Prionus Mating Disruption and Trap Capture in Sweet Cherry
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Objectives:
1. To evaluate trap shutdown in sweet cherry orchards treated with Isomate California prionus mating disruption dispensers as compared to untreated orchards.
2. To evaluate trap capture and longevity of a commercial pheromone lure from Contech Enterprises that contained 30 mg of pheromone as compared to a 0.1 mg research lure.

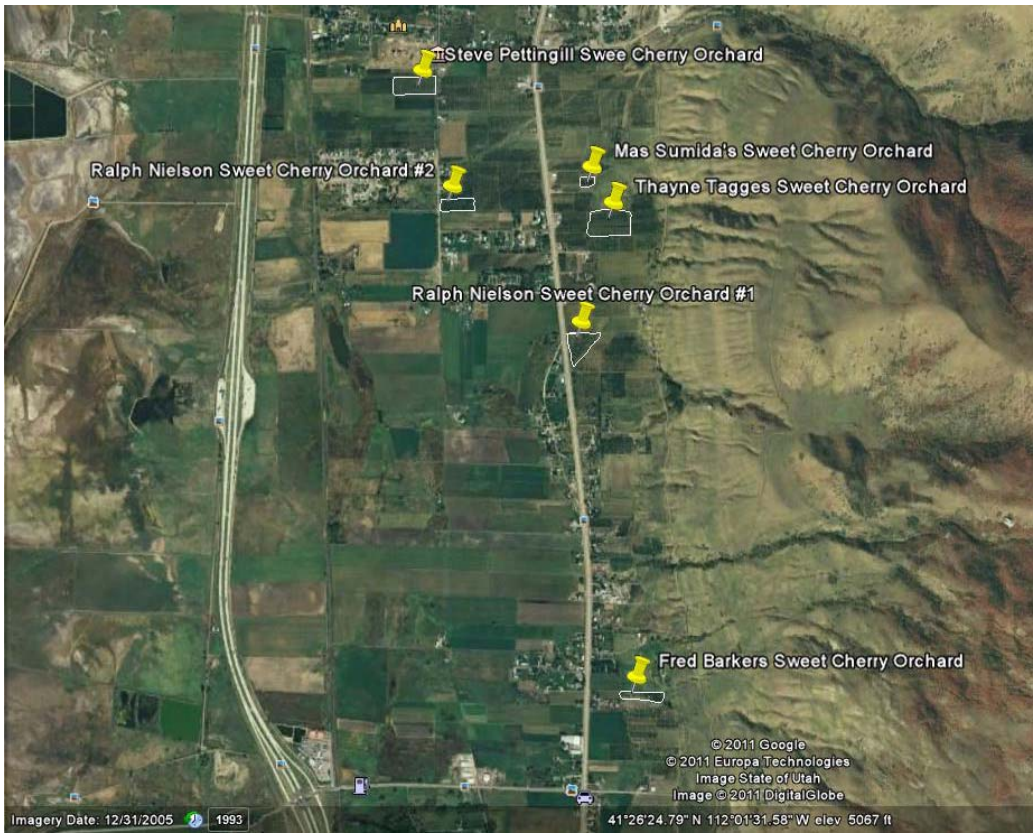
Methods:
Six sweet cherry orchards located in Perry and Willard, Box Elder County (northern Utah) were used in the study. Four orchards were used for the mating disruption (MD) trial, two replicates of paired MD-treated and untreated orchards. Two additional orchards were used to compare trap capture and lure longevity for a research and commercial pheromone lure, and were not treated with MD. Study site characteristics including research treatments, orchard size, number of trees, and distance between paired orchards are provided in Table 1. A map of the relative location of the six orchards is shown in Fig. 1. The general direction of the prevailing wind was from the north flowing south.

Table 1. Sweet cherry orchard study site descriptions.

Trial Replicate	Orchard	Treatment	Dimensions (ft)	Number of trees	Size (acres)	Distance to paired replicate (miles)
MD Trial						
1	Sumida	Untreated	100 X 215	55	0.5	0.25
	Tagge	MD-treated	255 X 450	480	2.6	
2	Nielson #1	Untreated	300 X 465	378	3.2	1.1
	Barker	MD-treated	120 X 630	182	1.8	
Lure Longevity						
1	Pettingill	Untreated	270 X 680	630	4.2	0.6
2	Nielson #2	Untreated	200 X 545	468	2.5	

On June 20, 2011, Isomate California prionus mating disruption dispensers (Pacific Biocontrol Corp., Vancouver, WA) were placed at a rate of 100 dispensers per acre in the two MD-treated orchards, Tagge and Barker. Dispensers were stapled to the tree trunks 4-8 inches above the soil line. Four bucket traps were placed in each MD-treated and untreated orchard (6 orchards total). Traps were positioned in a rectangle pattern within each orchard. Traps were made from 5 gal plastic buckets with the bail (handle) held upright by a zip-tie inserted around one side of the bail and through a hole drilled in the bucket side. A pheromone lure was attached to the top of the bail with a paper binder clip. In each

