

CHAPTER 4: INSECT PESTS OF ROSACEAE

1. CASE OF THE APPLE CODLING MOTH: *Cydia pomonella*

WORK PLAN

1.1. Morphological characteristics

1.2. Biological characteristics

1.3. Biological cycles and voltinism

1.4. Pest damage

2. Other pests of cultivated Rosaceae

SYSTEMATIC POSITION

- Class: Insecta
- Superorder: Endopterygota (Holometabola)
- Order: Lepidoptera
- Suborder: Microlepidoptera, Heterocera
- Family: Tortricidae
- Genus: *Cydia*
- Species: *Cydia pomonella* (Linnaeus, 1758)

1.1. MORPHOLOGICAL CHARACTERISTICS

- It belongs to the order Lepidoptera and family Tortricidae, recognizable by:
 - 4 wings covered with scales, often forming beautifully colored patterns
 - a sucking proboscis
 - absence of tympanic organs
 - presence of a frenulum connecting the wings
- Adult: 15–22 mm wingspan.
- Forewings elongated and bordered with hairs.
- They have a quadrangular appearance and are striped with fine dark lines, with a brown oval spot at the tip bordered by 2 shiny parenthesis-shaped bands.
- Hindwings copper-brown.
- Young caterpillar: 1 cm, whitish, with a black head and a brown thoracic plate.
- Pupa: yellow-brown to dark brown, 9–10 mm.

1.2. BIOLOGICAL CHARACTERISTICS

- Holometabolous insects whose morphology differs greatly from that of their larvae and which pass through a pupal stage.

- Moths with crepuscular habits.
- Caterpillars live in rolled leaves, hence the name “leafroller”.
- It can sometimes attack walnut and quince, and more rarely apricot and peach, but pear and apple trees are the most affected by larval damage.
- Nymph = pupa.
- Hibernation occurs as a last-instar larva (L5), in a whitish cocoon hidden in bark crevices or various shelters at ground level.

1.3. BIOLOGICAL CYCLES AND VOLTINISM

- F1 appears from late April to late May.
- In spring, the adult mates and lays eggs on leaves, twigs or young fruits.
- Crepuscular flight occurs only if temperatures are above 15°C for 2 days with relative humidity above 60%.
- Oviposition occurs during the first 5 days after mating but may last up to 12 days, at 50–80 eggs per laying period.
- Eggs hatch 9–12 days later.
- On almonds, L1 larvae perforate the husks and enter the fruits.
- L5 leaves the fruit on average 25–32 days later.
- After hatching, the larva enters the apple and tunnels into it until it reaches the seeds, which it feeds on.
- At the end of development, the larva leaves the fruit and either pupates to produce an F2 moth, with emergence ending at the beginning of September, or enters diapause.
- Larvae whose growth ends from late August to October enter diapause and spend winter in a silken cocoon in trunk crevices or ground shelters, then form a pupa in spring.
- Depending on regional climate, the insect has 2 or 3 generations/year.

1.4. PEST DAMAGE

- It can cause up to 90% losses in fruit production in untreated orchards.
- Fruits attacked early during growth fall to the ground.
- Otherwise, the fruit is never marketable.
- Even superficially damaged fruits are removed from the fresh-fruit market.
- Infestations result from larval attack.
- They reduce the quantitative and qualitative value of apple harvests.
- Larvae create a spiral tunnel through the fruit surface and extend it toward the seed area, where the seeds are completely consumed.

CONTROL

Control of larvae

- This is carried out in autumn and winter.
- Clean the soil around the trees.
- Burn the soil with a blowtorch over 1.5–2 meters.
- Whitewash the trees with lime to destroy the larvae.
- Collect all fallen fruits and remove them from the base of the tree or burn them.

- Spraying sugars at very low doses (1–10 g per 100 liters of water) protects trees and vegetables against many forms of attack.
- Sucrose can reduce codling moth damage in orchards by up to 40%.

INSECTICIDES

- A biological insecticide such as Carpovirusine or Madex (a granulosis-virus preparation) can effectively protect orchards if sprayed at the right time.
- When the larva ingests the virus, it stops feeding and dies rapidly, becoming liquefied.
- This is one of the few treatments available in organic farming, but 10–15% of conventional orchards also use Carpovirusine-based treatments.
- There are also preparations based on “Bt bacteria” (*Bacillus thuringiensis*), whose Cry protein is lethal by ingestion to many insects.

TRAP BANDS

- Trap bands made of corrugated cardboard, 20 cm wide, can be installed on trunks and large branches of apple trees.
- They capture codling moth larvae looking for shelter in which to metamorphose.
- Install the bands from May and open them regularly during summer (June, July and August) to kill hidden larvae.
- These cardboard bands also provide shelter for beneficial insects (earwigs, Miridae bugs) and useful predatory spiders that consume codling moth eggs and larvae in the foliage.
- Do not burn the cardboard bands; shake them over a bowl to remove beneficial organisms and larvae, allowing beneficial organisms to recolonize the apple tree while killing codling moth larvae.

PHEROMONE TRAPS

- Commercial pheromone traps attract codling moth males onto sticky boards.
- These traps can be used to limit the moth population in the orchard.
- It is recommended to combine these traps with another control method, such as trap bands.
- Pheromones can also act through mating disruption and can be sprayed like a conventional insecticide, without its environmental disadvantages, as with products from M2i Life Sciences.
- Hormone/pheromone dispensers exist (ECOPOM, Isomate OFM or Ginko).
- This biological control method is intended for professionals because effectiveness depends on the number of dispensers per area (400–1,000 dispensers/hectare).
- The dispensers look like small wires covered with plastic impregnated with female codling moth sex pheromone.
- Placed in the trees, the pheromone diffuses through the air, disorienting males, which become exhausted while trying to find females.
- Most males die before mating and fertilizing females.

BIOLOGICAL CONTROL

- Installing nest boxes to encourage insectivorous birds in the orchard helps reduce codling moth populations.
- Species to encourage include the blue tit and great tit, as well as bats such as pipistrelles or long-eared bats, which consume large quantities of larvae or moths.
- The earwig and many hunting spiders are predators of codling moth eggs and larvae.

- *Steinernema feltiae* nematodes, predators of overwintering codling moth stages in the soil, can be purchased and sprayed on the trunk and around the base of the apple tree.
- If humidity and temperature are favorable, these nematodes can establish themselves in the soil and provide long-term control of codling moth populations.

2. OTHER PESTS OF CULTIVATED ROSACEAE

- Pear psylla (*Cacopsylla pyri*) and apple psylla (*Cacopsylla mali*).
- Adults emerge from hibernation at the end of winter.
- During the following month: mating + egg laying (several hundred eggs/female).
- Eggs hatch in less than 3 weeks.
- In less than 2 weeks: first damage caused by larvae/nymphs.
- After 6–9 weeks: adults.
- Several generations/year.
- Clumps of waxy filaments + honeydew + ants + sooty mold.
- Bud burn.
- Yellowing of leaves and buds (mosaic pattern).
- Curling, deformation and drying of young shoots.
- Direct action: sap-feeding insects weaken the plant and slow growth.

CONTROL

- As soon as larvae appear, remove them with a jet of water.
- In the presence of honeydew: spray black soap diluted to 5%.
- Naturally occurring beneficial organisms: lacewings, bugs (*Anthocoris nemoralis*, *Orius*), ladybirds, hoverflies, gall midges, spiders and mirids.
- NOTE: excessive nitrogen input causes excessive plant vigor, making plants attractive to psyllids.