

# Lebbeck mealybug, a new pest management challenge in Florida citrus



Lebbeck Mealybug  
*Nipaecoccus viridis*  
(Newstead)

Photo Credit: T.R. Weeks, UF/IFAS CREC



L.M. Diepenbrock, UF/IFAS CREC

**UF** | **IFAS Extension**  
UNIVERSITY of FLORIDA

# What is it?

- Mealybug
- Can cause economic damage
- Serious pest around the world in citrus growing regions
- Known to cause significant damage, fruit drop
- First identified in 1894



Photo Credit: T.R. Weeks, UF/IFAS CREC

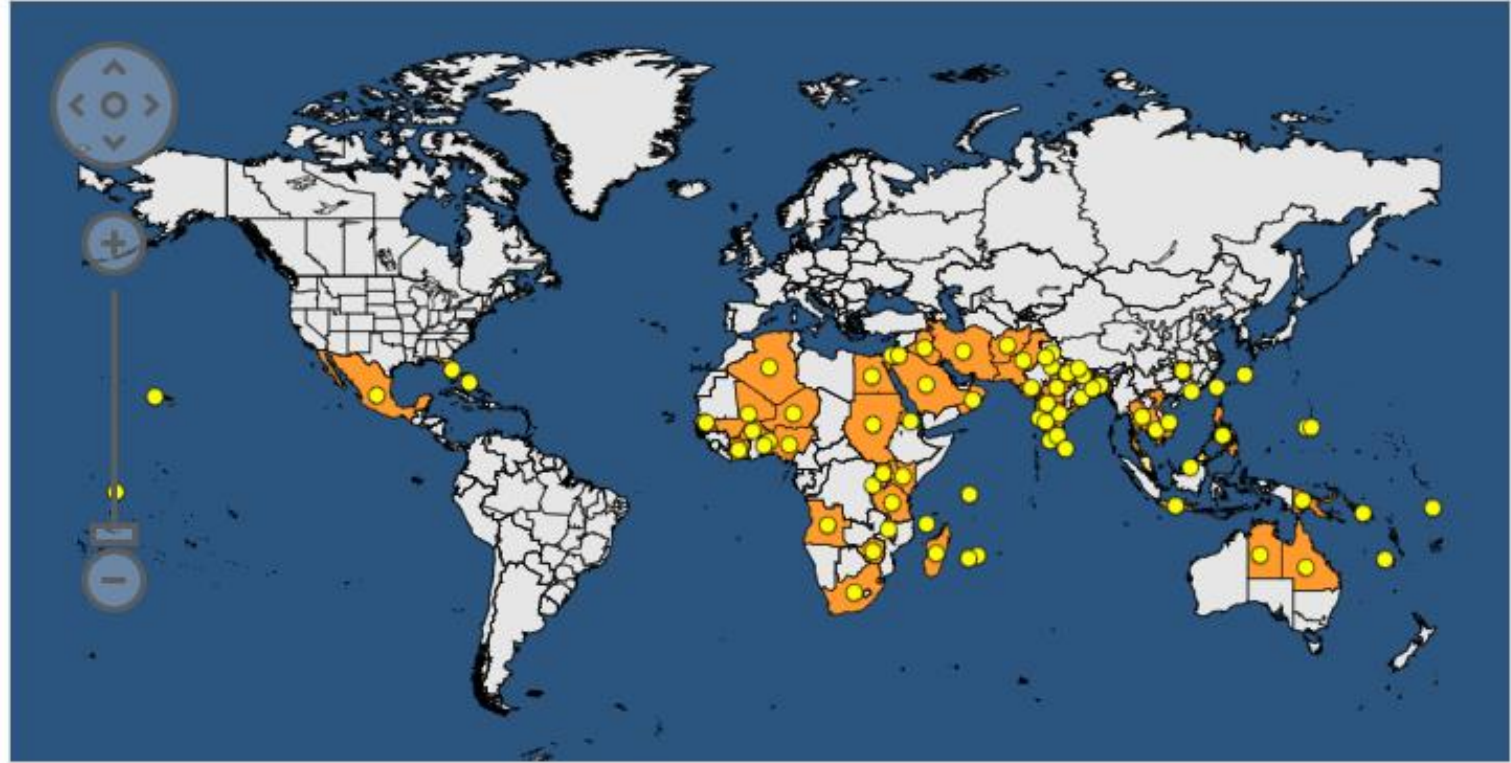
# Common Names

- Many common names throughout the world
  - Spherical Mealybug
  - Coffee Mealybug
  - Cotton Mealybug
  - Globular Mealybug
  - Lebbeck Mealybug
  - Bolle wolluis
  - Hibiscus Mealybug
  - Karoo Thorn Mealybug



