



Peach Twig Borer Mating Disruption

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Do You Know?

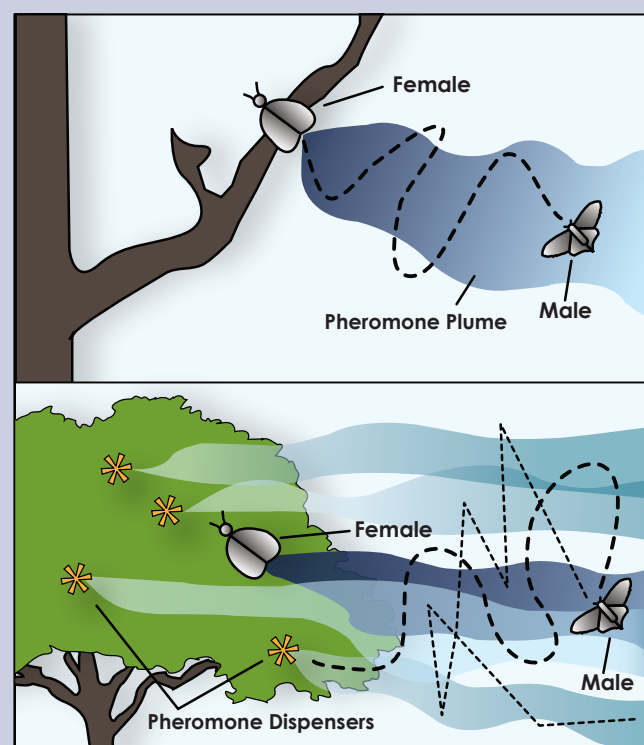
- Peach twig borer is a key pest of peach, nectarine, and apricot.
- Mating disruption is a certified organic (OMRI) management option for this pest that works best in orchards of 10 contiguous acres or more in size.
- It works by saturating the orchard with the female moth sex pheromone to delay or prevent mating.
- In orchards with heavy peach twig borer pressure, the first few seasons of use will require supplemental insecticides.
- A regular monitoring program is essential when using mating disruption for peach twig borer.
- Long-term use of mating disruption can reduce pesticide applications as well as local twig borer moth population.

Mating disruption as a method to manage orchard pests became commercially available in the early 1990s, and was adopted by many Utah growers about a decade later. Use of this pest management technology can be daunting due to high up-front costs and monitoring requirements; however, after two to three seasons of use, the cost of mating disruption is the same or even less than conventional pest management. It is a viable and important alternative for larger-acreage peach/nectarine, or apricot orchardists for managing peach twig borer. (For more about peach twig borer description and biology, see the [USU Fact Sheet](#).)

HOW MATING DISRUPTION WORKS

Like many moth species, the female peach twig borer emits a species-specific pheromone which attracts male moths for mating. Males easily follow the pheromone "plume" directly to the female. When an orchard is saturated with synthetic pheromone, mating is "disrupted" because males are limited in their ability to find females.

Mating Disruption, Simplified



In nature, female moths emit chemical cues (pheromone) to attract males for mating. The pheromone is distributed in a "plume" that male moths use to find their mates (**top**). In orchards with mating disruption, female moths' plumes are mixed with the synthetic pheromone plumes emitting from man-made dispensers. As a result, male moths' ability to find females is inhibited (**bottom**). The male may either fly randomly and not find a female at all (**thin dotted line**) or may hone in on a dispenser or a female (**thick dotted line**). The idea is that mating is either prevented, or delayed long enough so that it is unsuccessful.

Two theories have been proposed to explain how mating disruption delays or prevents mating (Miller 2010, Miller and Gut 2015; see graphic, above):

- "Competitive attraction," where males follow the false plumes at the expense of finding a mate

- The males' ability to find females has been blocked by the pheromone-saturated air, and they are unable to follow any plume

Entomologists at Michigan State University (MSU) suggest that the primary mechanism is competitive attraction. In their research, they repeatedly saw male moths approach pheromone dispensers, reducing their success of locating female mates (Miller and Gut 2015). The MSU research also showed a secondary response where males were unable to follow any pheromone plume due to sensory overload. They found that the males recovered the next day after flying out of the saturated orchard. The end result of these two mechanisms is that mating is delayed.

