

# Apple and Pear Insect Control for Homeowners (Codling Moth)

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There are few experiences that equal biting into a crisp, flavorful apple; few worse than finding half a worm in the remaining portion. Worms infesting apples and pears are immature larvae of codling moth (*Cydia pomonella*). Fruit growers eager to eliminate worms in apples must understand development of the insect and methods to keep them from damaging fruit.

## Codling Moth Development

In the late summer to early fall when codling moth larvae (1/2"-3/4") complete their development in apple and pear fruit, they emerge from the damaged fruit. They then encase themselves in silken cocoons on tree trunks under the bark, in orchard refuse, or under roughened surfaces of fruit collecting bins or other nearby structures, and stay the winter.

After pupation in the spring, adult moths emerge in search of the opposite sex. Each male will mate with multiple females. Once impregnated, each female moth lays from 30-70 eggs on or near developing fruit. These small, gray/brown moths are primarily active from dusk to a few hours after sundown when temperatures exceed 60F and are indistinguishable when at rest on tree bark where they spend the daylight hours.

Depending on temperatures, eggs hatch in 6-20 days. Newly hatched larvae bore into fruit within 24 hours and feed on the internal fruit flesh as they develop through five larval stages before exiting. They prefer to feed on the developing seeds in the center of the fruit. Fruit that drops from the tree prematurely during the summer is frequently infested with this first generation of codling moth larvae. Larvae that exit the fruit will seek protected pupation sites, and second generation adults emerge and begin laying eggs on fruit in mid-summer. Control measures for a third generation may be necessary in warm areas of the state.

## Codling Moth Control

To successfully control codling moth in fruit trees, larvae must be prevented from entering fruit. Consequently controls must be applied at a specific time. Once the eggs hatch and larvae enter the fruit, control measures are ineffective. Pheromone traps placed in the orchard monitor the appearance of adult insects and subsequent high/low temperatures determine the period of time required for eggs to hatch. Pheromone traps are not an effective control because they only capture males (the sex pheromone lure is only attractive to males) and a reduction in males will not substantially reduce female mating due to their polygamous behavior.

Throughout Utah, Extension personnel monitor traps and temperatures to determine the specific timing for pesticide application in different areas of the state. Fruit growers are encouraged to contact an Extension office or find this information on the web site: <http://extension.usu.edu/ipm/PhenolTables.htm>.

Many products and methods for controlling codling moth in fruit trees are readily accessible. The most important spray is the first one of the season that targets the first hatching eggs of the first generation. If the first



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generation is substantially suppressed, the subsequent generation may be smaller. From the first cover spray date (available from Extension sources), control must be on the tree for approximately 6 consecutive weeks. Control must be in place for another 6 weeks each for second and third generations.

## Effective Insecticides

Conventional insecticides include products such as Imidan, Sevin, Permethrin and Malathion. Each has a particular number of days the product effectively kills the insect. Product labels must be read and followed for reapplication timing and the number of days to wait following the final application before the fruit may be safely harvested.

Reduced-risk products (i.e., lower toxicity for humans and other mammals) are available from local nurseries or from mail order suppliers. Products include insect growth regulators, such as Intrepid (methoxyfenozide) and Esteem (pyriproxifen), which must be applied about 10 days before conventional insecticides so that residues are in place as eggs are laid. Newly hatched larvae feed not only on the plant, but also on the egg chorion, ingesting a double dose of insecticide before attempting to enter the fruit.

Another reduced-risk product that has a different mode of action than conventional pesticides is Assail (acetamiprid), a neo-nicotinoid. Its efficiency makes it an excellent option to normal pesticide applications. Success (spinosad) is a microbial (bacterial) product that has a short residual for killing codling moth larvae (7 days). The attract-and-kill method, such as Last Call, uses pheromones to lure male moths to a tiny particle with insecticide that kills the male upon contact. Use of pheromones in mating disruption dispensers, such as Isomate and CheckMate, disrupt and delay codling moth mating. Mating disruption is only appropriate for orchard-sized and regularly shaped blocks of apple and pear trees.

Products considered for organic production are generally lower in toxicity than conventional insecticides and have shorter protection intervals. Organic materials include the organic version of spinosad, Entrust, a bacterial product which must be reapplied every 7 days. Dipel, Crymax Bt, and Javelin contain the endotoxin of the bacterium, *Bacillus thuringiensis* var *kurstaki*. These products are very specific to caterpillars and soft bodied insects and should be applied weekly.

Surround (kaolin clay) acts as a suppressant to codling moth. It must be applied before moths arrive in the orchard and reapplied every week or two. Pyrethrin (Pyganic) is produced from African chrysanthemum flowers and also has a short residual of protection, 5-7 days.

Horticultural mineral oil, which is highly refined oil, can be used on trees during the growing season. Horticultural oil suffocates codling moth eggs, and when applied several times at the beginning of each generation can help suppress egg hatch. However, more than 3-4 applications of oil (diluted 1-1.5% solution) per season can reduce fruit size, tree growth and fruit set for the next year.

## Cultural Controls

Since codling moth larvae continue to develop in fruit that has dropped from the tree, it's important to remove windfall fruit throughout the season. Mature larvae emerging from fruit search for places to build a cocoon on tree bark. Corrugated cardboard strips, secured snugly around the tree trunk, provide secluded places for larvae to spin their cocoon and pupate. However, corrugations must be large enough for larvae to enter. The strips must be checked often from June to September (every 10-14 days), destroyed and replaced to effectively eliminate insect larvae. Individual developing fruits may also be covered with paper bags. Bags should be secured well, but must not constrict the twig. Remove the bags a short time before the fruit is mature to allow the fruit to color.



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