TROPICLINE

Horticulture Newsletter of the University of Florida Fort Lauderdale Research & Education Center

- *Volume 9, Number 2 ; October-December, 1996*
  Editor: Alan W. Meerow *Christine T. Stephens, Dean, Cooperative Extension*

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New Armored Scale Insect Introduction In Miami Area

F. W. Howard, Thomas Weissling and Dearmand Hull

Click here to read about preliminary scale control results

Ornamental cycads (Cycadaceae) in a section of Miami are highly infested with a recently introduced armored scale insect. Cycads are gymnosperms that have leaves reminiscent of palm fronds. They are popular for landscapes and interiorscapes where a tropical look is desired.

Heavy scale insect infestations on cycads were noticed about a year ago and initially were thought to be the magnolia white scale, *Psuedaulacaspis cockerellii* (Cooley), which has long been a pest of cycads and is almost identical in appearance to the introduced insect. But entomologists began to suspect that they were dealing with a different species because of the intensity of the outbreak and because plant species known to be hosts of *P. cockerellii* adjacent to the highly infested cycads were not infested. After careful examination of many specimens and extensive liturature research, Dr. Avas B. Hamon, the scale insect taxonomist with the Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville, identified the species as *Aulacaspis yasumatsu*i Takagi. Dr. Douglass R. Miller, Systematic Entomology Laboratory, USDA-ARS-SEL, Beltsville, Maryland confirmed Dr. Hamon's identification.

*Aulacaspis yasumatsu*i was previously known from Thailand and southern China on Cycadaceae and apparently is restricted to plants of this family. Undoubtedly, the insect was introduced via infested cycads from that region. There are many exotic species of armored scale insects in the United States, especially in Florida. Probably all of them have been introduced on live plant material. Armored scale insects are typically about 2 mm in diameter and tend to occupy sites along leaf midribs, in crevices in stems, etc., and so may easily go undetected by plant collectors and phytosanitary inspectors. At present, *A. yasumatsui* is undergoing a population explosion and has spread throughout an area of at least several square kilometers, but the extent of this infestation has not yet been determined precisely. Many of the infested cycads are almost completely coated with a white crust that includes a high proportion of dead scales as well as scales of live insects. Much of the crust consists of masses of male scales, which are much smaller than female scales and give the appearance of a layer of fine snow. There were about 500 live and dead male scales per square centimeter on some leaflets. Counts of live mature female scale insects were made on a cycad with a typical infestation. There were per up to 100 per leaflet and much greater numbers of dead scales. We have examined thousands of these scales without

observing parasitoid exit holes. A species of predaceous beetle (Coccinellidae) and an apparently predacdous species of mite (Acarina) have been observed on highly infested cycads, but so far these occur sparsely and have negligible effects on the scale insect infestation.

Some observations suggest that species of *Cycas*, a genus native to the Old World, are most susceptible, while African cycads other than *Cycas* and all New World genera appear to be less susceptible. Cycads are important items in the Florida nursery industry, are widely grown in the landscape throughout the southeastern U. S., and are shipped to markets in cooler regions for use in interiorscapes. *Cycas revoluta* (king sago-palm) and *C. rumphii* (queen sago-palm) are the two most popular ornamental cycads. (Cycads in cultivation formerly identified as *C. circinalis* have recently been determined to be *C. rumphii*). The world-famous Fairchild Tropical Garden, Parrot Jungle, and Montgomery Foundation, all of which have important cycad collections, are in the infested area. Some of the unusual and beautiful cycads in these collections are of high monetary value, and some are endangered species in their native habitats.

Horticulturists and pest control personnel in the area report that common methods of scale insect control with systemic insecticides, contact insecticides against crawlers, and oils have not been sufficiently effective in reducing these infestations. In some cases, they felt that they controlled populations temporarily but the cycads were quickly reinfested.

We are conducting studies to develop chemical control methods for this scale insect. These are urgently needed in the short term. Biological control with natural enemies, particularly parasitoids obtained from the native home of the scale insect, would probably be the most effective long-term method. This would necessitate explorations for these organisms in southeast Asia.

Ganoderma Butt Rot Of Palms In Florida

Monica L. Elliott and Timothy K. Broschat

Ganoderma butt rot of palms is a deadly disease affecting an increasing number of palms in Florida, especially southern Florida where palms are a dominant part of the landscape. The first research project on this disease was initiated in October 1994. Therefore, our knowledge is extremely limited.

The fungus causing this disease has been presumed to be *Ganoderma zonatum*. The primary host appears to palms. Initially, we had developed a short list of potentially resistant palms based on reports from Fairchild Tropical Gardens and the host list in Diseases and Disorders of Palms. This initial list continues to grow smaller each year.

