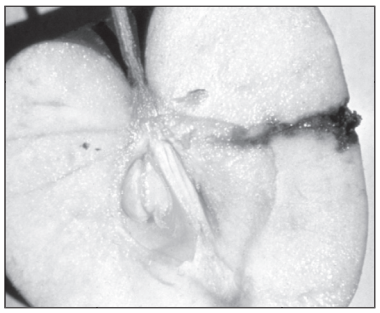
Codling Moth *(Cydia pomonella)*

Host/Site

Apples, pears, walnuts

Identification/Appearance

Adult codling moths may be seen flying around trees in May through July. The first evidence of damage on ripening fruit may be a visible entry hole in the side of the apple, usually filled with brown frass (frass may appear later than fruit damage). If the caterpillar enters at the blossom end, the entry is harder to find.



Top: adult codling moth; Bottom: codling moth larva in apple. Photos courtesy of WSU Cooperative Extension.

Egg: Codling moth eggs are pinhead-sized, flat, and almost transparent when first laid. They are laid on leaves or fruit but are difficult to see.

Larva: The first-stage larva is only about 1/10 inch (2 to 3 mm) long, with a black head and creamy white body. The full-grown larva has a brown or black head capsule and thoracic shield (distinguishing it from the apple maggot larva). The body is usually white, becoming slightly pink when mature. The larvae feed in the core of the fruit on flesh and seeds. When they have completed the feeding state, mature larvae leave the apple and tuck themselves under loose bark scales on the tree, in leaf litter at the base of the tree, or on nearby objects to form cocoons prior to pupating. **Pupa:** The pupa is brown and about 1/2 inch (12 mm) long and lies within a creamy-gray cocoon. **Adult:** The adult is speckled gray-brown in color and slightly larger than a house fly, about 1/2 inch (12 mm) long. The wings show very fine gray and white bands tipped by bronze-colored patches.

Life Cycle

The codling moth larva overwinters in a thick, silken cocoon in tree bark or close to the tree. Growth and emergence of the adult moth coincides with spring apple bloom. Moths emerge at about full bloom and continue hatching as adults for 6 or 7 weeks. Within two days of emerging, moths mate and begin laying eggs. Eggs of this first generation are laid primarily on leaves, although some are found on fruit. Newly hatched larvae emerge after 1 to 2 weeks, enter fruit, and move to the core, where they feed on seeds and flesh. As they eat, they push their excrement out of the apple through their entry hole.

After 3 to 4 weeks, fully grown larvae leave the fruit to pupate and emerge as second-generation adults. Adult moth activity peaks in mid-July to early August and continues into early September. Second generation larvae are in fruit from mid-July until late September. Damage occurs to fruit throughout summer and into fall.

Natural Enemies

Trichogramma wasps are a parasite of the codling moth egg. Under favorable conditions, they can parasitize a high percentage of eggs. To protect these beneficial parasites, avoid using broad-spectrum insecticides.

Monitoring

Feeding larvae cause two types of damage: deep entries and stings. Deep entries occur when larvae bore to the center of the fruit to feed, and brown deposits of frass appear on the surface of the apple. Stings are shallow, partial entries where the larvae died or moved on to another place. External damage disfigures the fruit. Deep entries make fruit storage impossible because they cause fruit rot. Some apples affected by codling moth may be trimmed for kitchen use by discarding the damage, but fruit cannot be marketed.

Pheromone traps monitor adult activity to give an earlier reading on populations and potential damage. The number of traps used and the quality, location, and maintenance of traps are all critical. Refer to WSU publications for more details on using pheromone traps for monitoring. Before the bloom reaches pink stage bud development, place traps in the tree canopy about halfway up, making sure the entrance is not blocked. Change pheromone caps and bottoms as recommended by the manufacturer. Examine traps daily until first moths are captured, usually at about full bloom.

Assessing fruit damage becomes especially important when sprays are not applied because of low trap catch or if alternative controls are employed. Examine 20 to 25 fruit per tree in early July. Sample in the upper half of large trees, where damage is most likely.

Banding trees with cardboard or burlap traps is useful as a monitoring or control technique (see details under "Physical/Cultural Controls."). Mature larvae migrating down the tree in search of shelters to spin cocoons are caught by the bands. This technique is much more efficient on young trees or varieties with smooth bark.

(continued/over)

GREEN GARDENING PROGRAM

The Green Gardening Program is a program of Seattle Public Utilities to promote alternatives to lawn and garden chemicals. Funded by the Local Hazardous Waste Management Program in King County.

