Biology and control of lobate lac scale insect.

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F. W. Howard [1] and C. M. Mannion[2]

[1] Fort Lauderdale Research & Education Center
3205 College Avenue
Fort Lauderdale, FL 33301

[2] Tropical Research & Education Center
18905 SW 280 Street
Homestead, FL 33031

Introduction. The lobate lac scale, *Paratachardina lobata* (Chamberlin), a scale insect that is native to India and Sri Lanka, was found in Broward County in 1999, and has since become widely spread in southern Florida. In our FNGA Endowed Research Fund grant proposal of last year we stated that we had found this scale insect on 40 species of trees and shrubs. We have now identified it on more than 150 species of trees and shrubs in over 40 plant families. The scale insect attacks fruit trees, ornamental trees and shrubs of both exotic and native origin, and is found in urban and natural habitats. The effects of the scale on its hosts are 1) dieback of twigs and branches, 2) thinning of foliage due to weakening of the plant, 3) formation of sooty mold, and 4) in some species, death of the entire plant.

We have initiated a project to elucidate the bionomics of this scale insect and to develop chemical and biological control for it. This work is partially supported by an FNGA Endowed Research Fund grant, and the present is a report of this work.

Bionomics of the insect. Observations were initiated to determine the life history of lobate lac scale. The lobate lac scale is in the family Kerriidae, most species of which are native to the eastern hemisphere. There are no species of this family other than *P. lobata* established in the eastern United States. Although the true lac scale insect, *Kerria lacca*, has been intensely researched, little is known about *P. lobata* and most other species of this family.

Our observations on the life history of lobate lac scale are summarized as follows: The first instars of the female are elliptical, maroon colored, and about 0.4 mm long. According to our observations so far, development period from first instar to adult female was a minimum of 90 days. This is a long period for the first instar relative to scale

insects in general, but is similar to that of some other species of Kerriidae studied in the Eastern Hemisphere. The third development stage is the mature female. The adult female is about 2 mm long and almost as wide, and of a deep maroon color. It does not have functional legs and is immobile, and is secured to the plant surface by a hard cement. Males of scale insects are generally a winged stage, but males of this species have not been observed in Florida. The species is probably parthenogenetic, as are many scale insects.

Host plant relationships. We constructed a list of host plants of lobate lac scale by combining our own observations with those of several collaborators from other local institutions and agencies. Since the lobate lac scale remains in the same feeding site from first instar to adult female (this is a general characteristic of scale insects), the presence of an adult female on the plant indicates conclusively that the plant is a host of this insect. In our study, a plant species is added to the host list of lobate lac scale when at least one specimen of an adult mature female is found on a specimen of the plant species in the field. The host plant list currently includes more than 150 species in more than 40 plant families. We do not have the exact number yet, because some records have not been compiled.

Based on our observations, lobate lac scales infest branches and main stems of 2 cm in diameter or less. We have not found them on foliage except in rare cases in which they have been found on leaf petioles.

Nearly all hosts upon which we have identified the lobate lac scale are woody dicotyledonous plants. We have found very sparse populations on a few specimens of two conifers (baldcypress, *Taxodium distichum* and southern redcedar, *Juniperus silicicola*), and the Division of Plant Industry reported it on a palm (miniature date palm, *Phoenix roebelenii*), but we consider these records anomalies.

In addition to identifying hosts of lobate lac scale, we made preliminary observations to determine plants that are apparently highly resistant or immune to this scale. Plants that were free of the scale but growing in close proximity to highly infested hosts were considered to be apparently resistant. We plan to select species from this list for testing to confirm their resistance or immunity.

Chemical control. An effective chemical treatment to control lobate lac scale on trees was developed. A pilot test was conducted in which six large *Ficus microcarpa* trees (about 60 cm in diameter) were treated and six similar trees served as untreated controls. A root drench with 2 ounces of Merit 50WP in 10 gallons of water was applied to each of the treatment trees. Lobate lac scale insects were sampled by cutting an equal number of twigs at random from each tree, and in the laboratory examining the scale insects under a microscope to determine the live/dead ratios. Sampling was conducted prior to treatment and four and 6 weeks following treatment. There were no significant differences in live and dead scale insects prior to treatment, nor four weeks after treatment. Six weeks after treatment, an almost complete kill of the scale insects was observed. When examined almost a year later, the treated trees were mostly free of lobate lac scale. The prolonged

effect of the Merit treatment is consistent with results of experiments with other hemipterous pests of trees. However, imidacloprid generally accumulates in young growing tissue, rather than in woody tissue, thus we initially harbored some doubts that Merit would be effective against this scale insect because of its feeding site on woody tissue.