The first project initiated was to confirm that *G. zonatum* was indeed a pathogen and not a secondary problem. It had never actually been show that this fungus was capable of infecting a palm and ultimately killing it. All we really had observed was a correlation between palms that died and the production of conks on these palms. Plant pathologists do not consider this to be conclusive proof. Yes, we are picky because we want to know we are controlling the right pathogen.

To obtain conclusive proof, we go through a series of steps called Koch's postulates. An experiment was established in October 1994. Mature (20 year old) Queen palms located at FLREC were used for the experiment. A total of 28 trees was selected, 14 were transplanted to simulate normal landscaping in Florida and 14 were not transplanted. Half of each group was inoculated with *G. zonatum* infested material obtained from a

diseased Queen palm. The inoculum consisted of a mixture of different size pieces ranging from chunks (3 inch by 4 inch) to splinters and sawdust. Each tree was inoculated with a 1 gallon volume of this material. It was buried at three points around the base of the tree, just below the surface.

Exactly two years later (October 1996), we observed the production of conks on two of the transplanted, inoculated trees. When these two trees were cut down, the trunk base was completely rotted. *G. zonatum* grew profusely from cross-sections of these trees. This provided the first evidence that this fungus is indeed a pathogen. We are now waiting impatiently to see what happens to the rest of the trees.

In southeastern Asia, where African oil palms are grown on plantations, Ganoderma butt rot is a severe problem. However, the species of *Ganoderma* is believed to be a different species, *G. boninense*. A selective medium developed for this species did not allow for growth of *G. zonatum*. So, our next project was to develop a medium for obtaining pure cultures of *G. zonatum*. That was accomplished and we now have numerous isolates from five different host palms in Broward, Dade and Palm Beach counties. These isolates, along with their respective conks, have been sent to Dr. Jean-Marc Moncalvo at Duke University in North Carolina. He has worked extensively on identification of *Ganoderma* from temperate regions and has examined the *Ganoderma* species in southeastern Asia. We anxiously await his results.

A number of other experiments have been initiated, but no results have been observed to date. We are trying to determine how the palm is infected, how much inoculum is required for infections, what size does the inoculum have to be for infection, are spores infective, etc. We are also trying to develop a method for evaluating disease tolerance or resistance using palm seedlings rather than mature palms. We are also looking at preventative control methods.

We do feel certain that once you see conks being produced on a palm, there are no methods for stopping the fungus. We have cut down a number of infested palms. Ganoderma butt rot is a very appropriate name. The disease is normally concentrated in the lower 3-4 feet of trunk. The fungus moves from the center of the tree to the outside. It is not moving from the outside to the inside of the tree. The conk production areas are not an indication of where the fungus entered the palm. They are an indication that the fungus has reached the outside of the palm!

In southern Florida, conks (shelf-like structures that protrude from the tree) can be formed at any time of the year. Initially, the conk is nothing more than a soft, white, usually circular "blob" on the tree. It will initially be flat against the tree. As it develops, it starts to extend itself outwards as a shelf, but it is still very white and soft. A hard woody brown conk with rings (zones) is an old conk. We have observed that the conk releases spores very early in its development. Millions of rust-colored spored are released from one conk. These spores are viable and easily spread by wind.

What are you going to do if you have a palm with Ganoderma butt rot? First, cut the tree down. The top area above the infection site can be mulched. The fungus is restricted to the lower portion of the trunk. This lower region should not be used for mulch. It would be preferable to have this portion incinerated. Second, if possible, remove the stump. If it is not removed, watch for production of conks on the stump and remove them as soon as you see them start to form. Simply remove them, place in a plastic bag and place the bag in garbage that is going to a land-fill or incinerator. Third, if you want to put a tree back in that region, do not plant a palm. Until we know exactly which palms are resistant, it would be preferable to plant any tree species except a palm back into that location. If you insist on planting a palm back in that area, please call us. We will

provide you with a list of potentially resistant palm species and suppliers.

We will keep the community posted as new research results become available. However, patience will be required! We would like to thank the Palm Beach Gardens Mall for providing the initial support for Ganoderma butt rot research. Recently, the Royal Palm Chapter of the Florida Nursery Growers Association provided us with research funds which have been matched by the FNGA's state-wide organization, and we thank them for this support!

Effects of Blending Compost Parent Materials on Performance as Plant Growing Substrates

