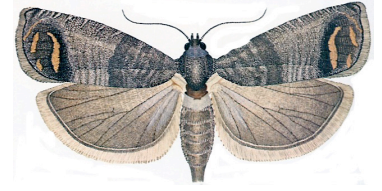


Managing Codling Moth in Ohio Apples: Using Traps & Temperature to Determine the Optimal Times to Spray Insecticide

The pest: Codling moth is the key pest of apples. This pest overwinters as fully grown larvae in cocoons under loose pieces of bark. Once temperatures warm up in the spring, they go through the pupal stage then emerge from cocoons as moths. The moths find mates by smell; the female codling moths emit a pheromone scent that is recognized by male codling moths. After mating, female moths lay eggs on leaves or fruit. Eggs hatch in 6 to 20 days, depending on temperature. Eggs hatch into tiny larvae that invade the fruit and feed around seeds in the core of the apple.



Management strategy: Insecticide is effective if it targets the young larvae just after they emerge from the eggs but before they bore into the apple fruit. Use a pheromone trap to tell when the moths begin to be active, then keep track of temperature to determine when the eggs will start hatching. Note that the pheromone trap catches and kills only *male* moths, so the trap is *not controlling* the pest, it is just *monitoring* the pest population's activity.

Trapping season: from bloom (late April) to harvest (mid-September).

Supplies needed per trap:

- 5 standard pheromone lures for codling moth (each lure lasts one month) or 3 long-life lures for codling moth (each lasts 8 weeks)
- a *delta trap* (such as Trécé's 'Pherocon VI') or *wing-style trap* (such as Trécé's '1CP'):
 - 1 trap top (plastic or cardboard) plus hanger
 - 5 to 10 sticky bottom panels
- OR a *bucket-style trap* such as the standard unitrap from Great Lakes IPM:
 - 1 trap plus hanger
 - 2 or 3 DDVP fumigant strips (Hercon Vaportape, 1 x 1/2 inch)



Number of traps: * 3 traps best in larger orchards.
* One trap per garden or orchard is adequate if there are just a few apple trees.

Expected trends in trapping:

1. the *first* codling moth is usually caught soon after bloom. In central Ohio, first catch is anywhere between late April and late May, but is usually in the second week of May.
2. *peak* catch of moths from the overwintering generation in central Ohio is any time from mid-May to mid-June, but usually around the first week of June.
3. there are usually 2 generations per year, with the 2nd peak in early August. In warm summers, the first two generations are early and there is a 3rd generation in late August or September.

Temperature tracking: Once traps detect sustained emergence of moths, start keeping a record of the daily high and low temperatures, and calculate daily degree-days (DD), base 50°F. Keep track of the *cumulative* degree-days each day until you reach 250 DD or other target number. See separate handout about how to keep track of degree-days.

Decision making: Apply spray to target hatching eggs after 250 DD have accumulated, for conventional insecticides such as organophosphates (Imidan), or pyrethroids (Asana, Baythroid, Danitol, Mustang Maxx, Proaxis, Warrior), or spinosyns (Delegate). Use earlier timing for other insecticides: 75 DD for Rimon, 150 DD for molting inhibitors (Intrepid), or 200 DD for neonicotinoids (Assail, Calypso, Belay). For the overwintering generation codling moth, 250 DD occurs *roughly* 14 days after first moth catch, but the whole point of tracking temperatures is to determine when egg hatch is most likely to occur at your specific location. For relatively low populations (peak numbers of <10 moths per trap per week) that have a fairly brief peak (1-2 weeks), one spray is enough. For moderate populations (>10 moths per week), a second spray should be applied 14 days after the first spray. When peak activity is prolonged (3-5 weeks), which is typical in many orchards, then a third spray should be applied 14 days later. Use the same procedure for the 2nd generation and possible 3rd generation.

Sources of traps and lures:

- Great Lakes IPM: www.greatlakesipm.com; 10220 Church Road NE, Vestaburg MI 48891
- Gempler's: www.gemplers.com; P.O. Box 5175, Janesville WI 53547-5175
- GreenStar Cooperative Inc.: <http://www.greenstarcoop.net> ; 12093 Lisbon Rd., P.O. Box 3, Greenford OH 44422

Degree day calculations for codling moth

Threshold (or 'base') = 50 degrees Fahrenheit

Daily degree days (DD) = daily average temperature – 50

Daily degree days (DD) = [(daily max + daily min) / 2] – 50

Cumulative degree days = today's daily degree days plus previous days' degree days.

Exceptions:

- 1) if a day's minimum temperature is **less than 50F**, then use 50F instead of the actual minimum
- 2) if a day's maximum temperature is **higher than 88F**, then use 88F instead of the actual maximum

Alternative, easier method: use the **look-up chart** each day rather than making your own calculation.

Example:

Date	Maximum temp.	Minimum temp.	Average temp.	Daily degree days	Cumulative DD
4/25	70	54	62	12	12
4/26	71	51	61	11	23
4/27	62	48 (use 50)	56	6	29
4/28	65	53	59	9	38

Date	Max	Min	DailyDD	CumDD	Date	Max	Min	DailyDD	CumDD
4/15					5/21				
4/16					5/22				
4/17					5/23				
4/18					5/24				
4/19					5/25				
4/20					5/26				
4/21					5/27				
4/22					5/28				
4/23					5/29				
4/24					5/30				
4/25					5/31				
4/26					6/1				
4/27					6/2				
4/28					6/3				
4/29					6/4				
4/30					6/5				
5/1					6/6				
5/2					6/7				
5/3					6/8				
5/4					6/9				
5/5					6/10				
5/6					6/11				
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5/20					6/25				