# Global Distribution

- Middle East
- Mediterranean
- Southern African regions
- Mexico
- United States
  - Florida
  - Hawaii



# United States

- Hawaii
- Florida
  - First mainland state
  - November 2009
  - Boynton Beach, Palm Beach County
  - Found on dodder (*Cuscuta exaltata* Engelm)
- Has been intercepted at ports multiple times since 1995

## Pest Alert

DACS-P-01716  
Pest Alert created 22-January-2010

Florida Department of Agriculture and Consumer Services, Division of Plant Industry  
Charles H. Bronson, Commissioner of Agriculture

### *Nipaecoccus viridis* (Newstead), a New Exotic Mealybug in South Florida (Coccoidea: Pseudococcidae)

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**INTRODUCTION:** Cooperative Agricultural Pest Survey (CAPS) Pest Survey Specialists Andrew Dierksen and Karolynne Griffiths collected this New Western Hemisphere Record on 13 November 2009 in the Rosemary Scrub Natural Area, Boynton Beach, Palm Beach County. The host plant was dodder (*Cuscuta exaltata* Engelm) (Fig. 1), a parasitic plant. Native to Asia, this mealybug has been previously intercepted at several ports-of-entry on plants from several plant families.

**DESCRIPTION:** Approximately 4 mm long by 3mm wide with body color being black, purple to blue green with thick white, or pale yellow wax. Females produce an ovisac (Fig. 2) with a wax that is sticky when touched. In high densities (Fig. 3), waxy secretions, may appear as a continuous layer of wax which will obscure individual mealybugs. Wax may turn yellow in older infestations. Specimens do turn black in 70% alcohol. Species identification or confirmation will require slide mounting.

**BIOLOGY:** There is extensive published information on the development and bionomics of this species in Asian countries. In laboratory settings, it was shown that high humidity and high temperatures (>30°C; 86°F) adversely affect development and survival.

**HOSTS:** CAPS Pest Survey Specialists noted that the original population of mealybugs was restricted to dodder. There are several co-occurring species of *Cuscuta* in South Florida, so it is possible that species other than *C. exaltata* could serve as hosts. A subsequent collection on 9 December 2009 recovered the mealybug from *Ximenesia americana* (tallow wood) (Olacaceae). Published collection records state that suitable plant hosts are found in 35 plant families, including Euphorbiaceae, Fabaceae, Myrtaceae and Solanaceae. It has been intercepted at US ports on *Punica* sp. (Lythraceae), *Nephelium* sp. (Sapindaceae), *Eugenia* sp. (Myrtaceae) and *Citrus* sp. (Rutaceae). In Okinawa, it is a significant pest of mango, and is a serious pest of citrus in South Africa.

**ECONOMIC IMPORTANCE:** This is an agricultural pest in Asia that attacks food, forage, ornamental crops and fiber crops, such as cotton. It is also a pest of stored potatoes. *Nipaecoccus viridis* is widespread throughout the tropic and subtropics, attacking numerous plant species and often causing considerable damage (Clausen 1978; Sharaf and Meyerdirk 1987). The potential for invasiveness appears high.

**NATURAL ENEMIES:** The literature reports that there are several natural enemies of the Lebeck mealybug including the mealybug destroyer, *Cryptolaemus montrouzieri*, which is present in Florida. The parasitic wasp *Anagyrus indicus* (Encyrtidae) was an effective control for an infestation in Jordan, but this species does not occur in the United States.



