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CIR 1415

Florida Crop/Pest Management Profile: Guava and Wax Jambu[1]

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Production Facts

- Guava (*Psidium guajava*) and wax jambu (*Syzygium samarangense*) are both tropical plants in the Myrtaceae family (1).
- In 1990, acreage of guava in Florida approached 80 acres. By the middle of that decade, guava was grown on nearly 200 acres (2).
- The annual production of saleable guava is an estimated 3,500,000 pounds. At an average seasonal price of $1.00 per pound, the crop would be worth approximately $3.5 million (2).
- There are several acres of wax jambu production in Florida (3).

Production Regions

Guava and wax jambu are grown exclusively in southern Florida. Over ninety-five percent of the guava acreage and 100 percent of the wax jambu acreage are located in Miami-Dade County (3).

Production Practices

The guava tree is small (six to 20 feet), with a broad, spreading top, branching freely close to the ground. The trunk is short with a scaly, greenish to light-brown bark (4). The tree is native to the American tropics, and it is believed to have been introduced to Florida from Cuba in 1847 (2). Leaves are oblong and opposite, three to seven inches in length, with prominent veins on the bottom leaf surface. This side of the leaf is also finely pubescent when leaves are young. Flowers are white, approximately one-inch in diameter, and borne singly or in small clusters. Fruit may range from one ounce to two pounds. Skin color varies from light green to yellow, and the pulp may be white, yellow, pink, or red. Fruit ranges from thin-shelled with many seeds embedded in a firm pulp to thick-shelled with few seeds. Flavor ranges from sweet to highly acidic, and the aroma may be strong and penetrating or mild and pleasant. The guava tree blooms continuously throughout the year. The fruit requires about 120 days to mature, and peak harvest runs from August through October, with a minor harvest in February and March (4,5).

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Wax jambu is a native of the Malay Archipelago. The tree is 16 to 50 feet tall with a short trunk. The fruit is pear-shaped, waxy, and approximately two inches long and two inches wide at the waist. The fruit skin is white, pink, or red, and flesh is spongy white. A single seed is present in the center. The tree flowers during April and May, and fruit are harvested from June through July (1).

Guava trees may be propagated by conventional methods. Although seed can be used, varieties do not reproduce true to type. Consequently, vegetative propagation is used. Air-layering is the easiest method, but is impractical when large numbers of plants are needed and the source of material is limited. Veneer grafting and chip budding are successful only when seedling rootstocks are young and vigorous and the scion comes from terminal growth, which is green and quadrangular. Leafy stem cuttings root successfully in a mist bed. Properly propagated and cultured trees may start to bear within two to four years, and a mature tree will produce from 120 to 220 pounds of fruit per year. Self-pollination is possible in guava. However, cross-pollination by insects results in higher yields (4).

Susceptibility to cold weather restricts guava growing in Florida to the southern portion of the state. Small trees may be killed by temperatures of 27–28°F. Older trees can withstand short periods of temperature as low as 25–26°F without much damage.

Under Florida conditions, guava plantings are spaced 10 to 20 feet in-row and 20 to 25 feet between rows (87 to 217 trees per acre). Guava trees also respond well to pruning. Pruning hastens flowering and fruiting by promoting vigorous flushes of mixed growth (i.e., leaves and flowers).

Worker Activities

Trees are picked by hand. A worker can generally pick up to three acres daily. Mechanical pruning is often done after the peak harvest, after the trees have been picked between two and six times (6).

Insect/Mite Management

Insect/Mite Pests

The principal pests on guava in Florida are redbanded thrips, Caribbean fruit fly, guava moth, and guava whitefly. Scale insects may also intermittently infest guava plantings (4,7).

REDBANDED THRIPS (*SELENOTHRIPS RUBROCINCTUS*)

The redbanded thrip is ubiquitous in its distribution throughout Florida, but it is generally found in damaging numbers from Orlando to Key West. Female redbanded thrips are slightly greater than 1 mm in length, and have a dark brown to black body underlain by red pigment, chiefly in the first three abdominal segments. The larvae are light yellow to orange, with the first three and last segments of the abdomen bright red. The life cycle of this insect is about three weeks in Florida, and several generations are possible each year. In addition to attacking tropical fruit trees (guava, avocado, and mango), redbanded thrips also attack sweetgum trees. Redbanded thrips prefer young foliage, which may lead to leaf drop, at times totally denuding trees. Infested leaves are spotted on the upper surface with fecal deposits that turn reddish brown to black. The russetting from thrips feeding results in fruit which is out-of-grade (8).

