

## **Codling Moth Management**

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Codling Moth in walnut is a difficult pest to control due to the challenge in choosing accurate spray timing to cover the long egg hatch period and the necessity for good spray coverage. Currently, the most effective way to time codling moth sprays is to monitor traps and follow degree days to interpret trap data and predict egg hatch. The best chance for successful control is to monitor individual orchards and develop a feel for codling moth activity both during the season and historically.

**Degree Days** As with many organisms, temperature controls codling moth growth and development. Accumulated heat units are referred to as Degree Days. One Degree Day is one day (24 hours), with the temperature one degree above the lower developmental threshold. For example, if the minimum development threshold is 50° F and the temperature remains at 51° F for 24 hours, one Degree Day is accumulated. Codling moth thresholds are 50° F and 88° F. Charts are available to calculate Degree Days using maximum and minimum temperatures; however inexpensive temperature sensors are available that directly output Degree Day accumulations. Degree Day and weather information is also available at the UCIPM website <http://www.ipm.ucdavis.edu>

**Codling Moth Traps** The second component of a codling moth monitoring program includes traps. Traps are used to verify flight activity and monitor populations. Traps are often hung high in the tree canopy and use pheromone, pear volatile, or a combination of the two as a lure. Recent USDA research shows orange/red delta traps are the best to use for Codling moth. These traps catch many more moths than the wing traps so you will have to develop experience on how to use them. Unfortunately traps are not good indicators of damage probably because of the many factors that influence trap performance.

**Codling Moth Activity** Codling moth over-winter as fully grown larvae in bark cracks on tree trunks and limbs. Over-wintering larvae emerge as adult moths in the early spring. The monitoring season begins by hanging codling moth traps in orchards by mid-March before the first codling moths emerge.

The goal is to get traps out early enough to record several dates with zero catch to confirm that traps are out early enough to guarantee first moth catch. Bio-fix is the first date when moths are consistently found in traps. To predict egg hatch, begin accumulating Degree Days from the biofix. If a spray is necessary, University of California Integrated Pest Management (UCIPM) suggests a treatment timing at 300 Degree Days after the first male biofix (pheromone lure) and 250 Degree Days after the first female biofix (pear volatile or combo lure). Degree Days are also used to predict the second peak of the first flight or "1B". Trap catch increases at 600-700 Degree Days identify the "1B".

The second flight (second biofix) usually occurs when trap catches increase at an average value of 1060 Degree Days from the first biofix (800-1300 is the possible range). Well maintained traps checked frequently will confirm and fine tune Degree Days at the second bio-fix. If a spray for the second flight is necessary, UCIPM suggests timing at 250 Degree Days from the second

bio-fix. Codling Moth typically has three generations in the upper Sacramento Valley. Third generation activity is monitored the same way as the second.

**Current Situation** For three walnut orchards in Tehama County, male biofix occurred on 3/24/08. First females were caught 4/11/08 to 4/14/08 with sunset temperatures suitable for egg laying. Degree Days (*figure 1*) are at 997 as of 6/9/08 suggesting that trap increases after that date will be the start of the second flight. Trap catches will confirm the second biofix and reset Degree Day accumulations to zero.

<i>DATE</i>	<i>DEGREE DAYS</i>	<i>DATE</i>	<i>DEGREE DAYS</i>
3/24	0 (Biofix Male)	5/05	372
3/27	25	5/08	423
3/31	35	5/12	487
4/03	56	5/15	556
4/07	87	5/19	662
4/10	104	5/22	719
4/14	168 (Biofix female)	5/27	772
4/17	191	6/03	877
4/21	224	6/05	911
4/25	241	6/09	997
4/28	293	6/13	1092
5/01	323	6/16	1162

**Figure 1.** Degree Day accumulations for a southern Tehama County walnut orchard. Accumulations start at a 3/24 male biofix.