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

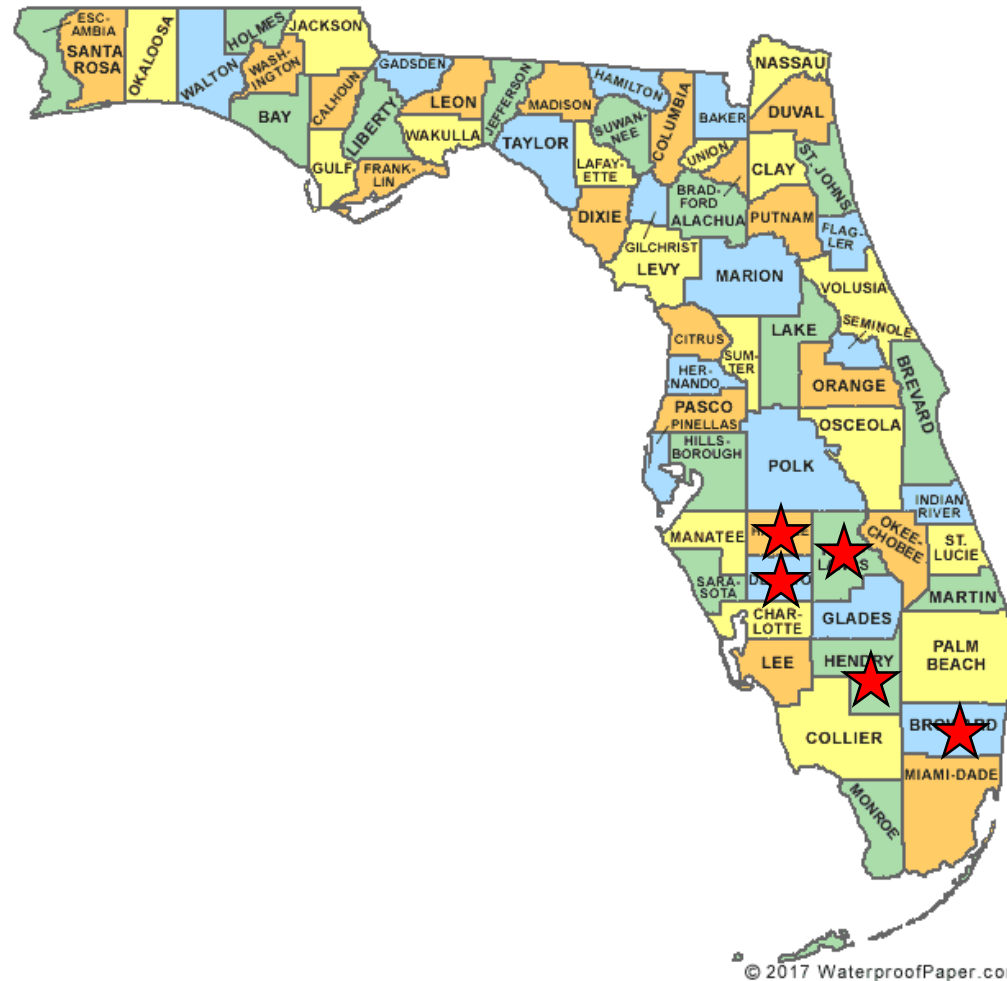


Image Credit: [https://www.freshfromflorida.com/content/download/66447/1601512/Pest\\_Alert\\_-\\_Nipaecoccus\\_viridis,\\_a\\_New\\_Exotic\\_Mealybug.pdf](https://www.freshfromflorida.com/content/download/66447/1601512/Pest_Alert_-_Nipaecoccus_viridis,_a_New_Exotic_Mealybug.pdf)

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# Distribution in Florida

- 31,882 acres surveyed since first find
- Commercial
  - Highlands
  - Hendry
  - DeSoto
  - Hardee
- Residential
  - Broward



# Favored Environmental Factors

- A pest in tropical and subtropical environments
- Survives well in plant hardiness zones 9-11
- Thrives in high humidity (60%) and high temperatures (86°F)
- Feeds on fruit, vegetables, field crops, and ornamentals



# Basic Biology

- Piercing, sucking mouthparts
- Reproduces sexually or asexually (like aphids)
- Development on citrus at 90.5° F (32.5° C), 72.1% relative humidity (lab):
  - Female: 19.2 days, Male: 14.8 days
- Continuous reproduction and quick development time leads to overlapping generations in the field

