



Florida Crop/Pest Management Profile: Pecan¹

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Production Facts

- In 2007, there were 963 pecan farms in Florida with a total reported acreage of 8,652 acres. Approximately three-quarters of this acreage (6,741 acres) was reported as bearing (1).
 - Slightly over a third (3,153 acres) of Florida pecan acreage is native production while the remainder (5,499 acres) is comprised of improved varieties (1,2).
 - Florida pecan production has increased from the lows of 2004 and 2006 (a half million pounds in each of those years) to almost two million pounds in 2007. However, that amount is only about half of Florida pecan production at its peak (3.7 million pounds) in 1999. The value of Florida's 2005 crop was \$1.5 million (3,4). Hurricanes and alternate bearing accounted for many of the low-production years (2).
 - In 2007, Florida ranked thirteenth out of 15 states reporting pecan statistics. Florida accounts for less than one percent of pecans grown in the United States (4).
- Prices for pecan nuts have more than tripled in recent years, from a low of 45 cents per pound in 2001 to nearly \$2 per pound in 2008.

Production Regions

All of the commercial pecan acreage in Florida is located north of Interstate 4, which runs east and west through Orlando. Pecan production in Florida becomes increasingly concentrated in the northern and western regions of the state.

Production Practices

Pecan is the largest of the hickories and can reach heights greater than 100 feet, but usually grows to a lesser height. Pecan canopies spread 40 – 75 feet. The tree needs ample room to grow, both below ground and above ground. The tree is deciduous and native to the United States, with North Florida being the southern-most boundary of its range (through 9A) (5).

In full-sun or part-shade locations, pecan trees grow best on fertile, well drained soil, whether acid or alkaline, but moist. Pecans are not salt-tolerant. They grow more slowly on dry, sandy soils and often defoliate early on such soils without sufficient irrigation (5).

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Figure 1. A pecan grove near Jay, Fla., pictured in October of 2006. Credits: Thomas Wright, IFAS/UF

Many pecan cultivars are not recommended for North Florida because of limitations such as a low percentage kernel or poor resistance to scab and other leaf diseases. However, 'Lakota', 'Excel', 'Gafford' and 'Headquarters' are highly recommended for North Florida due to above-average yield, nut size and disease resistance.

Among the historic cultivars, nut size of 'Elliott' is small. However, this cultivar is highly recommended for North Florida because of excellent disease resistance. 'Curtis' is recommended because it has produced consistently high yields and is disease resistant. 'Sumner' is a recommended cultivar because it has a good combination of yield, nut quality and disease resistance (6).

Some early-maturing varieties with less optimal disease resistance (e.g. 'Pawnee') are grown to capture the most lucrative part of the nut harvest, at the beginning of fall. Other cultivars with less resistance are grown for nut shape and taste (e.g. 'Desirable').

Worker Activities

Pecan trees are picked once a season, during a harvest period that extends from early October until late November. For larger operations, the nuts are shaken from the tree, swept into a bare-ground alleyway, and collected. For smaller operations, nuts are picked up in hollow wire balls.

During initial set, pecan trees are trained so that no limbs are lower than five feet. After about 20 years, the trees start to interfere with each other and may be pruned for several years before alternate trees are removed (2).

Insect/Mite Management

Insect/Mite Pests

Pecan has a number of insect pests that feed on shoots and foliage, as well as the nut. Pecan leaf casebearer, leaf phylloxera, yellow and black aphids, leafminers, spittlebugs, and various lepidopteran larvae feed on foliage and shoots. Nut-feeding pests

include pecan nut casebearer, pecan weevil, hickory shuckworm, and stink bugs. Some of these pests occur at regular and somewhat predictable times (7).

Hicory Leaf Stem Gall (*Phylloxera caryaecaulis*)

This tiny homopteran pest causes the formation of hollow green galls on leaves, stems, and twigs. The galls form in early summer and turn black in mid-summer. The galls can be large, up to a half-inch in diameter. *Phylloxera* is a yearly pest that is often the first of the season, with the most critical period for treatment in April (5,7).

Leaf/Nut Casebearers

(*Acrobasis juglandis*/*Acrobasis nuxvorella*, respectively)

The pecan–nut casebearer is one of the most important early-season pests of pecan. The larvae overwinter in hiding spots in pecan trees and emerge to continue feeding in early spring on buds and stems. The first generation larvae produced by the females from the overwintering larvae are the most devastating, as the females oviposit directly on the developing nutlets. After the eggs hatch the larvae begin feeding on the nutlets, destroying them. Distinctive signs of larval feeding damage are webbing and frass wrapped around the nutlets. A first-generation nut casebearer larva can destroy all the nuts in one to several nut clusters.