George Fitzpatrick

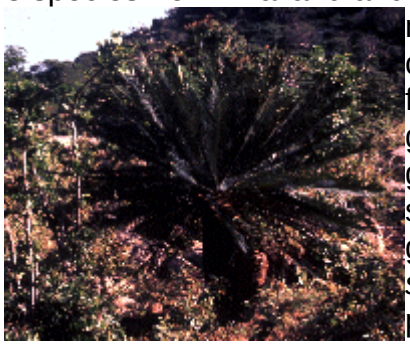
A variety of container grown ornamental plants species, ficus, *Ficus benjamina*; jasmine, *Jasminum volubile*; areca palm, *Chrysalidocarpus lutescens*; dwarf schefflera, *Schefflera arboricola*; philodendron, *Philodendron selloum*; hibiscus, *Hibiscus rosasinensis* and dwarf oleander, *Nerium oleander* were used to assess the effects of blending various parent materials on the performance of compost as a plant growing substrate. A commercially available horticultural growing medium consisting of 40% peat, 50% pine bark and 10% sand was used as a control medium and 4 different compost products, each made from a different blend ratio of various ingredients, were compared to this control blend. The 4 compost ingredient blends were: Compost A: 20% biosolids; 44% yard trimmings; 36% mixed paper, Compost B: 64% refuse derived fuel; 18% biosolids; 18% yard trimmings, Compost C: 74% refuse derived fuel residuals; 10% biosolids; 16% yard trimmings, and Compost D: 16% biosolids; 84% yard trimmings. Each of these 4 different compost blends was used at 3 different rates: (1) 30% compost, 60% pine bark, 10% sand; (2) 40% compost, 50% pine bark, 10% sand, and (3) 100% compost.

All compost types supported plant growth rates that were comparable to or greater than rates supported by the control medium. There was a general trend observed in which increasing compost rate supported faster plant growth. One of the compost products, compost C, contained high levels (*ca*. 12% by weight) of inert materials but this factor did not seem to affect plant growth rates in any of the species tested.

The *Cycas Pectinata* (Cycadaceae) Complex: Genetic Structure And Gene Flow

Si-Lin Yang and Alan W. Meerow

The *Cycas pectinata* complex is a group of poorly-understood Asian cycads threatened by habitat destruction and over-collecting. We estimated the genetic variation in 17 isozyme loci across 39 populations representing 10 taxa in this complex from China, India, Thailand and Vietnam. Another 3 species from Thailand and an Indian endemic were also examined for comparison. Large



numbers of historically shared alleles and high genetic identities confirm the close relationships of taxa in the complex. Strong gene flow occurs among local populations 2 - 7 km apart. Long distance gene flow is restricted. The estimates of gene flow among taxa were generally low except between *C. pectinata* var. *pectinata* and the 3 southern Thailand endemics. *Cycas clivicola*, possessing the least gene diversity in the complex, is likely the youngest species. *Cycas siamensis* has the highest gene diversity in the complex, and is probably the oldest species, centered in southern Thailand. This

 region, harboring more morphologically distinct taxa than any other, is a diversity center for the complex. It is these populations in southern Thailand that should be given priority in conservation.

REFERENCE: Yang, S. L. and A. W. Meerow. 1996. The *Cycas pectinata* (Cycadaceae) complex: genetic structure and gene flow. Intl. J. Plant Sci. 157: 468-483.

University of Florida - Fort Lauderdale

Spring 1997 Schedule of Classes

MONDAY

Plant Propagation PLS 3221, sec 8771, 2 credits

Dr. Kimberly Klock 6-10pm

Plant Propagation Lab PLS 3221L, sec 8770, 1 credit

Dr. Kimberly Klock

Fundamentals of Pest Management PMA 3010, sec 4653, 3 credits

Dr. Tom Weissling 6-9 pm

TUESDAY

General Soils SOS 3022, sec 4567, 3 credits

Dr. George Snyder 3-6 pm

Horticulture Seminar ORH 4932, sec 4564, 1 credit

Dr. George Fitzpatrick 6:15-7:15pm

Principles of Urban Pest Management ENY 3225c, sec 4566, 2 credits

Dr. Tom Weissling 6:15-8:15pm

WEDNESDAY

Weed Science PLS 4601, sec 4573, 3 credits

Dr. Vernon Vandiver 6-9 pm

Behavioral Ecology and Systematics ENY 4453, sec 4570, 3 credits

Dr. Betty Ferster 6-9 pm

THURSDAY

General Soils Lab SOS 3022L,sec 4568, 1 credit

Dr. George Snyder 4-6 pm

Tree and Shrub Insects ENY 3541c, sec 4565, 3 credits

Dr. F. William Howard 6:15-9:15pm

Environmental Plant Identification ORH 3514c, sec 4578, 3 credits

Dr. Edwin Duke 6:15-9:15pm

SATURDAY

Biology of Aquatic Plants ORH 4932, sec 4572, 3 credits

Dr. David Sutton 9-12 pm

Landscape Practices & Arboriculture ORH 4235c, sec 4571, 3 credits

Dr. George Fitzpatrick 9-1 pm

VIDEOTAPE

Human Resource Management in Agribusiness AEB 3424, 2 credits

Dr. Karl Kepner Flexible scheduling

INTERNET

Writing for Agriculture & Natural Resources AEE 3033, 3 credits

Dr. James Nehiley Flexible scheduling

Classes begin the week of January 6, 1997

3205 College Avenue, Davie, FL 33314 (954) 475-8990

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