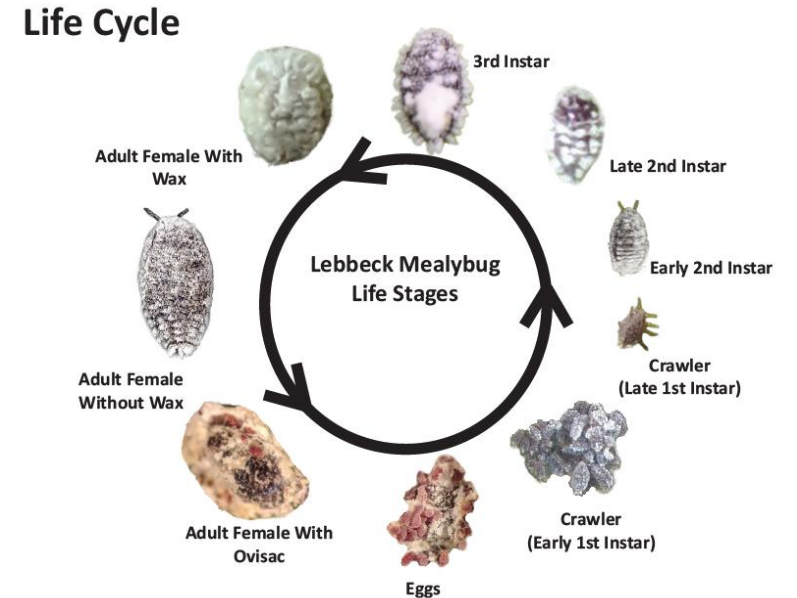
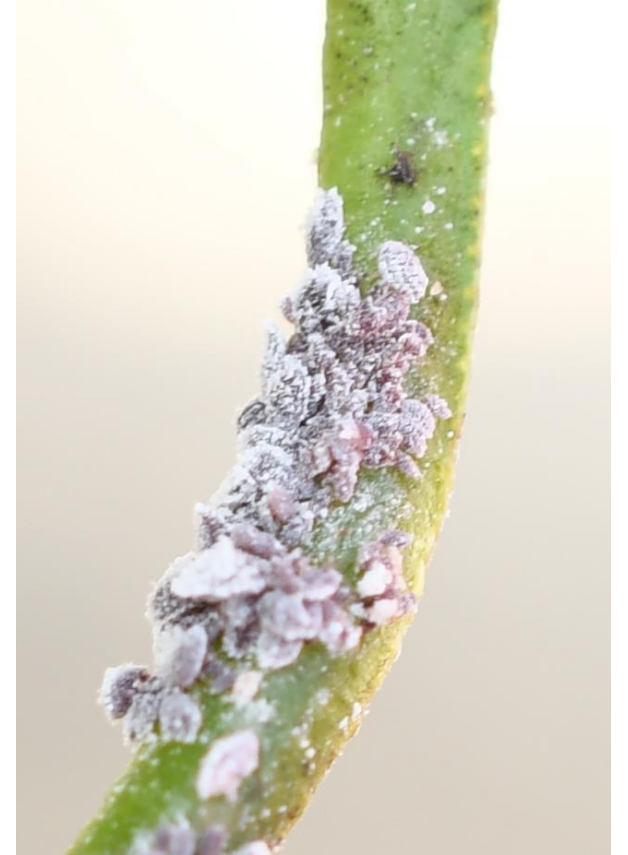


Image from *Field Guide of lebbeck mealybug*



# Reproduction Factors

- High relative humidity ( $\geq 60\%$ ) and temperatures below  $68^{\circ}\text{F}$  decrease egg survival\*
- A 1:2 male:female ratio
- The development of all life stages depends on climatic conditions and host plant
  - Citrus is a favorable host plant and the climate in Florida is ideal for this pest, making it easy to obtain outbreak level populations



\*lab study, does not appear to be true in outdoor conditions



# Location on Plant

- Branch junctions



Photo Credit: T.R. Weeks, UF/IFAS CREC

# Location on Plant

- Branch junctions
- Underneath calyx button/sepals



Photo Credit: T.R. Weeks, UF/IFAS CREC

# Location on Plant

- Branch junctions
- Underneath calyx button/sepals
- Blossom end of fruit



Photo Credit: T.R. Weeks, UF/IFAS CREC

# Location on Plant

- Branch junctions
- Underneath calyx button/sepals
- Blossom end of fruit
- Fruit buttons
- No preference for location on tree
- Does not infest tree roots



Photo Credit: T.R. Weeks, UF/IFAS CREC

# Scouting Tips

- Look where they prefer to feed
  - New growth: leaves, branches, and fruit
  - Branch junctions
  - Underneath calyx buttons/sepals
  - Fruit
  - Fruit buttons

