



Controlling the Pecan Nut Casebearer

*Allen Knutson and Bill Ree**

One of the most important nut-infesting insect pests of pecan is the pecan nut casebearer. It is found in all pecan-growing regions of Texas and in southeastern New Mexico. Casebearer larvae tunnel into nutlets shortly after pollination, often destroying all nutlets in a cluster.

The most effective and reliable control method is a well-timed insecticide application(s) made in spring to kill hatching larvae before they tunnel into the nutlets. However, insecticides should be applied only if infestations and nut load justify treatment.

Description

The adult casebearer is a gray to almost black moth about $\frac{1}{3}$ inch long. A ridge of dark scales followed by a band of lighter color runs across the forewings. Moths are active only at night, when they mate and lay eggs on pecan nuts. Each female lays 50 to 150 eggs during her 5- to 8-day life.

Eggs are oval, flat and tiny, just large enough to be seen with the unaided eye. When first laid, eggs are greenish-white or white. Tiny red spots soon appear on the egg, giving it a pink color before hatch. Casebearer larvae are olive-gray to jade green and grow to about $\frac{1}{2}$ inch long.

pollination. Eggs hatch in 4 to 5 days. Young larvae crawl to nearby buds to begin feeding, leaving empty white egg shells on the nut. The tiny larva feeds for a day or two on a secondary bud at the base of a compound leaf before it enters the pecan nut. Larvae generally tunnel in at the base of the nutlet. Silk and black frass (excrement) are often visible outside infested nuts.

Casebearer larvae feed for about 4 to 5 weeks, depending on the temperature. Full-grown larvae then enter the pupal stage inside the nut. The moth emerges 9 to 14 days later.



Adult pecan nut casebearer

Biology

First-generation casebearer eggs are typically deposited on pecan nutlets soon after

Seasonal cycle

The pecan nut casebearer completes two to four generations a year. Overwintering larvae develop into moths that emerge in April and May and lay eggs on pecan nutlets soon after pollination. These eggs result in first-generation larvae, which feed on nutlets and generally cause the most damage.

* Extension entomologist and Extension agent—entomology (pecans), The Texas A&M University System.

Second-generation larvae attack the nuts in mid-summer about 6 weeks after first-generation larvae enter the nut. Third-generation eggs are deposited on nuts from late July to early September. These larvae feed only in the shucks if the pecan shells have hardened.

Many third- and, if present, fourth-generation larvae do not feed, but crawl to the base of a dormant bud where they build a tough, silken cocoon (hibernaculum) in which to spend the winter. In spring, these immature larvae leave their cocoons and feed by tunneling into shoots. Full-grown larvae pupate in shoot tunnels or in bark crevices. Moths from these overwintering larvae lay first-generation eggs on nutlets.

When to scout

First-generation larvae usually can cause the most economic loss. For this reason, control is directed primarily at this spring generation.

Insecticide applications must be timed accurately to control newly hatched casebearer larvae before they enter the nuts. Once inside, larvae are protected from insecticide treatments.

In spring, examine nutlets carefully for casebearer eggs to determine:

- Whether egg infestations are high enough to justify treatment; and
- When to apply insecticide.

Often, most eggs are laid during a two-week period in late April to early May in the southern and coastal areas of Texas, and late May and early June in north Texas.

Weather affects when eggs are laid, because spring temperatures determine how quickly the overwintering generation develops. Pecan producers often know from years of experience when casebearer eggs are likely to be found in their orchards. However, eggs can be laid earlier in warm springs and later in cool springs.

To anticipate when eggs will be laid, growers can trap moths using pheromone traps, or determine daily heat units in the spring. To determine the number of heat units accumulated per day, add each day's high and low temperatures (F degrees) and subtract 38. Begin accumulating heat units 10 days before 50 percent budbreak occurs. The first significant nut entry is expected to occur once 1,831 heat units have accumulated.

Begin scouting for eggs at least a week before this anticipated date, as local weather conditions near the spray date can influence egg laying. Scout the

orchard for eggs and nut entry to determine if infestations justify treatment and to confirm the predicted spray date.

Using pheromone traps

Pheromone-baited traps can help determine when to begin scouting for first-generation casebearer eggs. The casebearer pheromone is the unique chemical that the female moth releases to attract the male moth. The pheromone is synthesized and placed inside a trap to attract male casebearer moths. To detect and monitor the emergence of male casebearer moths, record the trap catch periodically. This information can be used to predict when eggs will be laid and when nut entry will occur.

Pheromone lures and traps can be bought from several distributors of pecan supplies.

The following guidelines describe how to use pheromone traps and scouting for eggs and nut entry to determine whether you need to apply insecticide to prevent economic damage from pecan nut casebearer:

- *Pheromone lures and traps are commonly sold together as kits.*

There are many different trap designs, but kits sold for pecan nut casebearer use either the Pherocon 3 Delta trap, the Pherocon 1C wing trap or the Intercept-A trap. All three designs determine moth activity patterns effectively. The Intercept-A trap has a removable liner that makes it easier to use than the Pherocon 1C or similar wing-style trap. Keep pheromone lures frozen until used. Replace lures every 6 to 8 weeks; remove old ones from the orchard and discard them.