Fig. 1. Map of the six sweet cherry orchard study sites in Box Elder County, Utah. Orchard treatments are given in Table 1. Additional distances between sites: Tagge-Nielson #1, 0.5 mile; Sumida-Nielson #2, 0.6 mile; Tagge-Nielson #2, 0.6 mile; Sumida-Pettingill, 0.8 mile.



orchard, two opposite bucket traps were baited with a research lure made from a clear press-seal plastic bag containing 0.1 mg pheromone, while the other two opposite traps were baited with a commercial lure from Contech Enterprises (Victoria, BC, Canada). The Contech lure was a brown press-seal plastic bag containing a sponge loaded with 30 mg of the pheromone. Traps were checked weekly from June through the end of August when beetle catches were higher, and then every two weeks during September. Trap catch dropped to nearly zero by mid September; traps were removed on September 19. *Prionus* beetles were collected, and pheromone lures rotated one trap position in a clockwise direction. Clear 0.1 mg lures were replaced weekly. Brown 30 mg Contech lures were replaced every four weeks, except in the lure longevity trial (Pettingill and Nielson #2 orchards), one of the Contech lures was replaced every two weeks and one every four weeks. .

Prionus removed from traps were placed in plastic press-seal bags labeled with the orchard and trap identification. Beetle samples were stored in the freezer until processing. For each male, the number of antennal segments was counted with the aid of 10X magnification under a dissecting microscope in the laboratory. *Prionus californicus* has 12-segmented antennae. Other species of *Prionus* in the western U.S. have 13- and 14-segmented antennae. The number of beetles with each number of antennal segments was recorded for each sample. There were some beetles that had both antennae broken.

Total *Prionus* trap catch counts are presented in the results and included in statistical analyses. Analyses of variance (Proc Mixed; SAS ver. 9.2) were used to compare season total captures per trap as influenced by mating disruption treatment, lure type, and lure replacement interval.

Results:

Of the 338 male *Prionus* caught in all orchards and traps during the 2011 study, only one did not have 12-segmented antennae. One male beetle with 13-segmented antennae was caught in the Pettingill (untreated) orchard in a trap baited with a Contech lure (4 wk replacement interval) on August 9. Fifty-three males had both antennae broken.

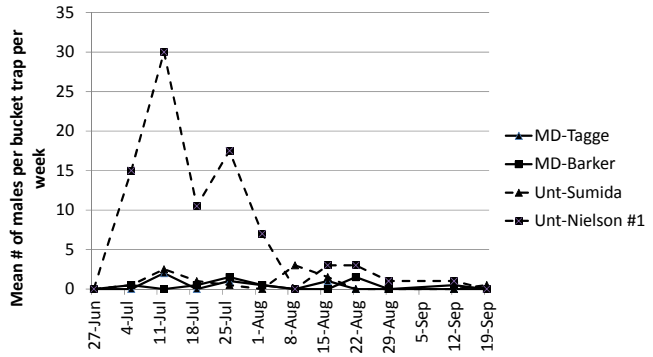
Significantly more male *Prionus* were caught in bucket traps in untreated than in mating disruption (MD)-treated orchards (Table 2). There was an interaction between MD treatment and lure type; significantly more beetles were caught in bucket traps baited with Contech lures in untreated orchards than in all other MD treatment and lure type combinations (Table 2). The clear 0.1 mg research lure also attracted more males to traps in untreated than MD-treated orchards.

Table 2. Effect of mating disruption treatment and lure type on capture of male *Prionus* in bucket traps, Box Elder County, UT, 2011. Means are season totals per trap for two replicate orchards per mating disruption treatment (4 orchards total).

Comparison	Mean (SE)	*P*>F
MD-treated	1.6 (0.4)	
Untreated	16.0 (4.7)	0.01
MD-Contech	2.4 (0.5)	
MD-0.1 mg	0.8 (0.4	
Unt-Contech	24.5 (8.1)	
Unt-0.1 mg	7.5 (2.7)	0.01

