

Crop Profile for Pecans in North Carolina

Prepared: December 1999

Revised: June 2005



General Production Information

- In 2003, North Carolina ranked 12th nationally in pecan production, representing 1.3% of the U. S. production.
- In 2003, North Carolina produced 2.5 million pounds of pecans with a value of \$2.0 million.
- There are approximately 45,000 to 55,000 pecan trees planted in North Carolina with many newly planted orchards in the last 5 to 10 years.
- The majority of North Carolina pecans are sold “in shell” to local accumulators or through local retail sales outlets. In recent years several businesses that shell and clean pecans have begun to use a significant portion of the pecans produced in North Carolina and sell the shelled pecans through various market channels, with several growers selling their pecans in value added candy mixes.

Production Regions

North Carolina is on the northern fringe of the U.S. pecan production region. The primary pecan production region in North Carolina is in the state’s Coastal Plain. However, there are a number of pecan

operations that are being established in the lower Piedmont region of North Carolina.

Cultural Practices

Pecans are grown primarily in the eastern area of North Carolina in well-drained soils. Pecan acreage is increasing in North Carolina with growers looking to diversify their farming operations. However, pecans must be viewed as a long-term investment with 20 to 23 years required for breaking even. In order to make pecans viable many growers are planting to higher tree densities (30 to 35 trees per acre) initially and cropping trees early and then removing trees when necessary to approximately 8 to 10 trees at orchard maturity (i.e., 18 to 20 years). Another option is for growers to "intercrop" the pecans with shallow rooted annual crops for the first 6 to 7 years. Because pecans are grown in lighter soils in the Coastal Plain, irrigation is strongly encouraged.

Most of the pecan orchards in North Carolina are relatively small compared to orchards in larger pecan producing states. Because of the size of North Carolina orchards, the use of fungicides and insecticides is drastically reduced. Most pecan growers use sanitation and cultural control practices to minimize insect and disease pressure and rely primarily on late-season insecticide applications to manage the pecan weevil, twig girdlers, and fall webworms. Because North Carolina orchards are smaller in size, the growers are able to be more intensive in their operations in areas such as training and pruning.

Worker Activities

(The following information was taken from the April 2005 Louisiana Pecan Crop Profile and adapted for North Carolina pecan production.)

- Post-emergence herbicide applications are made in late winter and early summer with tractor mounted sprayers although backpack sprayers are occasionally used. Row-middles are mowed during the growing season.
- Insecticides and fungicides are applied from early spring up to harvest primarily with orchard blast sprayers to a small percentage of North Carolina orchards.
- Mechanical tree shakers followed by a mechanical ground harvester are utilized by a few growers. Occasionally, falling limbs due to the mechanical shaker causes slight injuries.
- In North Carolina, there is very little orchard activity during the growing season where workers come in contact with the foliage of the pecan trees.

Insect and Mite Pests

Pecans in North Carolina are subject to attack by more than 20 insects and mites. However, only four insects, pecan weevils, twig girdlers, stink bugs and aphids are of economic importance in most years. It is critical that growers are able to recognize damage by these insects, understand their life history, employ insect monitoring tactics and subscribe to integrated pest management strategies. Some other insects of concern in some years include casebearers, leafminers, mites, fall webworms, spittlebugs, hickory shuckworm, phylloxeras and Asian ambrosia beetles.

The pecan weevil is the most serious late-season pest, as it attacks the nut. Its hosts include pecan and hickory. The life cycle of the pecan weevil consists of four stages and can span 3 years. Adult weevils emerge from the soil from August through September. Often a rain of 1 inch will trigger emergence. Adults crawl or fly, mate and live for many days. Females drill holes into nuts and lay eggs causing some nuts to fall in two or three days. Larvae pass through four stages feeding inside the nut. Nuts drop to the ground and the larva chews a circular hole through the shell and exits. They burrow into the soil where they remain for 1 or 2 years. They pupate and change into adults about 3 weeks later and remain in the soil until next August.