Written by Mary Robson and Philip Dickey • Graphic Design by Cath Carine, CC Design

Buy Smart. Buy Safe. Be Toxic Free.

Action Threshold

Commercial growers use two methods to determine the need for and timing of treatments based on trapping of moths in pheromone traps. One method is based only on trap counts, while the other incorporates calculation of cumulative temperatures (degree days) after detection to time control sprays. Both methods require careful observation and monitoring to guide control decisions and can reduce pesticide use by avoiding poorly timed, ineffective sprays. For more details, consult WSU Cooperative Extension Bulletin EB1072 *(Codling Moth Control: A New Tool for Timing Sprays)* or your local county agent.

Cultural/Physical Controls

Cultural/physical controls can reduce codling moth numbers. These methods are best used in combination, especially if choosing not to use chemical controls. Routine persistence is vital.

Sanitation can help gain control of codling moth. Every week or two beginning about 6 weeks after bloom, check fruit for signs of damage and destroy any infested ones. Clean up dropped fruit as soon as they fall to reduce the number of larvae that become adults. Sanitation is vital throughout the growing season but imperative in May and June.

Bagging fruit. One of the most effective controls is to place paper bags over fruit on the tree. Even if eggs are laid on the bags, the larvae can't access the apples. Before bagging, thin fruit to one per cluster when fruit is from 1/2 to 1 inch in diameter. Use No. 2 paper bags (standard lunch bag size measuring 7-1/4 inches by 4 inches). Cut a 2-inch slit in the bottom of the bag and slip this opening over the fruit to form a seal around the stem. Staple the open end shut. This technique does not affect the maturity or quality of the fruit, but it may be necessary to remove the bags a week or so before harvesting red apples to heighten the color.

Mass trapping. Pheromone traps can also be used for control if deployed in large enough numbers. Traps will catch enough male moths so the unmated females cannot reproduce. Mass trapping works best where trees are isolated by at least a mile from any trees harboring codling moth.

Start in mid-March to the beginning of April by placing 2 to 4 traps in each large tree and 1 to 2 in each small tree, away from the trunk and about 6 feet above the ground. Check the traps every week or two, removing dead moths. Replace pheromone lures and manage traps according to the manufacturer's recommendations. Scoring the sticky surface helps maintain its adhesive quality.

Trunk banding. Banding the tree trunks with corrugated cardboard or burlap can be used both for monitoring and for control. These bands will collect some of the larvae migrating down the trunk to find a place to pupate. Bands should be in place by the beginning of June. Banding works best on smooth-barked varieties; scaly varieties have so many crevices that many caterpillars may pupate before they get to the banded area. Even in the best situations, banding will only control a small percentage of the codling moths because many pupate elsewhere. Once a week, undo bands and destroy pupating codling moths. Inspect tree bark for cocoons, too.

Instructions for burlap banding: Buy natural burlap yardage. Whip cut ends. Wash in hot soapy water; dry. Cut prepared burlap into lengths so that a section will wrap around the tree trunk about 1 1/2 times, 2 to 3 feet from the ground. Fold in half 3 times, reducing it to about 5 inches in width. Place around trunk with folds facing DOWN and secure with wood clothespins.

Instructions for cardboard banding: Use a 4-inch-wide strip of large-core corrugated cardboard and wrap it around the trunk of the tree (pick the smoothest part of the trunk) so that the tubes are vertical and the band is snug against the trunk. Staple bands to trees about 18 inches or more from the ground and reinforce the staple with duct tape.

Biological Controls

Some important predators of the codling moth are birds, bats, spiders, insects, and some mite species. *Trichogramma* wasp species are available commercially for codling moth control. Consult label instructions for application details.

Chemical Controls

Chemical controls are likely to be ineffective unless carefully timed. Chemicals registered for codling moth are highly toxic and pose risks to bees (never apply chemicals during bloom) and beneficial mites.

Insect growth regulators have controlled codling moth in apple and pear. Only one product, Dimilin, is registered at this time. *Bacillus thuringiensis* (B.t.) products used alone have not provided good control, even when applied frequently. The larvae do not consume enough of the material because they are sheltered inside the apple. Viruses have not proven effective alone either. Organic growers have used combinations of B.t., virus products, and botanical insecticides, plus sanitation with reasonably good success. The virus registered for codling moth control is the granulovirus (product name CYD-X). Spinosad, a new reduced-risk insecticide fermented from a naturally occurring soil bacterium, is also registered for codling moth as Spin-Tor™. Care must be taken to avoid killing bees.

References

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