Nut casebearer populations may vary widely from year to year and from location to location. Populations fluctuate in response to the availability of nuts and other unknown factors. Larval parasitism rates are usually 10 percent or more. Two to four generations of nut casebearer may occur, but the first-generation larvae are typically the most damaging (8).

Recently a sex pheromone (attractant) produced by the female nut casebearer was identified, synthesized and tested for its attraction to males with excellent results. Baited traps can be placed in the orchard to monitor nut casebearer populations. In testing the baits, the earliest male emergence

observed in any year was April 5 while the latest first emergence was observed about May 10. This is a 35 day range in the emergence from year to year. This fact emphasizes how useful such tools for monitoring and detection can be to growers in helping them to make management decisions (8).

Male moths emerge about three days before females, and females require about three days for mating before laying eggs. Eggs require about four days before hatch, and larvae feed on buds for two days before nut entry. Population buildup requires about 2-4 days.

Adding all of these stage durations together provides an estimate that first nut entry takes place about 12-16 days after the first male is trapped. Based on the trap captures, timing for examination of nutlets for eggs and nut entry can be timed properly (7-12 days after the first capture) and treatment decisions can be better timed.

Because nut casebearer occur early in the season, apply an insecticide only when necessary and be careful to select an insecticide that will have the least impact on beneficial insects, such as ladybug beetles and lacewings (8).

Black/Yellow Aphids

(*Melanocallis caryaefoliae*/*Monelliopsis pecanis*, respectively.)

All aphids on pecans have similar life histories and development. The aphids overwinter as fertilized eggs in crevices in the bark or other protected places on the tree. Wingless female aphids—known as stem-mothers—hatch in late March.

The stem-mothers move out to the opening buds and leaves and feed until fully grown. When grown, they give birth to living young without mating. The young are likewise all females. Later, they too give birth to living young.

Pecan aphids have two population peaks, one in May–June and a larger one in August–October. Winter cover crops of hairy vetch with crimson clover planted in row middles are recommended to augment beneficial predatory insects. In most years beneficial insects will build up in the cover crops in

February–April and then suppress the May–June aphid populations in pecan. The action level for black aphid is between two and five per leaf (2).

A newly introduced lady beetle, *Harmonia axyridis*, is an important biological control of pecan aphids. It is suggested that pyrethroids not be used alone or in combination in early or mid season and not be used more than twice per season (7,9).

Pecan Weevil

(*Curculio caryae*) The pecan weevil can be a serious pest of pecans in Florida. The adults emerge from the soil beginning in July and can continue emergence into November. Adults feed on the nuts until the shell begins to harden, then they begin laying eggs. Weevil feeding on the nut prior to shell hardening prevents nut development and causes the nut to drop. Growers should monitor for adult weevils starting about mid–July using Tedders or circle traps. Drought periods will delay weevil emergence (7).

Stink/Plant Bugs

Several species of these bugs normally inhabit pecan, but typically in low populations. Populations increase as stink bugs outside the orchard—commonly referred to as kernel-feeding hemiptera—enter orchards in the fall.

The timing and movement of stink bugs into pecan orchards in the fall is related to weather conditions and to the type of vegetation and crops surrounding the orchard. For example, drought conditions increase the numbers of bugs in the orchard as does cooler weather. Weeds also attract and hold stink bugs in orchards. Peanuts should not be planted near a pecan orchard because stink bugs move out of peanuts into pecan when peanuts are harvested.

However, research has found that small plots of soybean planted outside the pecan orchard as a trap crop during the pecan growing season can be effective at suppressing stink bug populations in pecan orchards and can reduce pesticide use within the orchard if the soybeans are treated on a timely basis with pesticides (10).

Stink bugs that feed on pecan nuts before shell hardening cause an injury termed "black pit," which leads to nut abscission. In nuts with black pit, the interior is decayed and black in color.

Stink bug species that feed on nuts after shell hardening damage the kernel, but rarely cause abscission. This kind of damage is termed kernel spot. The kernel spots are variable in size, sunken and bitter to taste. Kernel spot lowers nut quality and is undetectable until shelling (10).

Chemical Control

For a schedule of yearly maintenance for Florida pecan (7), see *Insect Management in Pecans*, <http://edis.ifas.ufl.edu/IG077>.

A review of historic insecticide usage indicates that about a third of pecan growers employ these materials during nut production. This proportion of use generally coincides with the acreage of improved varieties that are cultivated under increased inputs (11). Due to the cost of materials, return on nuts, and cost of application (which is high in pecan due to height of tree), minimal insecticides are used.