An experiment was then conducted to test the effectiveness of high, medium, and low rates of Merit. The high rate was the maximum rate on the label for scale insects on ornamental plants. The medium and low rates were one half and one fourth, respectively, of the high rate. The methods were generally similar to those described in the above paragraph, however, the rate was calculated for each tree based on its diameter, as follows: high rate = 2 grams per centimeter of diameter; medium rate = 1 gram per centimeter of diameter; and low rate = 0.5 gram per centimeter of diameter.

As in the pilot experiment, six weeks after treatment, examinations of samples revealed that the treatments had resulted in an almost complete kill of the scale insects.

Biological control.

As a part of biological control research and development, we made observations to determine whether there are already natural enemies that attack this scale insect in Florida.

Twigs infested with lobate lac scale were sampled from diverse sites in southern Florida and kept in containers to capture any parasitic insects that emerged from the scales. If parasitic insects emerged, all scales in that container were examined for exit holes, and the twigs were examined to insure that no other scale insect or other possible host of the parasitoid was present. Thus far, a few specimens captured in containers with lobate lac scales were identified as *Anicetus carolinensis* Meyer (Hymenoptera: Encyrtidae) by Dr. Mike Schauff, Systematic Entomology Laboratory, ARS, USDA, Beltsville, MD. This parasitic wasp is native to the eastern U.S. and has previously been reared from a soft scale, *Mesolecanium nigrofasciatum* (Coccidae).

Specimens of several additional species of parasitic Hymenoptera were captured; specialists have not yet identified these specimens. We wish to emphasize that parasitoids have been reared from only a fraction of 1% of the lobate lac scales maintained in rearing containers. In summary, there are a few species of insects that attack lobate lac scale in Florida, but there is no evidence that they significantly impact this pest.

Emphasis is now being placed on obtaining natural enemies of lobate lac scale from southern Asia, and lobate lac scale colonies will be needed for rearing potential biological control agents in rearing facilities under quarantine. Thus, effort was invested in developing a method for establishing and maintaining colonies of lobate lac scale in the laboratory. Squash, pumpkin, potatoes, etc., which have been preferred in some laboratories for rearing certain scale insect species, did not support the development of lobate lac scale. We thus shifted our efforts to the use of containerized plants for

supporting colonies of this scale insect. Of several plant species tested, waxmyrtle (*Myrica cerifera*), seemed promising as a rearing host because small containerized plants exposed to highly infested trees became rapidly infested themselves. However, lobate lac scale infestations of this host species often result in death of the plant. Thus, plants that are usually moderately infested with lobate lac scale are also being studied as potential rearing hosts.

Communication of Information. An illustrated article that describes lobate lac scale, its taxonomy, life history, host plant relationships, and pest management prospects, and including a complete listing of the 140 host plant species identified as of October 2002, was posted on the Internet in the Featured Creatures online publication of the University of Florida Department of Entomology and Nematology in October 2002. We have recently translated this article, including the host plant list, into Spanish, and will post the Spanish version within about a week. We will prepare a report of the research summarized here and submit it for publication in a scientific journal before the end of the year.

We gave numerous oral presentations on lobate lac scale at extension meetings and at several scientific meetings. We also provided information to the public about the threat of lobate lac scale to Florida vegetation via newspaper, radio, and television news stories.

Planned research. During the coming year**,** efforts will be continued to gain an understanding of the basic biology of the lobate lac scale. Emphasis will be placed on improving our knowledge of the relative susceptibility of different hosts of this insect, as this knowledge would be of practical interest to growers and landscapers, and is critical for developing rearing hosts for biological control. We will continue to conduct collaborative work with scientists conducting research and development of biological control of this pest.