

## CODLING MOTH (CM)

*Cydia pomonella*

### Description:

#### Adults:

Gray mottled wings held tentlike over their bodies, with a coppery band at the tips.



Left: CM adult; note coppery forewings (source: NC State Extension). Right: OFM adult (source: WSU Extension).

#### Eggs:

Laid singly, eggs are pinhead sized, disc-shaped and transparent white when first laid. As they mature, they become opaque and develop a red ring. Just before hatching, the black head of the larva becomes visible. Eggs are primarily laid on leaves, although some may be found on fruit.

#### Larvae:

Newly hatched larvae are pinkish white with a black head. Mature larvae are about 0.75 in (19 mm) long and pinkish white with a mottled brown head. In walnuts, codling moth larvae resemble navel orangeworm (NOW) larvae but lack the crescent-shaped marks on the second segment that distinguish navel orangeworm larvae. Oriental fruit moth (OFM) larvae have a black anal comb with five teeth on the last body segment; codling moth larva lack this feature.

#### Pupae:

After completing development, larvae leave the fruit and drop to the ground in search of pupation sites. Pupation occurs in the soil, under debris, and sometimes larvae crawl back up the tree to pupate in bark crevices.



Above left: CM larva without mark behind head and above right: NOW larva with crescent-shaped mark on segment behind head (source: UC ANR).



Bottom: Posterior ventral view of anal combs of OFM larva and Center: dorsal view of anal plate of CM larva (source: Todd Gilligan, LepIntercept, Bugwood.org).

### Hosts:

Apples, pears, walnuts, plums and quince.

### Damage:

#### Pome and Stone Fruit

- Codling moth larvae mainly damage fruit with deep entries and stings.
- Larvae penetrate the fruit and tunnel to the core.
- Stings caused by early instar larvae that have been poisoned and die shortly after puncturing and entering the fruit, leaving a small scar as the affected area heals.
- Larvae enter through the sides, stem end or calyx end of the fruit.



Left: signs of larva infested apple; note the frass being pushed out from the entry holes (source: PNW Handbooks for CM). Right: internal apple damage from CM larva (sources: Ross Courtney, GFG).

#### Walnuts

- Damage caused by codling moth is different with each generation. Larvae may bore into the center of developing nuts to feed on the kernel, pushing frass out of the entry hole.
- First generation larvae reduce yield directly by causing nutlets to drop from trees soon after damage occurs.
- Nuts damaged later in the season will remain on trees, but kernels are unmarketable because of feeding damage.



Left: walnut damaged by CM larva. Right: CM larva feeding on walnut (source: UC IPM).

# CODLING MOTH (CM), *Cydia pomonella*

## Phenology:

- Two to four generations per year, depending on weather and location.
- Overwinter as full-grown larvae within a cocoon under leaf litter, loose bark, or any other sheltered place they may encounter.
- Emerges in March to early April in California; emerges in late April or May in Washington.

## Life Stages / Degree-Days:

Life Stage	Average D° F	Average D° C
Preoviposition period	58	32.2
Egg hatch begins	158	87.7
Larval development	471	261.4
Pupal development	431	239.2
Generation time (first)	1060	588.3
Generation time (second and third – CA)	1320	732.6

(Threshold temps: 50° F or 10° C; UC IPM Degree-day calculator for Codling Moth)

## Lure Type and Maintenance:

Lure Type	Use	Attractant Type	Replacement
PHEROCON® CM Standard 1X	Conventional or Mating disrupted orchard	Male only attractant	4 weeks
PHEROCON® CM Standard 10X	Mating disrupted orchard	Male only attractant	2-3 weeks
PHEROCON® CM L <sup>2</sup>	Conventional or Mating disrupted orchard	Male only attractant	8 weeks
PHEROCON® CM L <sup>2</sup> -P	Conventional or Mating disrupted orchard	Male only attractant	12 weeks
PHEROCON® CMDA COMBO PHEROCON® CMDA COMBO + AA	Conventional or Mating disrupted orchard	Multigender attractant - Male and female capture	8 weeks
PHEROCON® CMDA COMBO-P PHEROCON® CMDA COMBO-P + AA	Conventional or Mating disrupted orchard	Multigender attractant - Male and female capture	12 weeks
PHEROCON® MEGALURE CM DUAL 4K	Conventional or Mating disrupted orchard	Multigender attractant - Male and female capture	8 weeks

## Lure Storage:

- Store in unopened factory sealed packages in a cool place (< 74° F or 24° C maximum) for short periods or refrigerate longer term.
- Refrigerate or freeze unopened packages to carry over for annual storage.

## Trap Design:

- PHEROCON® VI, PHEROCON® 1CP OR PHEROCON® IIB.

## Placement Time:

- Before spring emergence, at bud break for pome fruit or pre-catkins for walnuts.

## Placement Pattern:

- Within orchard in a grid pattern.
- Within tree in the SE quadrant, in the upper 1/3 of the canopy.
- Within canopy but unblocked by leaves or developing fruit.

# CODLING MOTH (CM), *Cydia pomonella*

## Trap Density (in non-disrupted orchards):

	Number of traps	Acres	Hectares
<b>Pome Fruit</b>	Minimum of 2 traps	≤ 10	≤ 4
	One trap per 5-10 acres (2-4 hectares)	10-100	4-40
<b>Walnuts</b>	Minimum of 2 traps	10	≤ 4
	One trap per 10 acres (4 hectares)	11-100	4-40
	One trap per 15 acres (6 hectares)	> 100	>40

## Trap Maintenance:

- Check daily until biofix, then weekly thereafter.
- Remove insects and stir glue when checking.
- Replace trap liners every 4 weeks or when fouled with dust or insect debris.

## Trap considerations in mating disrupted orchards:

- A combination of traps should be used to monitor in mating disrupted orchards.
  - One trap with a CM Standard 10X lure to monitor phenology and emergence patterns.
  - One trap with CM Standard 1X lure to monitor for failure of mating disruption.
  - A trap with either a CMDA COMBO lure, CMDA COMBO-P lure, or MEGALURE CM DUAL 4K should also be used to monitor phenology and multigender captures.

## Recommendations:

- Examine leaves or fruit clusters in the orchard for eggs; eggs are frequently laid at the base of fruit clusters where stems come together.
- Sample fruit for damage during the latter half of each generation. Examine at least 200 fruit from throughout the orchard, as well as hot spots and edges.
- Check fruit for sting or entry wounds. Small holes covered with frass on fruit surfaces are characteristic signs of larval damage.

Source: Recommendations and certain other sections were sourced from UC IPM Walnut Pest Management Guidelines for Codling Moth, WSU Tree Fruit Codling Moth Guidelines, and Penn State Extension Guideline for Codling Moth.

## Note, always:

- Count and record captures as recommended.
- Change trap as needed.
- Discard lures in trash far from the area of use and remove trash afterwards.
- Follow recommendations.
- Contact local extension authorities and consultants for regional advice.