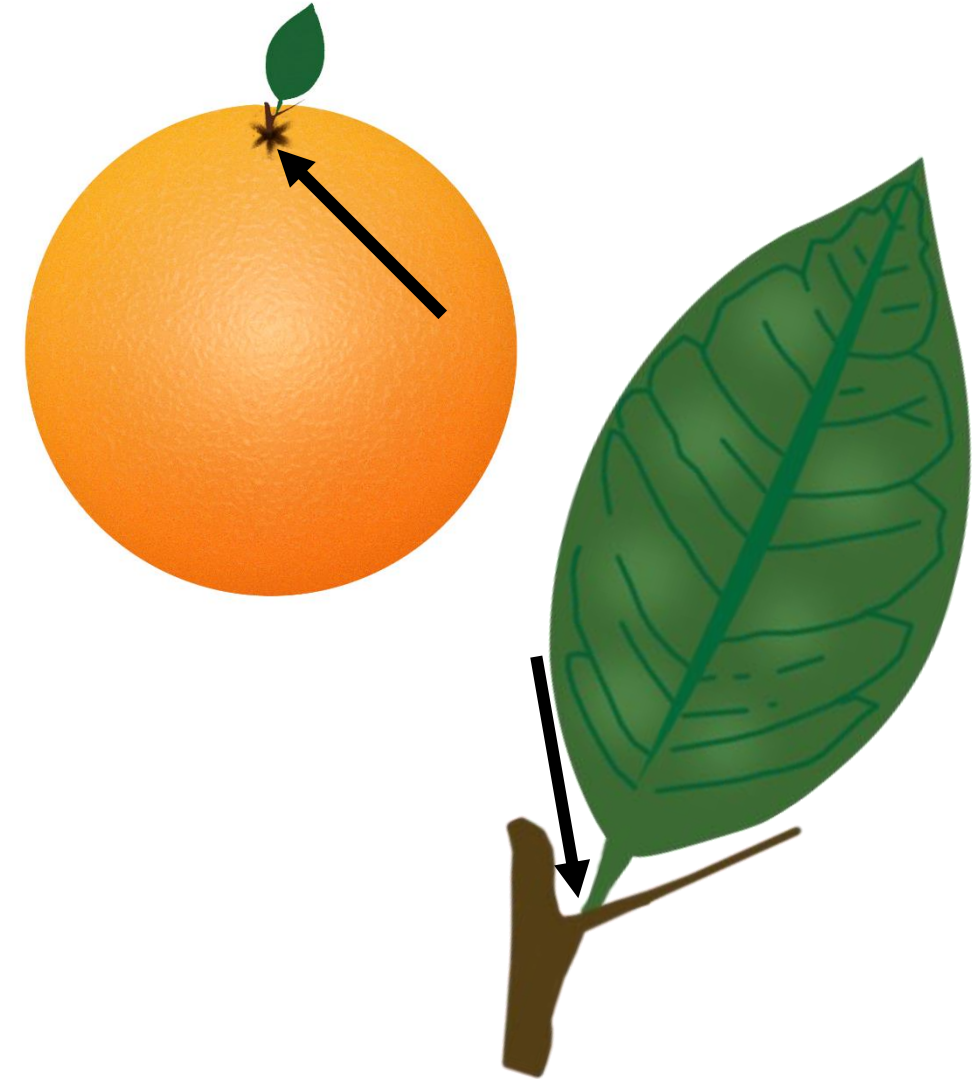


Image Credit: T.R. Weeks, UF/IFAS CREC

# Scouting Tips

- Look for dense areas of sooty mold (look up)
  - Lebeck mealybugs produce a LOT of honeydew
- Scan tree from top to bottom
- If using exclusion bags, sooty mold from high populations will be apparent on bags
- “Once you see it, you can’t stop seeing it.”
  - It is distinctly different from other mealybugs or honeydew producing pests and stands out once you become familiar with it



Image Credit: T.R. Weeks, UF/IFAS CREC

# Movement

- Easily moved by equipment, humans, and other animals
- Infested leaves blown by the wind can transport all developmental stages
  - but crawlers can be moved by the wind a few yards up to a few miles
- Ants farm (feed off honeydew and protect)
- Birds- ovisac sticks to their feet and is spread with their travel; this leads to widespread distribution
- Possibly also walking between hosts





# Sanitation Procedures

- Sanitize all tools that have come in contact with infested plant materials
- Pressure wash large equipment- knock off nymphs
- When moving between groves, change clothes and wipe exposed skin surfaces
- If possible, plan your grove visits so that known infested groves are the last visit of the day
- What is the best option for sanitizing tools?



