DACS-P-01745

PEST ALERT

Pest Alert created 7-February-2012

Florida Department of Agriculture and Consumer Services, Division of Plant Industry
Adam H. Putnam, Commissioner of Agriculture

The Rugose Spiraling Whitefly, *Aleurodicus rugioperculatus* Martin, a New Exotic Whitefly in South Florida (Hemiptera: Aleyrodidae)

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INTRODUCTION: Specimens of a new exotic whitefly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae), were collected from gumbo limbo (*Bursera simaruba* (L.) Sarg.) in Miami-Dade County by FDACS DPI inspector Olga Garcia on March 11, 2009 (Figs. 1-2). This species has the official common name of rugose spiraling whitefly, but is referred to in some publications and newspaper and television reports from 2010 and 2011 as the gumbo-limbo spiraling whitefly. *Aleurodicus rugioperculatus* was described in 2004 by Martin from specimens collected in Belize, and is thought to be native to Central America. There are over 30 species of whiteflies in the genus *Aleurodicus* found throughout Central America and the Caribbean, and several of these species are causing significant plant damage in the Caribbean. For instance, *Aleurodicus pulvinatus* (Maskell), which is a serious pest of coconuts, was recently found in the Bahamas. Since late 2009, the rugose spiraling whitefly has become so pestiferous in South Florida that numerous publications and presentations that document its spread and the damage it causes to trees and shrubs have been posted on the internet. The web pages of Broward County, Miami-Dade County and Monroe County University of Florida, Institute for Food and Agricultural Science (UF-IFAS) host information and links about this pest and are very useful (see below for links), and the extension agents from these offices host outreach and education programs about the whitefly.

BIOLOGY: As of September 2011, over 75% of samples received by DPI came from Miami-Dade County, but the whitefly is becoming common in Broward and Monroe Counties, especially in the Keys. There are additional records from Indian River and Polk counties, indicating that it may be able to survive in Central Florida. Unlike the ficus whitefly, which is restricted to hosts in the genus *Ficus*, over 60 plant species are recorded hosts for the rugose spiraling whitefly. The plants most seriously affected are gumbo limbo and palms, especially coconut, as well as avocado, Florida black olive and *Calophyllum* species. Infestations can become extremely dense, with almost complete coverage of the ventral leaf surface by multiple generations of whiteflies. Adults are small and gnat-like and take flight easily, appearing as clouds around the foliage (Fig. 2). Frequently, the distinctive egg spirals are seen on leaves, but with no developing larvae or pupae on the plant. As has been observed with other pest insect species, their numbers can become so great that females are forced to lay their eggs on nearly any surface, including plant species that are not suitable for further larval development.

Not only do the whiteflies cause stress to the plant by removing water and nutrients, but the sticky residue they excrete, called honeydew, covers leaves and promotes the growth of a fungus called sooty-mold. The honey and mold further reduce the ability of the leaf to produce nutrients and attract other insects, such as stinging ants and honeydew wasps. Ants protect the whiteflies and prevent predators and parasitoids from attacking the immature whitefly, a natural control of the population. Homeowners are not only plagued by the decline in the health of their plants, but by the honeydew, sticky wax and bodies of dead adult whiteflies that fall onto cars, patios, patio furniture and into pools, clogging water filters.

DESCRIPTION: Adults are approximately 2.5 mm long, resembling in life the adults of the giant whitefly, *Aleurodicus dugesii* Cockerell, and spiraling whitefly, *Aleurodicus dispersus* Russell. The adult stages are currently undescribed because whitefly taxonomy is almost entirely based on the final nymphal, “puparial” stage, but an adult can in part be recognized as a spiraling whitefly by its large size and the presence of a pair of irregular light brown ‘bars’ across the wing. Adult males have a long, pincer-like tail that can be seen with a hand-lens. Immature stages are found on the ventral surface of the host leaf and are approximately 1.1 mm long. They are light yellow to golden yellow in color and covered

