Codling Moth Trapping and Degree-Day Accumulations in Northern Utah

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November 5th, 2003
Why was it such a bad year for CM?

- Large overwintering populations?
- Mild winter?
- Cool, prolonged spring?
- Record-breaking summer heat?
- Resistance to insecticides?
- Imperfect control tactics?
Codling Moth Degree-Days

• *What* are D-Ds?
  ✓ Unit of measure (time and temperature unit).
  ✓ Time spent within a specific temperature range.
  ✓ Varies by pest species because temperature thresholds are species-specific.
Why are D-Ds so useful for managing CM?

- All arthropods are cold-blooded and grow only as much as temperatures allow.
- Arthropod pests generally don’t care about calendar dates.
- D-Ds help pin down the developmental stage of pests, allowing us to more accurately predict pest activity.
Important Stages in a Codling Moth’s Life

• Pre-ovip. Flight: 58 D-Ds
  • Eggs: 158 D-Ds
  • Larval Feeding: 471 D-Ds
    • Pupae: 431 D-Ds
• Total for Generation: 1,118 D-Ds
D-D Accumulations at Each Generation’s Egg-hatch:

- **220 D-Ds** (1st egg-hatch)
- **1,120 D-Ds** (2nd egg-hatch)
- **2,160 D-Ds** (3rd egg-hatch)
General Pattern of Codling Moth Flight and Egg-hatch, Relative to Degree-Days
General Pattern of Codling Moth Egg-Hatch and % Hatch Completed (Relative to Degree-Days)
Percentages (%) of CM Flight and Egg-hatch Relative to Degree-Days

Diagram showing the relationship between Degree-Day Running Total and Percent Completed per Generation (%). The graph compares % Moth flight and % Egg-hatch relative to the degree-day running total.
Case Studies from ’03 Season

✓ **Case 1:** No mating disruption; *high CM pop*; poorly timed apps; over-reliance on a single material; insecticide resistance documented.

✓ **Case 2:** No mating disruption; *moderate CM pop*; well-timed apps; use of IGR and conventional materials.

✓ **Case 3:** Mating disruption; *moderate CM pop*; well-timed apps; use of various materials.

✓ **Case 4:** Mating disruption; *moderate CM pop*; many applications; use of various materials.

✓ **Case 5:** Mating disruption (applied 1 week late); *high CM pop*; well-timed applications; various materials.

✓ **Case 6:** No mating disruption; *high CM pop*; well-timed apps early in season; insufficient management late in season.
Case 1: Codling Moth Flight and Degree-Day Accumulation for Apples in Perry (Boxelder Co.)

- **1st generation egg-hatch:** (220 D-Ds).
- **2nd flight begins:** (860-900 D-Ds).
- **2nd gen egg-hatch begins:** (1,120 D-Ds).
- **3rd flight begins:** (1,920 D-Ds).
- **3rd gen egg-hatch begins:** (2,160 D-Ds).

**Graph Notes:**
- **Moths/trap-day** vs. **Sample Date**
- **D-D Accumulation**
- **Biofix**
Case 2: Codling Moth Flight and Degree-Day Accumulation for Apples in Kaysville (Davis Co.)

- 1st gen egg-hatch (220 D-Ds).
- 2nd flight begins (860-900 D-Ds).
- 2nd gen egg-hatch begins (1,120 D-Ds).
- 3rd gen egg-hatch begins (2,160 D-Ds).
- 3rd flight begins (1,920 D-Ds).
Case 3: Codling Moth Flight and Degree-Day Accumulation for Apples in Payson (Utah Co.)

![Graph showing moths caught/trap-day and degree-day accumulation over time with key milestones for different generations of codling moth.]

- **1st gen egg-hatch begins** (220 D-Ds)
- **2nd gen flight begins** (860-900 D-Ds)
- **2nd gen egg-hatch begins** (1,120 D-Ds)
- **3rd gen flight begins** (1,920 D-Ds)
- **3rd gen egg-hatch** (2,160 D-Ds)
Case 4: Codling Moth Flight and Degree-Day Accumulation for Apples in Genola (Utah Co.)

*1st generation egg-hatch* (220 D-Ds).

*2nd flight begins* (860-900 D-Ds).

*3rd flight begins* (1,920 D-Ds).

*2nd gen egg-hatch begins* (1,120 D-Ds).

*3rd gen egg-hatch begins* (2,160 D-Ds).
Case 5: Codling Moth Flight and Degree-Day Accumulation for Apples in *Lincoln Point (Utah Co.)*

- **1st generation egg-hatch begins (220 D-Ds).**
- **2nd flight begins (860-900 D-Ds).**
- **2nd gen egg-hatch begins (1,120 D-Ds).**
- **3rd flight begins (1,920 D-Ds).**
- **3rd gen egg-hatch begins (2,160 D-Ds).**
Case 6: Codling Moth Flight and Degree-Day Accumulation for Apples in North Logan (Cache Co.)

1st generation egg-hatch (220 D-Ds).

2nd gen egg-hatch begins (1,120 D-Ds).

2nd flight begins (860-900 D-Ds).

Pupate or hibernate?

3rd flight begins (1,920 D-Ds).

3rd gen egg-hatch begins (2,160 D-Ds).
CM Damage Estimates

- **Case 1:** Not harvested due to CM damage (83% worm entry).

- **Case 2:** Moderate CM damage (1.3% worm entry).

- **Case 3:** Very low CM damage (damage estimates forthcoming).

- **Case 4:** Very low CM damage (damage estimates forthcoming).

- **Case 5:** High CM damage (approx. 20% worm entry).

- **Case 6:** Moderate CM damage.
Why was it such a bad year for CM?

• Large overwintering populations?
• Mild winter?
• Cool, prolonged spring?
• Record-breaking summer heat?
• Resistance to insecticides?
• Imperfect control tactics?
Effects of Scaling

- Live: 5%
- Dead: 95%
Improve the Odds for 2004

- Use Pheromone Mating Disruption to *reduce the egg load*.
- Time the cover sprays based on known biological events (run traps).
- Achieve better coverage by using higher gallonages and verifying uniformity within the canopy.
- **Sanitation** (remove infested apples from orchard).
- **Rotate insecticide classes** (implications for spray timing).