Both southern green stink bugs and leaf-footed bugs attack pecan nuts. They puncture nuts before shell hardening and after shell hardening. If feeding is early, the nuts drop. If the feeding is late then black spots or pits develop in the kernel. This damage is referred to as kernel spot or bitter pit. Both species overwinter as adults in debris. They emerge in the spring and lay eggs in grasses or soybeans. They move to pecans only as adults. There are four or five generations a year. Nymphs develop on grasses and vegetable crops.

The pecan twig girdler is a large beetle with long antennae that girdles twigs and small branches in September. Females lay clear glassy eggs in slits in the girdled branch. These branches fall to the ground when the wind blows. Larvae feed in the branch and exit to pupate in the soil. There is only one generation a year.

Two species of aphids attack pecans. Yellow and black aphids feed on leaves. Honeydew is deposited on the foliage and black sooty mold fungi develop. Damaged leaves may appear speckled or have patches that often turn brown and then die. Both species overwinter as eggs deposited in bark crevices. Nymphs are active in the spring. There may be 10 or more generations a year. Damaged leaves may appear speckled or have yellow patches that often turn brown and then die. Such feeding can cause leaves to drop prematurely.

Pest Management Strategies

Insect traps are used to catch pests and monitor their relative development and trigger additional sampling. Traps can also be used to time sprays. A black-light insect trap can be used for moths, beetles

and stinkbugs. They should be suspended on a pulley and operated some 20 feet in the tree canopy. Pheromone traps containing a sex attractant are also available for many insects. They are species specific. There are two ways to monitor for pecan weevils using traps. First is by placing cone cage traps under tree drip line and recording the number of adult weevils collected in the traps. A second way is to use trunk band traps. Burlap bags can be wrapped around tree trunks of several trees in an orchard. Daily collections and destruction of male and female weevils indicate when to spray as well as provide some physical control.

Another method of monitoring pests in general is to place a sheet of plastic or cloth on the ground under trees. Trees can then be sprayed with a knock down insecticide application. One can then return and record the insect found on the sheet. One could also jar the tree and look for insects. In the case of twig girdlers, fallen twigs can be examined for the smooth cut surface done by adult beetles.

Insecticides and Miticides

First Prepollination (buds are burst and first leaves are showing)

Aphids:

- Imidacloprid (Admire 2 EC): 16 to 32 pounds per acre.

Aphids, mites, leaf phylloxera:

- aldicarb (Temik 15 G): 33 to 67 pounds per acre.

First Cover (young nuts first appear)

Nut casebearers, leaf casebearers, mites, and stink bugs:

- chlorpyrifos (Lorsban 50 W): 1 to 2 pounds per acre.
- malathion 25 WP: 4 pounds per acre.
- endosulfan (Thiodan, Phaser) 3 EC: 1 quarts per acre.
- esfenvalerate (Asana) 0.66 EC: 2 to 5.8 ounces per acre.
- tebufenozide (Confirm 2F): 8 to 16 ounces per acre.
- methoxyfenozide (Intrepid 2F): 4 to 8 ounces per acre.

Fourth through Sixth Cover

Aphids, pecan weevils, hickory shuckworms, and stink bugs:

- carbaryl (Sevin 80 WP): 3 pounds per acre AND/OR (Sevin 4XLR): 2 quarts per acre.

- esfenvalerate (Asana 0.66 EC): 2 to 5.8 ounces per acre.
- chlorpyrifos (Lorsban 50 W): 1 to 2 pounds per acre.
- phosmet (Imidan 50 WP): 1.5 pounds per acre.
- tebufenozide (Confirm 2F): 8 to 16 ounces per acre.
- pyriproxyfen (Esteem 35WP): 4 to 5 ounces per acre.
- methoxyfenozide (Intrepid 2F): 4 to 8 ounces per acre.

Pecan weevil sprays should be made every seven days from mid-August through mid-September.

Insecticide and Miticide Use Estimates

Growers generally use Sevin for control pecan weevils, twig girdlers and worms. They will use Thiodan for control of Asian Ambrosia beetles.