A female that has not mated after three days has half the number of viable eggs (Mori and Evenden 2013). As a result, mating disruption alone is not a successful pest control strategy in orchards with high moth populations. Chance encounters and mating are known to occur under mating disruption where pest pressure is high.

The good news is that on-farm trials conducted by USU (Murray and Alston, unpublished) has shown that after several seasons of using mating disruption, the peach twig borer population declines, and mating and fruit injury are reduced.

WHO CAN USE MATING DISRUPTION

Before using mating disruption, make sure you have the time and resources for a proper monitoring program (see page 3), and a source of information when questions arise (such as USU Extension, a consultant, chemical company representative, publications).

Peach twig borer mating disruption requires a large, contiguous orchard to work successfully, with the following characteristics:

- **A minimum of ten acres** of solid peach, nectarine and/or apricot trees.
- Ideally, border edges are minimized. For example, mating disruption works better in a square-shaped orchard than in a long, narrow, rectangular orchard.
- Expansion of mating disruption to a large area of neighboring orchards will improve effectiveness.
- Newly planted orchards are not ideal for mating disruption because the pheromone quickly dissipates due to lack of foliage.

Know your initial twig borer population. If you have never used mating disruption, the orchard may have high pest pressure. In this case, be prepared to apply well-timed insecticide treatments as you would without mating disruption for the first one to two seasons. Once the population declines, it is possible to use mating disruption with few, or even without, supplemental treatments.

MATING DISRUPTION PRODUCTS

Currently, two brands of hand-applied dispensers (see box, below, and table on page 3) are available for peach twig borer, applied at a rate of 200 – 400/acre, depending on the manufacturer label and pest pressure.

The decision of which brand to use is based on user preference. The Checkmate brand of dispensers is very effective at disrupting mating but the pheromone dispersal lasts 90 days in the orchard. An average peach season in northern Utah lasts about 120 days, so application timing for Checkmate is crucial (see next section). The Isomate brand is long-lasting (150 days), and can cover a full growing season in all locations of Utah.

Trials at USU (Murray and Alston, unpublished) compared the Checkmate and Isomate products, and found that there was no difference in the amount of shoot or fruit injury in the orchard between the two brands. There was, however, a significant difference in moth catch in the monitoring traps, where the traps in the Isomate trial attracted more moths than the traps in the Checkmate

Brands Commonly Used in Utah



Checkmate PTB-XL (Suterra) is the industry standard for peach twig borer. It is a clip-on, flat membrane dispenser.



Isomate-PTB TT (Pacific Biocontrol) is formed of “twin tubes” (TT) that contain the pheromone. The dispenser is looped over branches.

Characteristics of Mating Disruption Brands for Peach Twig Borer

Brand	Pheromone Load (E)-5-Decenyl acetate (E)-Decen-1-ol	Minimum Rate per Acre	Product Cost/ Acre	Longevity	Application Timing	Notes
Isomate-PTB TT (Pacific Biocontrol)	48.84% 2.92% (269 mg)	200/acre	\$100	150 days	One month before expected biofix	Works best when pheromone saturates the orchard before moths emerge
Checkmate PTB-XL (Suterra)	8.34% 1.73% (200 mg)	200/acre	\$75-100	90 days	June 15 (northern Utah)	Apply first generation insecticide cover spray

trial. These results showed that unlike codling moth, there is no clear relationship between trap catch and injury to shoots or fruits in mating-disrupted orchards. The timing of when to apply the mating disruption dispensers will depend on which brand you choose.

APPLYING MATING DISRUPTION PRODUCTS

Isomate dispensers should be placed in the orchard approximately 1 month before predicted "biofix" (first male flight) to allow for full pheromone saturation in the orchard before moths emerge.

Checkmate dispensers should be applied approximately June 15 (northern Utah). This timing will allow the dispensers to last 90 days until September 15, which is when peach twig borer activity ceases. The June 15 timing will help to protect the fruit as it matures. Most orchards will need to apply a cover spray for the first generation (usually mid to late May).