# Sanitation Procedures

- Tested common products:
  - Ethanol: 100%, 75%
  - Isopropyl Alcohol (rubbing alcohol): 91%, 70%, 50%
  - Bleach: 1%, 10%, 25%
  - Tap water
- 3 sprays on 10 mixed-age nymphs without wax
- Everything but water killed on contact
- Needs repeating on eggs (hatch), with wax present



# Damage

- Fruit damage
  - Damaged fruit will not be marketable for fresh market
  - Quality of juice is yet to be determined
- Leaves exhibit physical feeding damage
- Excessive sooty mold build up
- May stunt growth on young trees
- Can cause tree death in new plantings



Photo Credit: T.R. Weeks, UF/IFAS CREC

# Identifying Fruit Damage

- Causes fruit drop leaving the buttons behind
- Causes fruit to be lumpy, particularly near the calyx button
- Fruit drop
  - We do not know the extent, but according to old literature from South Africa, it can cause 50% or more crop loss
  - The amount of fruit drop will depend on infestation levels



Photo Credit: T.R. Weeks, UF/IFAS CREC

# Fruit drop in Florida citrus

- Monitoring fruit drop due to mealybugs versus normal drop
- Nets below tree catch fruit to be counted and removed every other week
- Looking for more locations if anyone with an infested grove is willing to let us set up drop cages



Photo Credit: T.R. Weeks, UF/IFAS CREC

# Beneficial Insect Management

- Beneficial insects have been found **MORE** effective than insecticides in several studies
- Beneficial insects include:
  - Lady beetles- “mealybug destroyer”
  - Predatory caterpillars
  - Predatory fly larvae
  - Earwigs
  - Parasitic wasps (not known for North America)



Photo Credit: T.R. Weeks and L.M. Diepenbrock, UF/IFAS CREC

# Chemical Management

- Challenge: getting chemical through the ovisac
- 2-pronged approach
  - Kill reproductive female (systemic)
  - Spray when the crawlers are out (contact)
- **COVERAGE IS KEY!**
  - Increase gallonage of oil/surfactant
  - **SLOW DOWN-** 1.5 mph will get better coverage than 3 mph



# Chemical Management

- Studies in other countries have shown that natural enemies are more effective than most insecticides
- HOWEVER, Chlorpyrifos and Acetamiprid have good efficacy for outbreaks
  - Studies in the 1980s or earlier
  - Newer chemistries are available that should have impacts on the exotic mealybugs with potentially fewer non-target impacts
- We are currently rating an insecticide trial and will be screening additional materials in the lab





# Next steps...

- Defining the life cycle of the pest in Florida conditions to determine the best time for spray applications
- Setting up trials
  - Looking at beneficial insect control
  - Chemical testing
  - Lure testing (collaboration with Trécé)-  
\*looking for a few more grower collaborators\*
  - Impacts on juice quality
  - Impacts on fruit drop



# Submit a sample

- [www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Business-Services/How-to-Submit-a-Sample-for-Identification](http://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Business-Services/How-to-Submit-a-Sample-for-Identification)
- Follow the instructions on how to package and fill out the Specimen Submission Form (must be included with each sample)
- Ship to DPI for confirmation of species

The screenshot shows a web browser window displaying the Florida Department of Agriculture and Consumer Services website. The page title is "How to Submit a Plant, Insect or Soil Sample for Identification". The navigation bar includes links for Home, Pay/Register Online, About, Divisions & Offices, Forms, Cannabis, News & Events, and Contact Us. The main content area features a sidebar with "Business Services" links and a central article titled "How to Submit a Plant, Insect or Soil Sample for Identification". A red box highlights a paragraph: "Please fill out the [Specimen Submission Form](#) [ PDF ] and mail the form with the sample/specimen to: Florida Department of Agriculture and Consumer Services, Division of Plant Industry, The Doyle Conner Building, 1911 SW 34th St., Gainesville, FL 32608-7100". Below this is a section for "How to Fill Out the Specimen Submission Form" with a video player showing a woman at a table with plants and a phone number 1-888-397-1517. The video player also lists related topics: Plant diseases (plant pathology, nematology), Insect pests (entomology), and Identifying plants (botany). The right sidebar contains "Contact Us" information, including the address and phone number, and "Laws and Regulations" links.



# Any questions?

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