Current Insecticide and Miticide Recommendations for Pecans

Current North Carolina Cooperative Extension Service recommendations for insecticide and miticide use on pecans (including information on formulations, application rates, and precautions/limitations) are provided in the following table from the *North Carolina Agricultural Chemicals Manual*:

Table 7-13: Pecan Spray Program <http://ipm.ncsu.edu/agchem/chptr7/711.pdf>

Cultural Control Practices

- The following cultural practice are recommended for pecan growers:
- Establish a new planting away from wooded areas to discourage insects, squirrels, birds, etc.
- Do not grow soybeans, vegetables and related crops or weeds nearby, as these plants encourage stink bugs.
- Till the soil or mow the orchard early in the summer to destroy weed hosts.
- Provide good horticultural care using soil and foliar samples for fertility indexes and provide adequate moisture during the growing season.
- Monitor for aphids and their natural enemies and be prepared to use an aphicide should aphid populations build.
- Gather and destroy fallen twigs during September to reduce twig girdler populations.
- Frequently gather, remove and destroy weevil-infested nuts as they fall.
- Keep areas around the orchard free of debris, which harbor overwintering insects.
- Properly train and prune the trees for optimal slope to maximize light interception and allow wind circulation to minimize insect and disease pressure.

Diseases

Scab is the most common and damaging pecan disease in North Carolina. It is caused by a fungus that affects rapidly-growing leaves, shoots, and nuts. Symptoms on all parts of the plant are similar. Leaf symptoms first appear on the underside as tiny olive-brown lesions on the veins. Later, leaf symptoms appear on the upper surface as small olive-brown to black spots. Several spots may develop on the husk to form black blotches or may blacken the entire surface of the husks causing the nuts to drop prematurely in the husk. However, as mentioned earlier, very few North Carolina pecan growers use fungicides to minimize disease pressure due to the smaller size of their orchards and the high cost of equipment necessary for mature pecan orchards.

Fungicides

Scab:

- **azoxystrobin (Abound 2.08F)**: 12 fluid ounces per acre.
- **dodine (Syllit 65 WP)**: 2 pounds per acre.
- **fenbuconazole (Enable 2F)**: 0.5 pint per acre.
- **propiconazole (Orbit 45 WP) + triphenyltin hydroxide (Super Tin 80 WP)**: 1 Agpac per 5 acres. Super Tin 80 WP is not used heavily in North Carolina because it must be applied with a cabbed tractor (most North Carolina growers have an open tractor).
- **thiophanate-methyl (Topsin M 70 WP)**: 0.75 to 1.0 pound per acre.

Fungicide Use Estimates

Estimates of fungicide use are not available for pecan production in North Carolina.

Current Fungicide Recommendations for Pecans

Current North Carolina Cooperative Extension Service recommendations for fungicide use on pecans (including information on formulations, application rates, and precautions/limitations) are provided in the following table from the *North Carolina Agricultural Chemicals Manual*:

Table 7-13: Pecan Spray Program <http://ipm.ncsu.edu/agchem/chptr7/711.pdf>

Cultural Control Practices

The most effective strategy to control pecan scab is to plant varieties, which have some degree of resistance such as Cape Fear, Elliott, Gloria Grande, and Stuart.

Weeds

One of the best management strategies for a pecan orchard floor is to use a grass alley with a vegetation-free strip. This vegetation-free strip can be established and maintained with herbicide. The permanent grass sod between the tree rows will minimize soil erosion, increase soil aeration and permeability, and support equipment movement through the orchard during wet weather. The vegetation-free strip will help to minimize soil moisture and nutrient competition of grasses in the alley with trees, resulting in optimum tree and nut growth. The vegetation-free strip may help minimize tree damage or loss from voles during the dormant season.

It is best to avoid mechanical cultivation, which can injure tree roots and increase the potential spread of crown gall in established orchards.

Herbicide Considerations

Several herbicides are registered for use in pecans. Some are preemergence herbicides that control weeds that have not emerged and others are postemergence herbicides that control emerged weeds. Preemergence herbicides control germinating weed seeds but do not usually give acceptable control of emerged weeds. However, some herbicides (i.e., Karmex) will control weeds both preemergence and postemergence. Postemergence herbicides are most effective in controlling actively growing weeds.