to various degrees by white wax. Frequently, the pupal stage is seen as if it were floating on a 'pillow' of wax beneath it and attached to the leaf surface (Fig. 3). The wax projecting from the sides and top of the body contains both tufts of fluffy white wax and long crystal-like rods of glassy wax. Although it is likely that whiteflies in South Florida fitting the above description are the rugose spiraling whitefly, many species in this genus are very similar and require slide-mounting for accurate identification. Females lay eggs in a concentric spiraling or circular pattern and cover them with white wax (Fig. 4), but all the species of *Aleurodicus* in Florida do this, so it is not a diagnostic character for this species. Frequently, puparia that are dark brown to nearly black in color are found on the leaf, which indicates that they have been parasitized (Fig. 5). Any part of the ventral surface of the leaf is suitable for development, but in palms in particular, they tend to develop in a row along either side of the mid-rib down the center of the leaf (Fig. 2).

Puparia of most members of the genus *Aleurodicus* are characterized by seven pairs of compound pores, the cephalic and first four abdominal pairs each with a central process that is dagger-shaped and protrudes beyond the pore rim. Puparia of *A. rugioperculatus* are characterized by an apically acute lingula that is exserted and slightly short of the posterior margin of the pupa (Fig. 6) and a quadrate operculum with wrinkled, or 'rugose' texture, that completely fills the vasiform orifice. The marginal pores are arranged laterally and posteriorly into clusters that occur between the marginal compound pores.

Two other species of *Aleurodicus* are found in Florida. *Aleurodicus dispersus* (spiraling whitefly), described in 1964 from specimens collected in Florida, now occurs in almost all counties south of Tampa. It is often collected on coconut and seagrape, but is known from many other plant hosts (http://www.freshfromflorida.com/pi/enpp/ento/disp.html). *Aleurodicus dugesii* Cockerell (giant whitefly), first recorded in Florida in 1997, also occurs in all South Florida counties, but can be found as far north as Duval and Suwanee counties. Giant whitefly was a common pest of hibiscus, but is also known from many other plant hosts (http://www.freshfromflorida.com/pi/enpp/ento/giant.html). Possibly due to the occurrence of natural bio-control agents, neither the spiraling whitefly nor the giant whitefly are particularly common anymore.

NATURAL ENEMIES: At least one wasp species, *Encarsia guadaloupae* Viggiani (Hymenoptera: Aphelinidae), parasitizes this and other species of whiteflies, and very high parasitism rates have been observed. *Nephaspis oculata* (Blatchley) (Coleoptera: Coccinellidae), a beetle predator that specializes on whiteflies, has also been observed feeding on rugose spiraling whitefly infestations. Dr. Martin, who discovered this species in Central America, reported that some of the specimens were parasitized. However, the wasps could not be identified, but possibly are a species not found in Florida. Often, parasitoid wasps are host-species specific, so a species found naturally occurring in the home range of the whitefly may be a better control agent than more generalist whitefly parasitoids such as *E. guadaloupae*. Continuing research might discover other predators and parasitoids that contribute to controlling the whitefly and how natural bio-control agents and chemical techniques can be combined to achieve long-term control.

CONTROL: Dr. Catherine Mannion, UF Tropical Research and Education Center in Homestead, is actively researching the biology of this whitefly and is studying ways of controlling it using both natural biocontrol agents, such as a predators and parasitoids, and chemical control techniques. Several publications (see References below for links) by Dr. Mannion and IFAS extension agents discuss the use of chemicals for controlling the whitefly. Good control using systemic insecticides, either as soil drenches or trunk injections, can be achieved, but reapplication is necessary to prevent re-infestation from trees in the neighborhood that have not been treated. For small plants, washing the foliage with a jet of water or with a detergent spray will dislodge many of the pupae and clear the leaf, but this is only a temporary solution and is impractical for larger trees and palms.

