Codling Moth (*Cydia pomonella*) and Its Control

Cooperative Extension Service
College of Agriculture and Home Economics

Guide H-427

L.M. English, Extension Entomologist

This publication is scheduled to be updated and reissued 04/06.

DESCRIPTION

Codling moth is the most serious insect pest of apples and pears in New Mexico. It is less important on walnuts, plums, and other stone fruit. The moth has a wingspan of 1/2 to 3/4 inch. The tip of each forewing has a copper-tinged, dark brown band that distinguishes this moth from others found in apple orchards. Females lay eggs singly on leaves or, later in the season, on fruit. The eggs are tiny, smaller than a pinhead, and opaque white when first laid. Just before the eggs hatch, the black heads of the larvae become visible. Newly hatched larvae are white with black heads. Mature larvae are 1/2 to 3/4 inch long and pinkish white with mottled brown heads.

OVERWINTERING

The codling moth passes the winter as a full-grown larva in diapause (winter resting stage) inside a thick, silken cocoon. These larvae are pinkish white caterpillars with brown heads and are approximately 3/4 inch long. They usually spin their cocoons under loose bark on the trunks of apple trees, under shelters about the base of the trees, or on the ground nearby. They may overwinter in and around packing sheds. They remain dormant through the winter and are able to withstand rather cold temperatures. However, a drop in temperature of 25°F will kill many of the larvae. During the winter months, birds such as woodpeckers find and kill a substantial number of these larvae. In mid-spring, the larvae change inside their cocoons to a dark brown pupal stage. After two to four weeks, grayish adult moths will emerge from these pupae.

DAMAGE

The codling moth can cause two types of damage: stings and deep entries. Stings are entries where larvae bore a short distance into the flesh before dying. The deep entries occur when larvae penetrate the fruit skin, bore into the core, and feed into the seed cavity. Larvae may enter the sides, stem end, or calyx end of the fruit. One or more holes plugged with frass on the fruit's surface is a characteristic sign of codling moth infestation. Entries into the calyx are often difficult to detect without cutting into the fruit.

CULTURAL CONTROLS

Prune tall, overly dense tree tops to improve spray coverage. Hand thin to remove all infested fruit, and remove dropped fruit. If possible, remove host trees in nearby abandoned orchards to destroy reservoirs of codling moth. Also remove any nearby unsprayed apples, plums, apricots, and walnuts. Remove all brush, boxes, and other debris from the orchard.

BIOLOGICAL CONTROL

Alone, natural enemies can't keep codling moth populations below economic levels. However, augmenting naturally occurring parasites with releases of the parasitic wasp *Trichogramma planteri* can supplement non-pesticidal controls such as mating disruptants. *T. planteri,* which attack codling moth eggs, are released on the borders of orchards treated with mating disruptants to help

control eggs laid by mated female moths immigrating into the area.

Timing of the *T. planteri* releases is very important. They must be released to coincide with codling moth egg-laying. Generally this occurs when moths are consistently caught in traps and sunset temperatures are 62°F or higher. These tiny parasitic wasps are very susceptible to insecticides, so they should not be released in areas where broad spectrum insecticides have been used.

Biological control in conjunction with mating disruptants and sprays of dormant oils generally are acceptable organic control methods.

MONITORING, MATING DISRUPTION, AND PESTICIDE TREATMENTS

Pesticide sprays and pheromone dispensers to disrupt mating have proven to be effective in codling moth control.

In orchards treated with pheromone dispensers (mating disruptors), place the dispensers in the upper third of the tree canopy before the first moth emergence in mid-March to early April. A second application of the pheromone will need to be made when the first application expires. The timing for the second application will depend on the product. Read the labels closely for application intervals. In some years in the most southern portions of the state, a third application may be necessary if the moths are still flying and the apples have not yet been harvested. Mating disruption control programs are most effective when moth populations are low and in uniform orchards on flat ground.

It is important to closely monitor pheromone-treated fields for damage from codling moths moving into the field from neighboring apple, walnut, pear, and plum trees. If damage occurs and it is necessary to use a pesticide, discontinue any parasite releases for the rest of the season. Growers should use pheromone traps to monitor the effectiveness of mating disruption treatments. Place the traps in the trees at the same level as the pheromone dispensers to evaluate the development of codling moth populations. If the trap counts become high, the codling moth population is too high to be effectively controlled with mating disruption, and a pesticide application may be necessary. Monitoring traps should be checked on a weekly basis and the trap lures changed on the manufacturer's schedule.

In orchards to be treated with insecticides, it is important to time applications to kill larvae as soon as possible after they emerge. The optimum time to treat can be determined by using pheromone traps, degree-days (DD), and twilight temperatures to monitor codling moth activity and determine when egg hatch occurs.

Soon after bud break, place pheromone traps in the orchard to monitor for the first moth emergence. Manufacturers generally recommend that traps be placed on the southeast quadrant of the trap tree and 6 to 7 feet high. See table 1 for threshold level of treatments. After the first moths are present in the field (the biofix point), you can begin to accumulate degree-days. Once moths are

Table 1. Counts of codling moth for thresholds for chemical management.