A good weed management program for pecans consists of the application of a preemergence herbicide (s) in late winter (late February to first week in March) for preemergence control of summer weeds. Applying a non-selective postemergence herbicide (Gramoxone MAX, Rely) to burn down existing vegetation is recommended when applying preemergence herbicides. Throughout the summer and especially prior to harvest, postemergence herbicides should be used to control escaped weeds. A post-harvest application of a preemergence herbicide(s) to control fall or winter weeds is also recommended. Continued use of the same herbicide or herbicides with the same mechanism of control over several years may lead to resistant weeds. Whenever possible, growers are encouraged to rotate herbicides with different mechanisms of action.

Pest Management Strategies

It is important to scout orchards monthly to determine the weed species present. Scouting allows early

identification of difficult-to-control weeds, which may help prevent them from establishing in the entire orchard. If difficult weeds are noticed for the first time in an orchard, they need to be removed before they produce seed. This can be done by hand removing weeds or spot treating weeds with a non-selective postemergence herbicide like glyphosate, paraquat, or glufosinate (Roundup, Gramoxone, or Rely, respectively). If weeds are mature and have produced seed, remove the weed from the orchard when damp to prevent the spread of seed in the orchard. Scouting also gives growers an opportunity to know the weeds that have not been controlled by their weed management program so that adjustments in this program can be made in the future. Growers should consider the potential for weeds located around the borders of the orchard to infest it.

Herbicides

Preemergence Herbicides:

- **Chateau 51 WDG (flumioxazin):** 6 to 12 ounces per acre. Chateau provides preemergence control of annual broadleaf and grass weeds.
- **Devrinol 50DF (napropamide):** 8 pounds per acre. Provides preemergence control of annual grasses and some broadleaf weeds.
- **Goal 2XL, Galligan, or OxyFlo (oxyfluorfen):** 5 to 8 pints per acre. Provides preemergence control of broadleaf and some grass weeds in non-bearing and bearing pecans.
- **Prowl 3.3 (pendimethalin):** 2.4 to 4.8 quarts per acre (or Prowl H₂O at 2 to 4 quarts per acre). Provides preemergence control of annual grasses and small seeded broadleaf weeds.
- **Solicam 80DF (norflurazon):** 2.5 to 5 pounds per acre. Controls annual grasses and some broadleaf weeds preemergence. Solicam will suppress nutsedge.
- **Surflan AS or FarmSaver Oryzalin (oryzalin):** 2 to 4 quarts per acre. Provides preemergence control of annual grasses and some broadleaf weeds.

Established Orchards (Only)

- **Karmex DF (diuron):** 2 to 4 pounds per acre. Provides preemergence control of broadleaf and some annual grass weeds.
- **Princep 4L; Simazine 4L (simazine):** 2 to 4 quarts per acre; Princep Caliber 90; Simazine 90 WDG (simazine): 2.2 to 4.4 pounds per acre. Provides preemergence control of annual broadleaf weeds and annual grasses.

Postemergence Herbicides:

- **Basagran (bentazon):** 1.5 to 2 pints per acre. Postemergence control of certain broadleaf weeds in NON BEARING pecans ONLY. For yellow nutsedge control, apply Basagran at 2 pints per acre when yellow nutsedge is 6 to 8 inches tall.
- **Fusilade DX (fluazifop):** 1 to 1.5 pints per acre. Provides postemergence control of annual and perennial grasses.
- **Gramoxone MAX (paraquat):** 1.75 to 2.7 pints per acre. Provides postemergence control of broadleaf and small grass weeds.
- **Poast (sethoxydim):** 1.5 to 2.5 pints per acre. Provides postemergence control of annual and perennial grasses in pecans.
- **Rely (glufosinate):** 3 to 6 quarts per acre. Provides non-selective herbicide for postemergence control of broadleaf and some grass weeds.
- **Roundup WeatherMax (glyphosate):** 22 to 44 fluid ounces per acre; various generic glyphosate formulations: 1 to 4 quarts per acre. Provides non-selective herbicide for post-emergence control of broadleaf and grass weeds.
- **Select 2EC or Arrow (clethodim):** 6 to 8 fluid ounces. Provides postemergence control of annual and perennial broadleaf weeds.
- **Weedar 64 and various generic formulations (2, 4-D amine):** 2 to 3 pints per acre. Provides postemergence control of annual and perennial broadleaf weeds.