Insecticides and miticides registered for use on Florida pecan are the following: azadirachtin, *Bacillus thuringiensis*, bifenazate, bifenthrin, calcium polysulfide, carbaryl, chlorpyrifos, cyfluthrin, cyhalothrin, cypermethrin, deltamethrin, dicofol, endosulfan, esfenvalerate, etoxazole, fenbutatin, hexythiazox, imidacloprid, insecticidal oils, insecticidal soaps, kaolin, malathion, methidathion, methomyl, methoxyfenozide, phosmet, pymetrozine, pyrethrins+/-rotenone, spinosad, spiroticlofen, sulfur, tebufenozide, and thiamethoxam.

Weed Management

Weed Pests

Weeds can reduce pecan yields by competing for water and nutrients. Occasionally, the alleyways of the orchard are double cropped with other plants, such as cabbage. Consequently, herbicide selections may sometimes need to be considered for both crops. Such herbicides will be labeled accordingly.

Chemical Control

A review of historic herbicide usage indicates that about a third of growers employ these materials for weed control. This proportion of use generally coincides with the acreage of improved varieties that are cultivated under increased inputs (11).

Herbicides labeled for use on bearing pecan in Florida include the following: diuron, simazine, glyphosate, norflurazon, oxyfluorfen, paraquat, napropamide, oryzalin, carfentrazone, fluzifop, glufosinate, sethoxydim, 2,4-D, halosulfuron, rimsulfuron, and pelargonic acid). Trifluralin, diquat, clethodim, bentazon, flumioxazin, and pendimethalin can be used on non-bearing pecan trees in Florida (12).

Disease Management

Disease Pathogens

The principal disease affecting pecan production in Florida is scab (*Cladosporium carigenum*), which can affect leaves, stems, and nuts. Other diseases that can be problematic include downy spot, zonate leaf spot, vein spot, brown spot, and liver spot. Many of these fungi are undescribed on Florida-grown pecan (5,6,13,14).

High humidity and high summer rainfall have limited the range of acceptable cultivars for the southeastern United States due to difficulty controlling pecan scab in such environmental conditions. Although several highly recommended cultivars have good to high resistance to scab (>Moreland=, Elliott=, >Cape Fear), substantial pecan acreage in Florida must be treated for scab and other leaf diseases (6,11). Additionally, many pecan cultivars originally regarded as resistant to scab are now considered quite susceptible because the pathogen has adapted to the cultivar (13).

The scab fungus attacks actively growing tissue. Stem tissue can be infected in early spring; leaves can be infected from bud break until fully expanded. Nuts are susceptible from the time they are formed until they have ceased growth in late summer. Nuts are especially susceptible to infection during the period of rapid enlargement, usually from late June through July (13).

Infections are started from spores of the fungus, including spores remaining from the previous year's infections. Warm weather produces sporulation, leading to primary and secondary inoculum spread. Lesions are generally circular, range in size from pinpoint to about one-quarter of an inch in diameter, and are light brown to black. On leaves the lesions are most numerous along the veins, but can occur everywhere (13).

Lesions on nuts become sunken and often hardened and are likely to crack as the nuts age. Severely infected nuts can be distorted and may stop growing. These infected nuts may drop prematurely or remain attached to the tree throughout the season. Less severe infections and infections that occur later in the season reduce the growth of the nuts and lower yields (13).

Chemical Control

For a schedule of yearly maintenance for southeastern pecans, see *Pecan Disease Spray Guide* (14).

A review of historic fungicide usage indicates that nearly half of growers employ these materials during nut production (11).

Fungicides registered for use on Florida pecans are the following: triphenyltin, fenbuconazole, propiconazole, tebuconazole, azoxystrobin, kresoxim, pyraclostrobin, trifloxystrobin, dodine, copper hydroxide/sulfate, thiophanate, calcium polysulfide, carbonic acid, sulfur, phosphorous acid, and ziram. The organotin and triazole fungicides have historically been utilized by pecan growers in Florida. Several products are manufactured that are mixtures of triazoles and organotin or triazoles and strobilurins (14).

Biological Control

Several biological fungicides have been registered for use in pecan. *Bacillus subtilis* and *B. pumilus* are both registered for use in this crop.

Nematode Management

Nematode Pests

Plant-parasitic nematodes are microscopic roundworms found in soils and primarily attack plant roots. General signs of nematode damage include stunting, premature wilting, leaf yellowing, root malformation, and related symptoms characteristic of nutrient deficiencies. Stunting and poor stand development tend to occur in patches throughout the field as a result of irregular distribution of nematodes within the soil. Pecan roots are known to host the sting nematode *Belonolaimus longicaudatus* (15).

Chemical Control

The only nematicides registered for use on pecan in Florida are aldicarb and azadirachtin. Azadirachtin is generally accepted as an insecticide, and little data exist that gauges the efficacy of this material against nematodes.

Other Pests of Pecan

In addition to insects, weeds, diseases, and nematodes, pecans can be damaged by rodents (squirrels). Approximately 200–300 feet of open space are required from other forested areas to reduce the impact of rodent feeding (2).

Contact Information

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