Trap counts*	Population levels	Comments
10 moths/trap/week	High	Requires heavy insecticide use. If left untreated, heavy damage will result.
3–10 moths/trap/week	Moderate	Sprays should be applied accurately for each generation.
2 moths/trap/week	Low	Sprays are sometimes unnecessary, but be sure to monitor fruit for damage.

*Using the Pherocon 1-CP or one-gallon type trap

consistently present and sunset temperatures have reached 62°F, degree-day accumulations may be used to predict egg hatch. The degree-days referred to in this text are based on a lower threshold of 50°F and an upper threshold of 88°F. Egg laying should then be verified in the field by checking leaves and fruit for eggs. Consider past-season trap counts and surrounding conditions in determining when to treat.

Throughout most of New Mexico, there are generally two to three generations of codling moth, with a partial fourth generation occurring only occasionally in the extreme southern portion of the state. Often there is a lot of overlap from generation to generation. Growers should continue to monitor the overwintering populations and later summer generations with traps and continue to accumulate degree-days until the crop is harvested or populations decline to below damaging numbers in September.

When using pheromone traps, keep in mind factors such as tree size, trap density, type of trap, trap placement, brand of pheromone, and climate because these factors may affect the trap counts. Table 1 data may be used as a guideline for economic or spray threshold throughout the growing season.

PREDICTING EGG HATCH

Using a codling moth model, it is possible to predict egg hatch in successive generations of codling moths. This can be a good tool to time the first spray with the beginning of egg hatch. Spray should be timed to kill larvae of the first-generation hatch 250 to 300 degree-days after the first biofix (when the first moth is found in pheromone traps) for moderate to heavy populations, and 400 to 500 degree-days for light populations (see table 1). In many orchards it may be necessary to use more than one spray to adequately control first-generation codling moth, especially if the orchard has a history of codling moth infestations. Near the end of the overwintering generation, moth flight trap catches may not be reliable enough to determine the need for another spray. To determine if another treatment is needed, inspect 100 fruit clusters for eggs on leaves, fruit, and at cluster bases throughout the upper half of 10 trees. If any eggs or larval entries are found, treat.

In case of a second generation, use pheromone trap catches to detect an increase in flight activity around 1060 degree-days from the first biofix. This will signal the start of the next flight of moths, or the next biofix. For low to moderate populations, a single pesticide application usually is sufficient. Make this application 200 to 250 degree-days from this second biofix. Under heavy moth populations, one spray is seldom enough, so it will be necessary to make a second pesticide application. Under these conditions, make the first applications 1050 to 1150 degree-days from the first biofix. The second should be made when the previous spray's residual ends.

The third generation of codling moth does not occur in all parts of the state. Codling moth larvae normally go into diapause, or winter dormant stage, during the third week in August. However, in warm years and in warm locations, they may start pupation before this time. These pupae will soon emerge and produce the third generation. In these areas, if 650 degree-days have accumulated between the peak of the first generation flight and August 22, most of the larvae will not go into an overwintering stage but will pupate and emerge into the third generation. If this occurs, use pheromone traps to establish a third biofix when flight activity increases around 1100 to 1200 degree-days after the second biofix. Apply a spray when 200 to 250 degree-days accumulate from the third biofix.

TREATMENTS FOR CONTROL OF CODLING MOTH

Parasitic wasps, Trichogramma planteri, at the rate of 100,000 per acre. Release this parasite to supplement mating disruption treatments. Treat the entire orchard if codling moth populations are moderate to high. For low populations, treating the orchard border may be adequate. It is necessary to make weekly releases during the egg-laying period.

Narrow range oil (Supreme), 1 to 1-½ gallons per acre when dry (no visible moisture on leaf surface). Oils are only mildly effective against codling moth, so they need to be reapplied frequently during egg hatch. Oils may be phytotoxic if used within a few weeks of a sulfur spray or if applied at higher rates during hot weather. The best use is

generally to maintain lower populations in mating disrupted orchards.

Mating disruptants (Isomate-C), 400 dispensers/acre. This treatment is most effective on larger blocks of trees of uniform size. It is important to scout the field for other insects (stink bugs, lygus bugs, and leafrollers) that are normally controlled by codling moth insecticides.

Insecticides labeled for codling moth control include:

- Asana
- Pounce
- Lannate
- Javelin
- Ambush
- Thiodan
- Guthion
- Sevin*
- Imidan
- Diazinon*

*Available to non-licensed pesticide applicators.

Be sure to read and follow all label instructions when applying pesticides.

REFERENCES

University of California, IPM Pest Management Guidelines, January 1996.

Oklahoma State University Extension Agents' Handbook of Insects, Plant Disease and Weed Control, January 1999.

Metcalf, Flint, and Metcalf. Destructive and Useful Insects, Fourth Edition, McGraw-Hill Book Company, 1962.

April 2001 **Las Cruces, NM**
5C