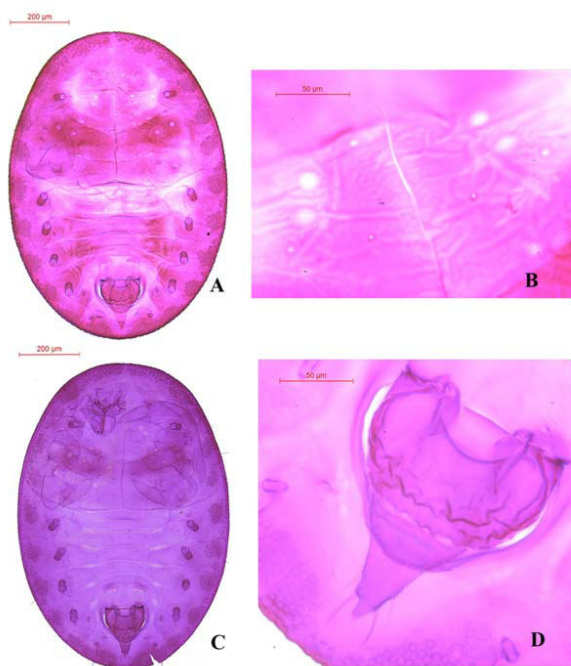


Fig.1. *Aleurodicus rugioperculatus* Martin, puparium, A. Dorsum B. Reticulate sculpture on cephalothorax, C. Venter, D. Operculum and lingula

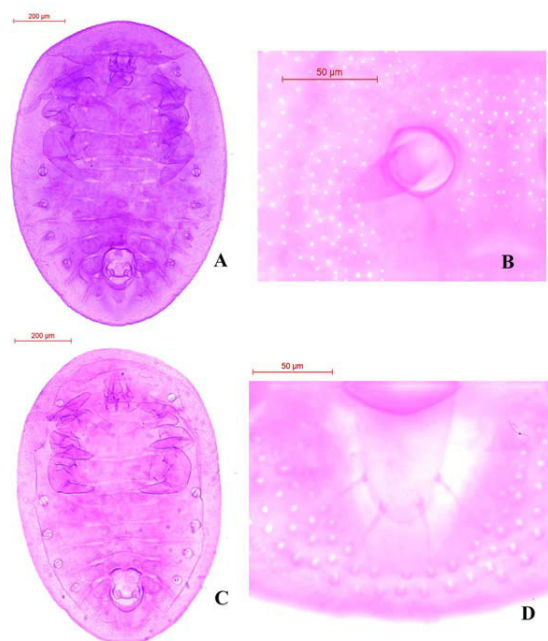


Fig.2. *Aleurodicus dispersus* Russell, A. Dorsum B. Compound Pore, C. Ventral, D. Lingula

Aleurodicus rugioperculatus being a recent introduction, is still in the process of adapting and establishing on various native plants in India. Hence the species was observed only on lesser number of host plants in India compared to those in North America. The host range is likely to expand as the species becomes more established and spread to newer areas in India.

Natural Enemies: *Encarsia guadeloupeae* Viggiani (Hymenoptera: Aphelinidae), a well known parasitoid of *A. dispersus* (Ramani *et al.* 2002; Evans, 2007), was found to parasitise *A. rugioperculatus*. This has already been reported on *A. rugioperculatus* from Florida (Kumar *et al.*, 2013; Taravati *et al.*, 2013) and appears to be a potential biocontrol agent against RSW as 50 to 60% natural parasitisation of the pupae was observed (Figs. 7, 8A to 8G).

Mode of entry of RSW into India is unknown. However, it is likely that the pest gained entry into the country through trade in ornamental plants. Having been introduced, it may be impossible to contain spread and establishment of the pest in India. Hence sustainable pest management practices should immediately be initiated.



Fig.3. Host plants heavily infested with rugose spiraling whitefly, *Aleurodicus rugioperculatus* Martin, A. Coconut Leaf, B. Coconut leaf petiole, C. Mango leaves, D. Guava leaf.

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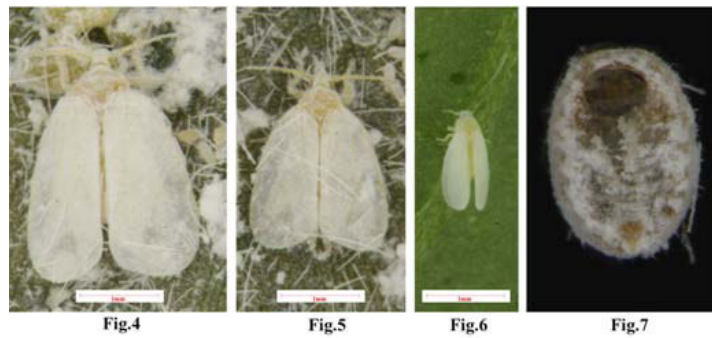


Fig.4. *A. rugioeperculatus* adult. Female, Fig.5. *A. rugioeperculatus* adult. Male, Fig.6. *Bemisia tabaci* adult, Fig.7. Parasitoid exit hole on *A. rugioeperculatus* puparium.

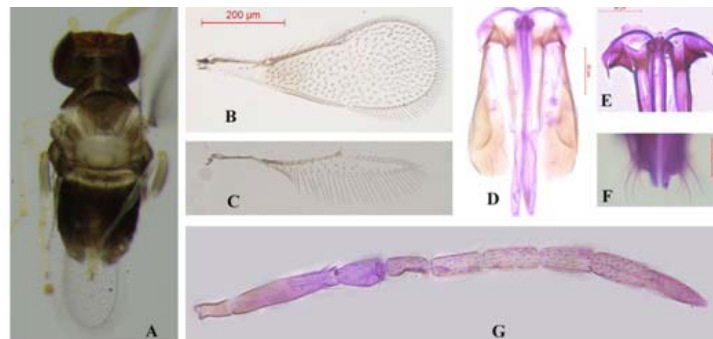


Fig.8. *Encarsia guadeloupae* Viggiani (Hymenoptera: Aphelinidae) A. Adult, B. Fore wing, C. Hind wing, D. Ovipositor, E, F. Ovipositor (in part), G. Antennae.

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