Codling Moth Development and Model Predictions
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Introduction
An insect’s development is primarily controlled by temperature.
• No physiological means to control body temperature
• Metabolic rate, temperature is outside temperature
• Temperature is a better predictor of development than calendar days
Degree-day (DD) models allow you to predict an event which is difficult to observe but important to IPM, or give advanced warnings of problems
• Predict CM egg hatch to help time insecticide applications
• If CM eggs hatch, larval entry will increase
• Degree-day models should improve on calendar predictions.
• The ultimate goal for the codling moth model is to predict larval entries.

How Degree-day Models Work

Variations from Prediction

- The codling moth degree-day model accounted for 90-95% of the variation in population development at TFREC, Wenatchee.
- Normal observations can be extremely variable, and dependent upon temperature and inspection intervals.
- Model predictions remain consistently accurate for many orchards.
- Variation can occur over time, possibly due to a change in management practices or an influence from outside sources.

Conclusion

The codling moth DD model consistently predicts development in an undisturbed population. There are several potential sources of error in predicting development at individual orchards. Some errors can be traced to human mistakes or errors due to a reliance on the degree-day model.

- Try to maintain a trap density that is sufficient to monitor even low-pressure orchards. Consider 1 trap/2.5-5 acres. Keep a fresh lure and clean sticky liners in the traps.
- A DD model should be viewed as one tool to help manage CM. A grower’s and/or consultant’s observations and experience are important elements in a successful IPM program.

Sources of Error
Degree-day models predict development of an undisturbed population. There are several potential sources of error in predicting development at individual orchards. Some errors can be traced to human mistakes or errors due to a reliance on the degree-day model.

- Poor weather data: Errors can have a cumulative effect throughout the season. Weather patterns are extremely variable:
  - Temperatures above development threshold of 50°F, but below flight threshold (62°F) at dusk. Adults continue to emerge, when temperatures go over the flight threshold it appears like a large number of moths emerged all at once.
  - Weather temperatures can influence overwintering chill-hour accumulations and influence spring emergence.

Normal orchard management can influence model predictions:
- Pesticide applications, overhead cooling and mating disruption may delay normal emergence
- Bin piles (see drawing) or other outside sources can introduce a population that is not synchronized with model predictions.

Some errors can be traced to human mistakes:
- Setting the real biofix: Requires a high trap density in low pressure orchards.
- Bin piles (see drawing) or other outside sources can introduce a population that is not synchronized with model predictions.

Some simple measures can be followed to help to alleviate management errors due to a reliance on the degree-day model.

- Try to maintain a trap density that is sufficient to monitor even low-pressure orchards. Consider 1 trap/2.5-5 acres. Keep a fresh lure and clean sticky liners in the traps.
- A DD model should be viewed as one tool to help manage CM. A grower’s and/or consultant’s observations and experience are important elements in a successful IPM program.