



WORMS IN MY APPLES—NON-CHEMICAL CONTROL OF CODLING MOTHS

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From *The Curious Gardener*, Fall 2010

All summer you looked forward to your first, fresh-picked apple of the season. Picking a beautiful apple off the tree, the only imperfection is a slight red spot on the skin---somewhat like a blossoming human pimple. Biting into the crisp, juicy apple you notice what appears to be a worm tunnel. Picking more apples, you notice a damp, brown granular substance (frass) protruding from holes in the skin. When you cut an apple, the core contains frass, a mixture of worm feces and food fragments. The apple damage is caused by the larvae ("worms") of the codling moth, *Cydia (Laspeyresia) pomonella*, the most serious caterpillar pest of apples, pears, and walnuts. Although less common, codling moths also attack plums and other stone fruits.

Knowing when to use the various means of control to protect your fruit and walnuts from codling moths requires an *understanding of the insect's life cycle*. During late summer to early fall the codling moth larvae emerge from damaged fruit---- after enjoying the opportunity to fully develop within the fruit. The fact the larvae, which are white to light pink with a brown head, live within the fruit makes it difficult to control and eradicate codling moths.

After emerging from the fruit, the larvae encase themselves in a cocoon, overwintering under bark on tree trunks, in nearby debris, or in any other location that provides a hiding place. In the spring, after pupation inside the cocoon, the adult moths emerge in search of mates of the opposite sex. The moths which are about 1/2 to 3/4 inch long with mottled gray wings banded with dark, coppery brown at the tip of the wings, spend the daylight hours on tree bark where they are indistinguishable. The moths become active a few hours before and after sunset when temperatures exceed 62oF. The male codling moths mate with multiple females. Each female will lay 30 to 70 tiny, single, disc-shaped eggs on fruit, nuts, leaves, or spurs. As the eggs hatch, the young larvae bore into fruit and nuts where they develop and then leave the fruit to drop from the trees in search of pupation sites. And, so the cycle goes.

The rate of development varies with the weather. More rapid development occurs in warmer weather and climates. If the weather conditions are right for them, two to four generations of codling moths can develop per year. Because codling moths can be so prolific and are difficult to manage once inside the fruit, it helps to reduce the numbers of successive generations by eliminating as many of the first hatch as possible. Codling moth populations building up generation after generation are especially difficult to get under control with chemical, as well as nonchemical means.

Nonchemical controls include selecting varieties of fruit and nut trees that are less susceptible to the moths, sanitation, mass trapping, trunk banding, and fruit bagging.

Varieties that are less susceptible to codling moth are early maturing apples and pears and late leafing walnuts. Check with your local nursery regarding the availability of early producing apples and pears and late leafing walnuts.

Sanitation is vital if you wish to use nonchemical means to control codling moths. During the winter, remove any props, old fruit, debris, rubbish, and loose bark that provide a hiding place for pupae. Once fruit has set in the spring, check it every week or two for signs of damage. Any fruit showing signs of damage (small red dots called

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“stings”) or frass-filled holes should be removed and discarded in a manner that will prevent further infestation. Dropped fruit may have larvae in them making it important to pick up and promptly discard dropped fruit throughout the season. Removal before the larvae are old enough to crawl out and begin the next generation will help to reduce the population of the next generation.

Pheromone traps have limited usefulness for codling moth control *unless used along with other controls*. The usefulness of traps is limited because the traps attract only male moths by mimicking the scent of a female moth. Traps should be hung beginning in mid- March. Check the traps every week or two and replace traps or lure caps as they become full or as directed by the trap manufacturer.

Another nonchemical method of codling moth control is **trunk banding** which traps mature larvae in a band of “tanglefoot”, burlap bags or corrugated cardboard as they move down the tree to pupate. “Tanglefoot” is a commercially available, non-pesticide sticky gel that can be applied to tree bands.

Larvae attempting to cross the bands become stuck in the gel, preventing them from reaching the ground to pupate. Banding will control only a small percentage of the larva because they often pupate before being trapped. The trapped larva must be killed by crushing them so they do not emerge as adult moths.

One way to utilize mass trapping is to use a strip of large-core (1/8-inch wide corrugations) corrugated cardboard about 4 inches wide just before larva drop (typically during May). Place the corrugated side of the cardboard snugly against the tree at the smoothest part of the trunk with the corrugations vertical to the ground. Remove the bands by the end of May, destroying any trapped larvae and pupae before discarding the cardboard. Place new trunk bands in mid-August, removing and discarding them between November and January.

The final nonchemical control method is **bagging** the immature fruit. Although it is time consuming to use, excellent control of the codling moth can be achieved by enclosing each young fruit in a bag right on the tree. Bagging should be done about 4 to 6 weeks after bloom when the fruit is 1/2 to 1 inch in diameter.

First, thin the fruit to one per cluster. Then, using standard lunch bags cut a 2-inch slit in the bottom fold of each bag. Slip the fruit through the 2-inch slit so it forms a seal around the stem. Staple the open end shut. This will not affect the maturation or quality of the fruit, but may prevent full color development on some varieties.

Although it may be difficult to totally eliminate codling moths from your orchard, with a little effort throughout the year, next fall you should be able to enjoy your apples, pears, and nuts with fewer “worm” incidents.

References

“Codling Moth,” December 2005, University of California Pest Notes Publication No. 7412.

“Pests of the Garden and Small Farm--A Grower’s Guide to Using Less Pesticide,” 1998, Mary Louise Flint, UC ANR Publication 3332.

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