UTAH PESTS fact sheet
EXTENSION
UtahStateUniversity

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-172-14 January 2014

Peach Twig Borer Mating Disruption

Marion Murray, IPM Project Leader • Diane Alston, Entomologist

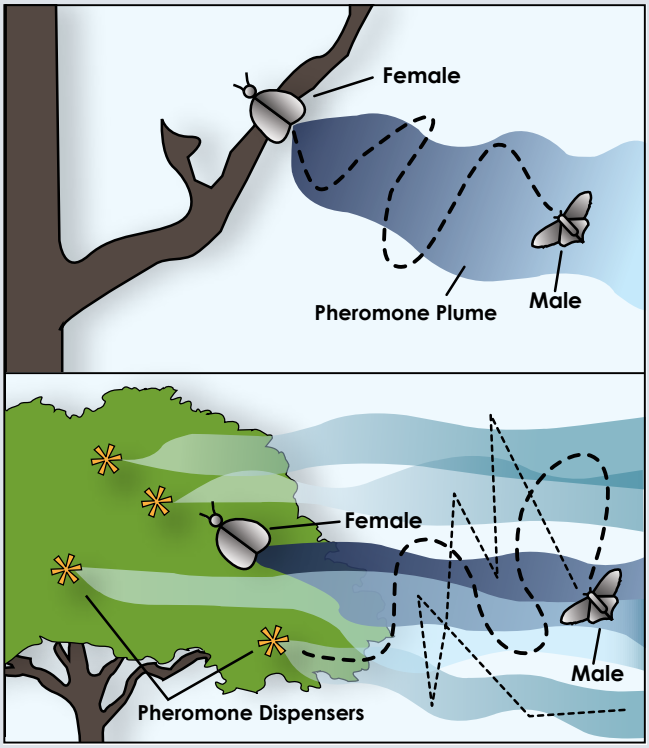
Do You Know?

- Peach twig borer is a key pest of peach, nectarine, and apricot
- Mating disruption does not kill insects; it saturates the orchard with the female moth sex pheromone to delay or prevent mating
- At least 10 contiguous acres are required for twig borer mating disruption to be effective
- In orchards with heavy peach twig borer pressure, supplemental insecticides are required for at least the first few seasons
- A regular monitoring program is essential for successful management of twig borer
- Long-term use of mating disruption can reduce insecticide exposure and twig borer populations
- Use of mating disruption is OMRI (organic) certified

Mating disruption 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. With the loss of Guthion, and pressure to reduce pesticide use, mating disruption is a viable and important alternative for larger-acreage orchardists.

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" as the males are limited in their ability to find females.



Female moths emit a chemical blend (pheromone) that forms a plume. Male moths follow the plume to find their mates **(top)**. In the presence of mating disruption, the female moth's plume is mixed with the plumes of pheromone dispensers, which inhibits the male's ability to find the female **(bottom)**. The male may either fly randomly and not approach a moth at all **(thin dotted line)** or hone in on a dispenser or even a female **(thick dotted line)**. The idea is that mating is either delayed or prevented.

Two theories have been proposed to explain how mating disruption delays or prevents mating:

- "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. 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 result of these two mechanisms is that mating is delayed.

A female that has not mated after 3 days has half the number of viable eggs. 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, after several seasons of using mating disruption, the peach twig borer population declines, and mating and fruit injury are prevented.

WHO CAN USE MATING DISRUPTION

Before using mating disruption, be sure you have the time and resources for a proper monitoring program, and a source of information (consultant, agriculture company representative, Extension) when questions arise.

Peach twig borer mating disruption requires large, contiguous areas of orchard to work successfully.

- **Ten acres** of solid peach, nectarine and/or apricot trees is the minimum size.
- Ideally, border edges are minimized (i.e., mating disruption works better in a square-shaped orchard than in a long, narrow rectangular orchard).
- Expansion of mating disruption to 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, only hand-applied dispensers are available for peach twig borer, although manufacturers are working on releasing a "Puffer" version. Hand-applied dispensers are applied at a rate of 150 – 400/acre, and puffers at 1-2 canisters/acre.

The following brands are most commonly used in Utah:

Checkmate PTB-XL is the industry standard for peach twig borer. It is a clip-on, flat membrane dispenser. These dispensers last 90 days in the orchard.

Isomate-PTB TT is formed of "twin tubes" (TT) that contain the pheromone. The dispenser is looped over branches. The pheromone lasts the duration of peach season in Utah.

The two brands of mating disruption dispensers do not last the same amount of time. The Checkmate brand, although very effective, only lasts 90 days. An average peach season lasts about 120 days. Pheromone from the Isomate brand does last the full season.

Recent research at USU (2011) 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 trap catch, where the monitoring traps in the Isomate trial attracted more moths than the monitoring traps in the Checkmate trial. These results show that unlike with codling moth, there is no clear relationship between trap catch and injury to the tree.

Characteristics of two hand-applied dispensers

Dispenser	Pheromone Load (E)-5-Decenyl acetate (E)-Decen-1-ol	Minimum Application Rate (dispensers/acre)	Product Cost/acre	Manufacturer /Distributor
Isomate-PTB TT	48.84% 2.92% (269 mg)	200/acre	$100	Pacific BioControl, Vancouver, WA
Checkmate PTB-XL	8.34% 1.73% (200 mg)	200/acre	$75-100	Suterra LLC, Bend, OR

APPLYING MATING DISRUPTION PRODUCTS

The timing of when to apply the mating disruption dispensers will depend on which brand you choose.

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

Checkmate dispensers should be applied on approximately June 15. This timing will allow the dispensers to last 90 days until September 15, the last point at which eggs hatch. The later timing will help to protect the fruit. Most orchards will need to apply a cover spray for the first generation (usually mid to late May).

Product labels will instruct 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 in disrupted orchards is essential to determine pest pressure and the need for supplemental insecticide. There are no specially manufactured pheromone lures for peach twig borer mating disrupted sites. Traps using a standard lure in MD orchards should ideally never trap any moths.

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

Peach twig borer moths are small (less than 1/4 inch) and a dark, dull gray. The palps at the top of the head give it a pointed appearance. Monitoring traps in successful mating disruption orchards will catch very few moths (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.

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/tree, the area should be treated.

CAUSES OF FAILURE

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

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.

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