HOSTS:

Alismataceae	*Sagittaria latifolia*	Euphorbiaceae	*Acalypha wilkesiana*
Anacardiaceae	*Mangifera indica*	Fabaceae	*Pithecellobium keyense*
	Schinus terebinthifolius	Fagaceae	*Quercus virginiana*
	Spondias mombin	Lauraceae	*Persea americana*
	Spondias purpurea	Liliaceae	*Cordyline fruticosa*
	Spondias sp.		*Smilax auriculata*
Annonaceae	*Annona* sp.	Malvaceae	*Thespesia populnea*
Apocynaceae	*Catharanthus roseus*	Moraceae	*Ficus aurea*
Araucariaceae	*Araucaria heterophylla*		*Ficus carica*
Arecaceae	*Adonidia merrillii*	Musaceae	*Musa* sp.
	Coccothrinax sp.		*Strelitzia nicolai*
	Cocos nucifera		*Strelitzia reginae*
	Dictyosperma album	Myricaceae	*Myrica cerifera*
	Dypsis decaryi	Myrtaceae	*Eugenia axillaris*
	Dypsis lutescens		*Eugenia* sp.
	Hyophorbe verschaffeltii		
	Pinanga coronata		*Eugenia uniflora*
	Phoenix roebelenii		*Myrcianthes fragrans*
	Sabal palmetto		*Psidium guajava*
	Veitchia arecina		*Syzygium cumini*
	Veitchia sp.	Orchidaceae	*Zeuxine strateumatica*
	Washingtonia robusta	Orchidaceae	*Zeuxine strateumatica*
Rosaceae	*Rosa* sp.	Sapotaceae	*Chrysophyllum oliviforme*
	Wodyetia bifurcata		*Manilkara roxburghiana*
			Manilkara zapota
Brassicaceae	*Brassica rapa*		*Sideroxylon foetidissimum*
Burseraceae	*Bursera simaruba*		*Sideroxylon salicifolium*
Calophylaceae	*Calophyllum inophyllum*	Simaroubaceae	*Simarouba glauca*
Chrysobalanaceae	*Chrysobalanus icaco*	Vitaceae	*Parthenocissus quinquefolia*
Combretaceae	*Bucida buceras*		
	Conocarpus erectus		
	Terminalia catappa		

DISTRIBUTION: Belize, Mexico, Guatemala, Florida.

REFERENCES:

Hunsberger, A. and C. Mannion. 2010. http://miami-dade.ifas.ufl.edu/documents/Thegumbolimbospiralingwhiteflyfact-sheet.pdf. Accessed 3 October, 2011.

Mayer, H., J. McLaughlin, A. Hunsberger, L. Vasquez, T. Olcyzk and C. Mannion. 2010. http://miami-dade.ifas.ufl.edu/pdfs/urban_hort/Common%20questions%20about%20the%20gumbo%20limbo%20spiraling%20whitefly.pdf. Accessed 3 October 2011, 2011.

Mannion, C. 2010. http://trec.ifas.ufl.edu/mannion/pdfs/Gumbo%20Limbo%20Spiraling%20Whitefly.pdf. Accessed 3 Oct, 2011.

Martin, J.H. 2004. The whiteflies of Belize (Hemiptera: Aleyrodidae) Part 1 - introduction and account of the subfamily Aleurodicinae Quaintance & Baker. Zootaxa 681: 1–119.

Martin, J.H. 2008. A revision of Aleurodicus Douglas (Sternorrhyncha, Aleyrodidae), with two new genera proposed for palaeotropical natives and an identification guide to world genera of Aleurodicinae. Zootaxa 1835: 1-100.

USEFUL LINKS:
Broward County IFAS. http://www.broward.org/parks/extension/Pages/Default.aspx
Broward County Master Gardeners. Mastergardener@broward.org
Miami-Dade County IFAS. http://miami-dade.ifas.ufl.edu/
Monroe County IFAS. http://monroe.ifas.ufl.edu/
Florida Department of Agriculture and Consumer Services, Division of Plant Industry.
http://www.freshfromflorida.com/pi/pest-alerts

Figure 1. Puparia of *Aleurodicus rugioperculatus* on *Calophyllum* sp., Doral, Florida. Photograph: Lyle Buss, University of Florida, Department of Entomology and Nematology.