CARIBBEAN FRUIT FLY (*ANASTREPHA SUSPENSA*)

This fly is also referred to as the guava fruit fly or Greater Antilliean fruit fly. The fly is indigenous to the West Indies and aggressively attacks guava and Surinam cherry in its range. In Florida, this fly was absent from the late 1930s until 1965, when a large outbreak occurred near Miami. Since that time, the fly has continued to spread, and it now occurs in most of southern Florida, commonly north to Citrus and Volusia Counties. The Caribbean fruit fly has become the main fruit fly problem for citrus and several other crops in Florida, including guava.

The fly is yellowish brown and about the size of a housefly. The wings are yellow to yellow-brown as well and have a pattern of black markings. The fly only infests mature to overripe fruit. Eggs are laid singly and hatch in two to three days. Larval feeding occurs for ten to 14 days, and pupation lasts an equal amount of time.

Since 1990, a joint federal/state program has been implemented that rears an endoparasitic braconid wasp, *Diachasmimorpha longicaudata*. This wasp deposits eggs in the pupae of the fruit fly. The larval wasps hatch and feed on the flies as they develop. Trapping results reflect a 40 percent reduction in fruit fly numbers with this plan in operation. Additionally, millions of sterile flies are produced and released yearly in a sterile insect technique program (9).

GUAVA MOTH (*ARGYRESTHIA EUGENIELLA*)

Although not as damaging as the Caribbean fruit fly, the larvae of this moth spoil ripe fruit by tunneling through it. The larvae are whitish with black heads. They become pink as they approach maturity and attain a length of nearly one-quarter inch (7).

GUAVA WHITEFLY (*METALEURODICUS CARDINI)*

This insect is also known as Cardin's whitefly. This whitefly has been identified in Florida since 1917, from southern Florida to as far north as Gainesville. However, it is much more common in the subtropical areas of the state. Guava whitefly is usually innocuous, but under conditions that disrupt the parasite/predator complex, it can become a damaging pest.

The adult guava whitefly is greenish yellow with a fine dusting of white wax. The wings are dusky with a conspicuous dark spot near the center of each wing. As females deposit eggs, a fine trail of fluffy white wax is rubbed from a tuft of wax on the ventral side of the abdomen (10).

Chemical Control

Forty percent of responding surveyed guava growers reported insecticide use. No insecticide use was reported by wax jambu growers. Those survey respondents that provided an insect damage estimate indicated that up to 90 percent of the guava crop would be lost to insect damage (n=1). For wax jambu, this figure was estimated to be 95 percent (n=1) (11). Insecticides and miticides registered for use on Florida guava and wax jambu in 2008 include azadirachtin, *Bacillus thuringiensis, Beauveria bassiana*, buprofezin, imidacloprid, insecticidal oil, insecticidal soap, malathion (guava only), methoxyfenozide, pyrethrin +/- rotenone, pyriproxyfen, spinetoram, spinosad, and sulfur, while pyriproxyfen and methoprene are available for fire ant control (12).

In non-bearing trees, bifenazate and bifenthrin are registered, while pymetrozine, fenpropathrin, and hexythiazox are labeled for non-bearing nursery trees. Hydramethylnon and fenoxycarb are available for fire ant control in non-bearing trees (12).

MALATHION

Malathion is an organophosphate compound that causes death by interfering with proper nerve transmission. Based on survey response, malathion is mainly used to manage Caribbean fruit fly. The median price of malathion is $5 per pound of active ingredient, and the approximate cost per application is $4 per acre (13,14). The preharvest interval (PHI) is 2 days, and the restricted entry interval (REI) is 12 hours (14). The label also recommends that the application be made in conjunction with one pound of partially hydrolyzed yeast protein or enzymatic yeast hydrolyzate per acre for fruit fly control. Forty percent of surveyed guava growers applied malathion to their acreage ten times (50 percent) or 24 times (50 percent), for an average use of 17 times per season (11).

Cultural Control

Based on survey results of all tropical-fruit-growing respondents, 44 percent reported keeping records of pest problems, 50 percent adjusted applications (timing or rate) to protect beneficial insects and mites, and 52 percent alternated pesticides to reduce resistance. Sixty-two percent reported selecting the pesticide that is least toxic to beneficial insects and mites and 63 percent spot sprayed only infested plants or areas. Seventy percent reported selecting pesticides that are least toxic to the environment to make this the dominant form of cultural pest control (11).

Biological Control

Seven percent of the responding tropical fruit growers reported release of predatory wasps for control of lepidopteran pests. Additionally, 30 percent reported the use of biological-derived pesticides like B.t. (11).

Weed Management

Weed Pests

Weeds can reduce yields to tree crops by competing mainly for water and nutrients. Although individual weed species may vary from region to region within the state, predominant weed species in groves are often grasses, sedges, and pigweeds (15).