Product labels provide instruction on placement in the orchard, but in general:

- Hang dispensers singly and uniformly throughout the orchard, in the top third of the tree canopy
- Choose sturdy branches for hanging so that dispensers remain attached even in high winds
- Dispensers last just one season; a fresh batch should be reapplied each spring
- Store leftover dispensers in the freezer for up to one year
- For new mating disruption orchards, consider doubling the application rate on the borders and at problematic "hot spots"
- Monitor moth population with pheromone traps and check trees for injury to assess effectiveness

MONITORING

Monitoring peach twig borer populations using pheromone traps and visual tree inspections in disrupted



Orange, large plastic delta traps are used for monitoring peach twig borer. Unlike white, the orange color does not attract bees. Lures are available that last either 30 or 60 days.



Section of a trap's sticky liner, showing peach twig borer lure and moths. Moths are small (less than 1/4 inch) and a dark, dull gray. The palps at the top of the head give the moth a pointed appearance. Where mating disruption is successful, pheromone traps will catch very few moths in the orchard (0 to 3 moths/week is normal). Trap catches over 10 moths/week may warrant a supplemental insecticide, although this number is just a general recommendation.

orchards is essential to determine pest pressure and the need for supplemental insecticide.

For monitoring with traps (see images above), use a large plastic delta trap with the same lures used for monitoring in undisrupted orchards. Unlike codling moth, there are no specially-manufactured twig borer lures to be used in mating disrupted sites. Therefore, these standard-lure traps used under successful mating disruption will catch few to no moths. No threshold has been developed for



The standard monitoring tool to determine whether or not to apply a supplemental insecticide is to check for shoot strikes on trees. These are areas where the larvae have bored into succulent new shoot tips. If the average number of shoot strikes is 3 per tree, the area should be treated.

- Not increasing dispenser rates in “hot spots” such as along borders with external moth sources (e.g., backyard trees) or along upwind borders of strong prevailing winds
- Not applying supplemental insecticides when necessary
- Not monitoring and detecting increased moth populations and shoot strike injury
- Not applying dispensers according to labeled recommendations

CONCLUSION

Mating disruption can be a highly effective method to lower peach twig borer populations and reduce insecticide usage, and is organic approved. It does not kill moths, but prevents or delays mating. It is only appropriate for use in contiguous blocks of 10 acres or more.

Dispensers are applied either one month before predicted biofix (Isomate brand) or around June 15 (Checkmate brand). It is critical to prevent high populations of peach twig borer from building up in a disrupted orchard; otherwise, fruit injury is likely to occur. Transition of orchards from traditional twig borer management to mating disruption is most successful if a complete or nearly-complete spray program is used in combination with mating disruption for the first season or two to lower moth populations. Thorough monitoring of moth populations and use of injury thresholds to determine the need for supplemental treatments are essential for successful implementation of mating disruption.

pheromone trap catch, but a general recommendation is that trap catches of more than ten moths per week may require a supplemental insecticide.

Additional monitoring should occur early in the season, and during times when trap catches are high, to determine peach twig borer activity in shoots (called “shoot strikes”; see image above). Count shoot strikes in random areas of the orchard or in hot spots to determine an average number per tree. If this is three or more, the area should be treated with an insecticide (Pickel et al. 2002).

CAUSES OF FAILURE

- Use of mating disruption in a small area (less than 10 acres) or use in an orchard with a high ratio of border trees to interior trees

RESOURCES AND REFERENCES

Alston, D. and M. Murray. 2019. *Peach Twig Borer*. Utah State University Extension Fact Sheet ENT-36-07. 6 pp.

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Mori, B. A. and Evenden, M. L. 2013. When mating disruption does not disrupt mating: fitness consequences of delayed mating in moths. *Entomol Exp Appl*, 146: 50-65. doi:10.1111/j.1570-7458.2012.01309.

Pickel, C., et al. 2002. Pheromones control oriental fruit moth and peach twig borer in cling peaches. *California Agriculture* 56(5): 170-176.

University of California Pest Management Guidelines. Peach Twig Borer (<http://ipm.ucanr.edu/PMG/r602300611.html>), accessed Nov. 2019.

Utah State University Extension Intermountain Tree Fruit Guide website (intermountainfruit.org).

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