- *Three pheromone traps are enough to determine the pattern of moth activity at a given location.*

As a general guide pending further research, consider 3 to 5 traps for orchards smaller than 50 acres and 5 or more traps for those larger than 50 acres. Consider additional trapping locations where orchard conditions vary, such as between river bottom sites and upland sites.

- *Separate traps at a location by at least several trees.*

Place traps near the terminal of a nut-bearing limb at a convenient height. Traps placed in the lower canopy accurately reflect moth activity. Although data indicate that traps placed higher in the canopy capture more moths, the activity pattern is the same, so the extra effort to place traps high in the canopy is not rewarded.

- *Place pheromone-baited traps in the orchard four weeks before the expected spray date.*

Traps must be in the orchard before moth flight begins to ensure that the date the first moth is captured represents the beginning of moth activity. In South Texas, traps should be in the orchard by April 1; in Central Texas by April 15; and in North Texas, May 1.

- *Monitor traps at least every 3-4 days and three times a week if possible.*

Frequent monitoring is necessary to detect the first flush of moth activity. Each time you check the trap, count and record the number of casebearers captured. Also record the trap location and sample date. Remove all moths, other insects and any leaves or twigs from the trap.

Do not confuse pecan nut casebearer moths with pecan bud moths or other imposters (see photograph) sometimes captured in pheromone traps. Replace traps or trap liners when the sticky material becomes covered with moth scales, dust or other debris. To avoid contaminating the lure, use forceps or the tip of a pocketknife blade to transfer the pheromone lure to the new trap or liner.

- *Begin scouting the orchard for casebearer eggs 7 to 10 days after the first pecan nut casebearer moths are captured in the pheromone traps.*

The first male casebearer moths are usually captured two weeks before the optimum time to apply an insecticide. During this time, trap catches usually increase and then begin to decline over a 2- to 3-week period. You may be tempted to apply an insecticide during peak moth capture, but such an application would be a week or more before a properly timed treatment, if needed, should be applied.

Research indicates that numbers of captured moths accurately reflect patterns of moth activity. *At this time, trap catches cannot be used to predict the threat of damage by casebearer larvae or the need to apply an insecticide.* For this reason, you need to scout nutlets closely for eggs and nut entry. Use the sampling plan described below to determine if an infestation is damaging enough to justify an insecticide application.

- *Pheromone traps can also be used to monitor flights of later casebearer generations.*

A second moth flight can be detected about 6 weeks after the spring flight and follows a similar pattern of increase and decline during a 2- to 3-week flight. Nut entry, and thus optimum timing of an insecticide application for second

summer-generation casebearer, *if needed*, occurs about 12 to 16 days after the second moth flight begins.

As with the first summer generation, base your decision to treat the orchard on the presence of eggs and larvae and not the number of moths captured. The pheromone trap is very attractive and will capture casebearer moths even when an economic infestation of larvae does not develop. Pheromone traps continue to capture moths of the third and fourth generations throughout the summer into November. However, these later generations rarely threaten nut production.

Orchard scouting and treatment

Most casebearer eggs are found at the tip of the nutlet, either on the top (stigma) or hidden just under the tiny leaves (sepals) at the tip of the nutlet. You need a good hand lens to identify casebearer eggs and determine their development (hatched, white or pink). Also, look for bud feeding just below the nut cluster to detect the presence of newly hatched larvae.

As described above, begin scouting for eggs 7 to 10 days after the first casebearer moths are captured in pheromone traps, or 7 to 10 days before the date of first nut entry as predicted by heat unit accumulations. Use the following sampling plan to determine if infestations warrant applying insecticide. The plan is based on the assumption that treatment is justified when infestations are large enough to destroy 5 percent or more of the nuts expected to be harvested.

About 2 to 3 days before the predicted first significant nut entry date, examine 10 nut clusters per tree. A cluster is considered infested if it has a casebearer egg or nut entry. If, on this date, you find two or more infested clusters before 310 nut clusters are sampled, the casebearer population is large enough to damage more than 5 percent of the harvest. Apply an insecticide within the next few days.

If you find fewer than two infested clusters, sample again 2 to 3 days later. If you find two or more infested clusters before 310 clusters are examined, apply an insecticide treatment without delay.

If no treatment is indicated, sample again two days later. A third sample is especially important if cold, rainy nights have occurred, which can delay egg-laying. If you find fewer than three infested clusters, treatment is not warranted. Infestations of three or more infested clusters at this time indicate some damage may occur. Consider the effect of rainy weather on egg-laying and crop load in making treatment decisions at this time.

Nut clusters with eggs can be tagged with a piece of ribbon and checked each day to determine when hatch occurs. Apply the insecticide 1 to 2 days after the first eggs hatch, or as soon as nut entry by larvae is first observed. Delaying treatment maximizes the insecticide's residual activity. However, consider the time required to treat the orchard and possible delays caused by weather, so that the insecticide can be applied before many larvae tunnel into nutlets.