Herbicide Use Estimates

Estimates of herbicide use are not available for pecan production in North Carolina.

Current Herbicide Recommendations for Pecans

Current North Carolina Cooperative Extension Service recommendations for herbicide use on pecans (including information on formulations, application rates, and precautions/limitations) are provided in the following table from the *North Carolina Agricultural Chemicals Manual*:

Table 8-11B: Chemical Weed Control in Fruit Crops – Tree Fruits <http://ipm.ncsu.edu/agchem/>

Contacts

Michael L. Parker

Extension Specialist (Tree Fruit)
Department of Horticultural Science
North Carolina State University
Campus Box 7609
Raleigh, NC 27695-7609
Telephone: (919) 515-1198
E-mail: Mike_Parker@ncsu.edu

Wayne E. Mitchem

Extension Weed Management Specialist
Department of Horticultural Science
North Carolina State University
Mountain Horticultural Crops Research and Extension Center
455 Research Drive
Fletcher, NC 28732
Telephone: (828) 684-3562
E-mail: Wayne_Mitchem@ncsu.edu

Kenneth A. Sorensen

Extension Specialist
Department of Entomology
North Carolina State University
Campus Box 7626
Raleigh, NC 27695-7626
Telephone: (919) 515-1662
E-mail: Kenneth_Sorensen@ncsu.edu

Mr. Bill Bunn

President
North Carolina Pecan Growers Association
P.O. Box 435
Bailey, NC 27807
Telephone: (919) 266-1809

References

1. Hall, M., R. Sanderlin, J. Pyzner, M. Grodner, and C. Graham. 2005. Crop Profile for Louisiana Pecans. April 2005. Louisiana AgCenter, Louisiana State University, Baton Rouge, LA. <http://www.ipmcenters.org/cropprofiles/docs/lapecans.html>
2. Jones, R.K. and D.F. Ritchie. 1991. Some common pecan diseases and their control in North Carolina. North Carolina State University. Ornamental Disease Information Note No. 3.
3. Mitchem, W.E., and M.L. Parker. 2005. Orchard floor management in pecans. North Carolina State University, Horticulture Information Leaflet 380.
4. Parker, M.L. and K.A. Sorensen. 1994. Growing pecans in North Carolina, North Carolina Cooperative Extension Service Bulletin, AG-81.
5. Sherrell, E. M. (ed.). 2004. North Carolina Agricultural Statistics 2004. Publication No. 204. North Carolina Department of Agriculture & Consumer Services, Raleigh.
6. Sorensen, K.A. 1994. Pecan insects and their management. North Carolina State University. Fruit Insect Note #P-2.

On-Line References

Some Common Pecan Diseases and Their Control in North Carolina

<http://www.ces.ncsu.edu/depts/pp/notes/Ornamental/odin003/odin003.htm>

Insects and Related Pests of Pecans

<http://www.ces.ncsu.edu/depts/pp/notes/Ornamental/odin003/odin003.htm>

Pecan Insects and Their Management

<http://www.ces.ncsu.edu/depts/ent/notes/Fruits/fruitp2.html>

Orchard-Floor Management in Pecans

<http://www.ces.ncsu.edu/depts/hort/hil/hil-380.html>

North Carolina Pest News

http://ipm.ncsu.edu/current_ipm/pest_news.html

Growing Pecans in North Carolina

<http://www.ces.ncsu.edu/depts/hort/hil/ag81.html>

Prepared by:

Michael L. Parker, Wayne E. Mitchem, Kenneth A. Sorensen, Bill Bunn, and Stephen J. Toth, Jr. (ed.)

The image of pecans is from the U. S. Department of Agriculture, Agricultural Research Service's Image Gallery at: <http://www.ars.usda.gov/is/graphics/photos/>).