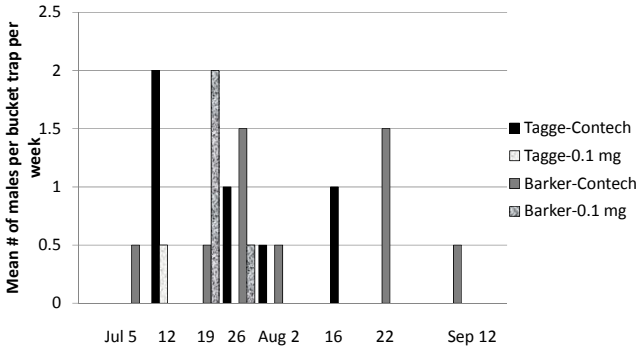
Trap capture was substantially greater in one untreated orchard, Nielson #1, than in the other, Sumida (Fig. 2). Trap capture in the Sumida orchard may have been influenced by pheromone moving in from its paired MD-treated orchard, Tagge, which was only 0.25 mile away. This is only speculation, and not confirmed by any supporting data. However, Nielson #1 (untreated) was only 0.5 mile downwind from Tagge (MD-treated), and this orchard had the highest *Prionus* trap catches. The other MD-treated orchard, Barker, was 1.1 miles from its untreated pair, Nielson #1. Additionally, pheromone traps (baited with 0.1 mg clear lures) were placed in the Sumida and Barker orchards in 2010, but not in any of the other orchards. The *Prionus* populations may have been reduced in Sumida and Barker from trapping in the previous year; however, Prionus' life cycle requires 4-5 years to complete, so reduction of adult populations in one year is unlikely to translate to reduction in adults the following year.

Fig. 2. *Prionus californicus* mating disruption in sweet cherry, UT. Male capture in bucket traps baited with Contech (brown) pheromone lures (2 replicate traps per orchard).



In MD-treated orchards, more males were caught in traps baited with 30 mg Contech than 0.1 mg lures in seven of eight weeks when males were caught in traps (Fig. 3). Only on July 19 was the trap catch higher in a trap baited with the 0.1 mg lure.

Fig. 3. Effect of pheromone lure type on trap capture of *Prionus californicus* in mating disruption-treated sweet cherry orchards, UT (2 replicate traps per orchard).

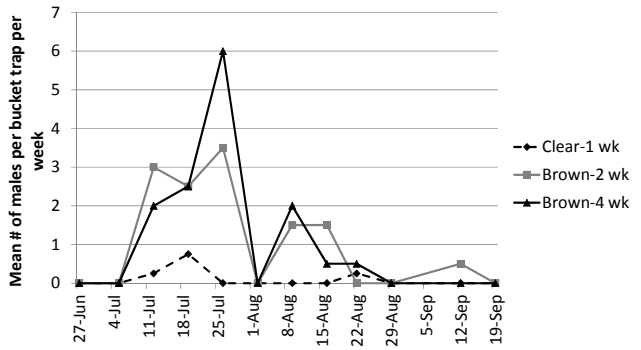


In the two untreated orchards used to compare lure type and longevity, Pettingill and Nielson #2, significantly more males were caught in traps baited with 30 mg Contech than 0.1 mg lures (Table 3). However, there was no effect of replacement interval (2 or 4 wk) on attractiveness of Contech lures to males (Table 3 and Fig. 4).

Table 3. Effect of lure type and lure replacement interval on capture of male *Prionus* in bucket traps, Box Elder County, UT, 2011. Means are season totals per trap for two replicate orchards.

Comparison	Mean (SE)	P>F
Contech lure (brown)	3.3 (0.6)	
0.1 mg lure (clear)	0.3 (0.2)	0.001
Contech-2 wk	3.3 (0.8)	
Contech-4 wk	3.4 (0.7)	0.83

Fig. 4. Comparison of *Prionus* lure type and longevity for Contech (brown) vs. 0.1 mg (clear) lures in two sweet cherry orchards, UT (no mating disruption).



Conclusions:

The Isomate California prionus mating disruption dispensers were highly effective in reducing trap capture in pheromone-baited traps. A mean of only 1.6 males per trap was caught in two MD-treated orchards as compared to 16.0 males per trap in two untreated orchards.

Traps baited with Contech lures caught about three times more males than traps baited with the 0.1 mg research lure in both MD-treated and untreated orchards. Substantially more males were caught in untreated orchards in Contech lure-baited traps than in any other MD treatment-lure type combination. Even in MD-treated orchards, Contech lures caught more males than 0.1 mg lures in seven of eight weeks with male activity.

Trap capture with Contech lures replaced every four weeks was the same as for those replaced every two weeks. These results support that Contech lures are effective for at least four weeks. Longer replacement intervals were not evaluated in this study.

The predominant species of *Prionus* captured in this study was *P. californicus*. Only one non-California prionus was caught.

If we assume that trap capture rates are a good indication of mating disruption, the Isomate California prionus mating disruption dispenser appears to be highly effective in disrupting the mating behavior of *P. californicus* in sweet cherry orchards. This study only included two MD-treated orchards, so findings are preliminary. Our results suggest that this Isomate product can be a valuable management tool for the destructive root-boring pest, *P. californicus*. The commercially available 30 mg Contech pheromone lure is an effective monitoring tool for California prionus and can last at least four weeks. Our results suggest that the Contech lure can be used to mass-trap male *P. californicus* which may reduce populations of this pest in sweet cherry orchards.