Insecticide selection

Backyard trees - urban areas

Be careful when applying insecticide sprays in backyard and urban areas, because spray may drift onto nearby gardens, pets and living areas. In urban areas, use only products containing carbaryl (Sevin® and other trade names), malathion, chlorpyrifos (Dursban® and other trade names) or *Bacillus thuringiensis* (several trade names) which are labeled for homeowner use.

These formulations for homeowner use on pecans are commonly available:

- Carbaryl: Green Light® Sevin 25%;
Ortho Sevin 27%
- Chlorpyrifos: Green Light® Termite and Insect
Pest Killer, 12.6%
- Malathion: Green Light® General Spray, 50%
- Diazinon: Spectracide® Lawn & Garden, 25%

Before purchasing and applying any insecticide, always read the label to determine if the product is labeled for use on the target plant or site. Follow mixing instructions and safety precautions.

Commercial pecan production

Many insecticides are labeled for controlling pecan nut casebearer on pecan. Base your insecticide choice on applicator safety, grazing restrictions if livestock are present, and potential impact of the insecticide on beneficial insects and other pests.

The use of pyrethroid (e.g., Asana®, Ammo®, Fury®) or carbaryl (e.g., Sevin®) insecticides has sometimes been followed by outbreaks of aphids or spider mites in pecans. For this reason, using these insecticides for the pecan nut casebearer is discouraged, especially if the orchard has a history of aphid or mite problems. If you use pyrethroid insecticides, apply them no more than once per season.

Two classes or groups of insecticides that have low toxicity to humans, wildlife and beneficial insects are those that have *Bacillus thuringiensis* (e.g., Dipel® and Javelin®) or tebufenozide (Confirm®) listed as the active ingredient. The active ingredients of these insecticides are specific only for the larvae of moths

and butterflies and, unlike other insecticides, these insecticides do not kill pecan nut casebearer adults.

Sunlight degrades *Bacillus thuringiensis*, (B.t.) insecticides so their residual control period (less 4 days) is shorter than that of some other insecticides. Under moderate to heavy infestations, multiple applications of B.t. insecticides may be needed to achieve control. Field tests using tebufenozide for the pecan nut casebearer have shown a residual equal to that of synthetic insecticides.

Additional insecticides labeled for pecans to control pecan nut casebearer include: chlorpyrifos (Lorsban®), azinophosmethyl (e.g., Guthion®), endosulfan (e.g., Thiodan®), phosmet (Imidan®) and malathion.

Thorough spray coverage, accurate timing to treat hatching larvae, using recommended insecticide rates, and proper sprayer calibration are critical for achieving good control of the pecan nut casebearer.

Insecticide labels can change from year to year so it is the user's responsibility to follow current label directions for worker safety, grazing restrictions and application rates for target pests.

Biological control

Many kinds of insects and spiders occurring naturally in pecan trees feed on pecan nut casebearers. Some of the most important natural enemies are tiny parasitic wasps that sting and kill the larvae. More than 25 different species of wasps attack casebearer larvae; although little is known about these beneficials, they help reduce casebearer populations.

Tiny parasitic wasps of the genus *Trichogramma* lay eggs inside the casebearer egg. The wasp eggs hatch and the *Trichogramma* larvae consume the casebearer egg and complete their entire development inside it, turning the egg black. *Trichogramma* wasps occur naturally, but little is known about their importance in controlling pecan pests. *Trichogramma* wasps can be bought for release in orchards, but so far, studies indicate that currently available species and release methods do not control casebearer effectively.

Additional Resources

The following publications can be obtained through your county Extension office or ordered from the Texas Agricultural Extension Service, Distribution and Supply, P.O. Box 1209, Bryan, TX 77806:

- B-1238, *Managing Insect and Mite Pests of Commercial Pecans in Texas* (\$2.00 per copy)
- B-5041, *Homeowners Fruit and Nut Spray Schedule* (\$1.00 per copy)
- B-6055, *Field Guide to the Insects and Mites Associated with Pecan* (\$12.95 per copy).

Send check or money order payable to Texas Agricultural Extension Service to the address above.



Pecan nut casebearer egg on stigma.



Pecan nut casebearer egg on side of nutlet.



Pecan nut casebearer egg on bract of nutlet.



Pecan nut casebearer larva entry on new shoot.



Frass at the base of a secondary bud.



Pecan nut casebearer damaged cluster.



Pecan nut casebearer (left) and pecan bud moth (right).

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the cooperative Extension Service is implied.

Acknowledgment

Major funding for this publication was provided by the Western Pecan Growers Association. Additional funding was also provided by the Texas Department of Agriculture.

Produced by Agricultural Communications, The Texas A&M University System

Educational programs of the Texas Agricultural Extension Service are open to all people without regard to race, color, sex, disability, religion, age or national origin.

Issued in furtherance of Cooperative Extension Work in Agricultural and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Edward A. Hiler, Interim Director, Texas Agricultural Extension Service, The Texas A&M University System.
5,000 copies, Revision