Figure 2. Close-up of puparia of *Aleurodicus rugioperculatus*. Photograph: Holly Glenn, University of Florida-IFAS.

Figure 3. Close-up of puparia of *Aleurodicus rugioperculatus*.
Photograph: Holly Glenn, University of Florida-IFAS.

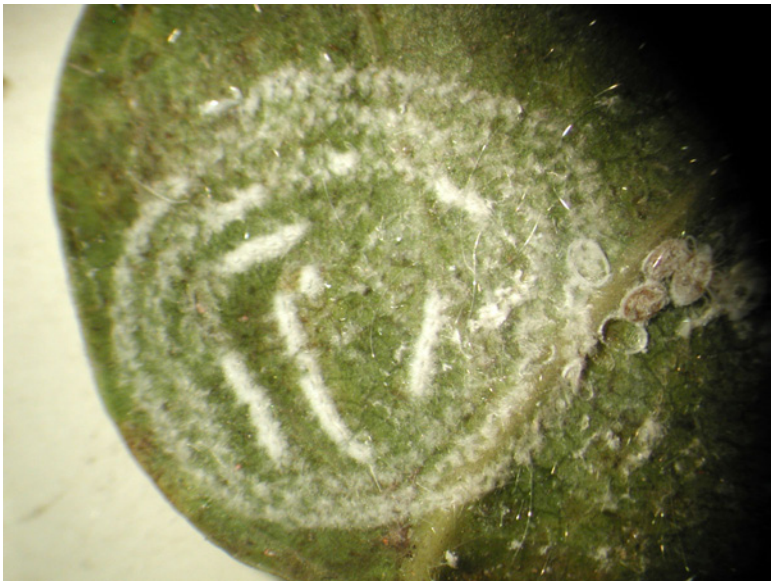

Figure 4. *Aleurodicus rugioperculatus* egg spirals with wax.
Photograph: Holly Glenn, University of Florida-IFAS.

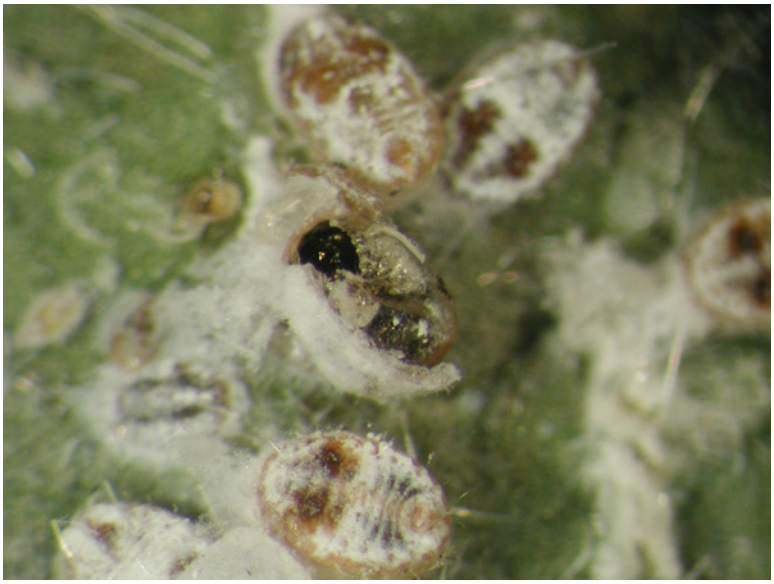

Figure 5. Parasitized puparium of *Aleurodicus rugioperculatus*.
Photograph: Holly Glenn, University of Florida-IFAS.

Figure 6. Photomicrograph of the posterior of the puparium of *Aleurodicus rugioperculatus*, showing operculum and characteristic triangular shape of the lingula with four apically situated setae.
Photograph: Ian Stocks, FDACS-DPI.