Chemical Control

Eighty percent of surveyed guava growers and 100 percent of wax jambu growers reported herbicide use (11). Herbicides labeled for use on bearing guava include glyphosate, paraquat, atrazine, oryzalin, oxyfluorfen, pelargonic acid, and carfentrazone. Fluazifop, flumioxazin, and diquat are only registered for non-bearing guava. The only herbicides available for wax jambu are glyphosate, carfentrazone, and pelargonic acid, while flumioxazin is labeled for non-bearing trees only (12).

GLYPHOSATE

Glyphosate is a phosphorylated amino acid herbicide used for total vegetation control. Glyphosate is applied as a directed spray so that foliage is not injured. The median price of glyphosate is $10 per pound of active ingredient and the approximate cost per application is $20 per acre for annual weeds and $50 per acre for perennial weeds (13,16). The PHI for glyphosate is 24 hours (guava) or 14 days (wax jambu) and the REI is 4 hours (16).

Eighty percent of surveyed guava growers in Florida applied glyphosate either three (25 percent), four (50 percent), or six (25 percent) times, for an average use of 4.3 times per season. One hundred percent of wax jambu growers applied glyphosate for weed control (number of times used was unspecified) (11).

Disease Management

Disease Pathogens

The principal diseases affecting guava production in Florida include fungi and a parasitic algae. Anthracnose (*Colletotrichum gloeosporioides*) and leaf spot (*Pseudocercospora psidii*) are fungal diseases that affect guava production. Algal spot (*Cephaleuros virescens*) may become apparent in summer, and sooty mold is often present, though not considered a true disease of guava. Non-manageable diseases include mushroom root rot (*Armillaria tabescens*) and thread blight (*Rhizoctonia solani*). These diseases are controlled by selecting proper planting areas and pruning out diseased tissue, respectively (17).

ANTHRACNOSE (CAUSED BY *COLLETOTRICHUMGLOEOSPORIOIDES*)

The fungus attacks young shoots, leaves, and immature fruit. Shoots develop a typical dieback during moist periods. Young leaves exhibit large, irregular, necrotic leaf spots that form pinkish spore masses during moist periods. The fungus infects green fruit, causing circular, brown-to-black lesions that enlarge. The zones of pinkish sporulation can often be observed on the fruit as well (17).

ALGAL SPOT (CAUSED BY *CEPHALEUROS VIRESCENS*)

Algal spot has a wide host range among tropical trees. Lesions on leaves are roughly circular, raised, and purple to reddish-brown in color. The alga will eventually produce rust-colored microscopic "spores" on the surface of the leaf spots, giving them a reddish appearance. The alga may also spread to branches and fruit. Fruit spots are slightly raised, dark-green to black, 2 mm in diameter, with irregular margins. Fruit may also crack at the lesion sites (17).

LEAF SPOT (*PSEUDOCERCOSPORA PSIDII*)

Symptoms may establish on leaves, stems, and fruit. Infections appear as small, irregular, dark, smokey brown patches, with darker brown, diffuse borders. They appear on the upper leaf surfaces. Under high humidity, the fungus in the center appears greenish gray (17).

Chemical Control

Forty percent of surveyed guava and 100 percent of wax jambu growers reported fungicide use. Those survey respondents that provided damage estimates indicated that 10 percent of the guava crop would be lost to disease (n=1). Wax jambu growers only reported a 15 percent loss from disease (11). Fungicides registered for use on guava and wax jambu include azoxystrobin, copper hydroxide/sulfate (guava only), hydrogen dioxide, *Bacillus subtilis*, phosphoric acid, sulfur, and *Trichoderma harzianum* (12).

COPPER

Copper has long been used as a fungicide and can be applied in multiple forms. Copper is used to manage anthracnose and algal spot. The median price of copper hydroxide is $2 per pound of active ingredient, and the approximate cost per application is $5 per acre (13,18). The PHI and REI for copper hydroxide are 0 day and 24 hours, respectively (18).

Forty percent of surveyed guava growers in Florida applied copper (in some form) either two (50 percent) or three (50 percent) times, for an average use of 2.5 times per season (11).

Nematode Management

Nematode Pests

Plant-parasitic nematodes are microscopic roundworms, found in soils, which primarily attack plant roots. General signs of nematode damage include stunting, premature wilting, leaf yellowing, root malformation, and related signs characteristic of nutrient deficiencies. Stunting and poor stand development tend to occur in patches throughout the field as a result of the irregular distribution of nematodes within the soil. Species of nematodes reported to be associated with guava trees include *Rotylenchulus reniformis, Radopholus similis, Hemicriconemoides mangiferae*, and *Meloidogyne* (*M. incognita*, *M. arenaria, M. javanica*, and *M. hapla*). All four of these root-knot species are

widespread and cause considerable damage to guava tree roots (19,20).

Chemical Control

There are no currently registered nematicides for use on guava or wax jambu.

Key Contacts

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