Prionus californicus Mating Disruption in Utah Sweet Cherry 2013

Michael Pace, Box Elder County Agricultural Agent, and Diane Alston, Entomologist
Utah State University Cooperative Extension
James Barbour, Entomologist
University of Idaho

The California prionus (*Prionus californicus* Motschulsky; Coleoptera: Cerambycidae) is a root-boring beetle that can cause severe crop loss and tree death in orchards of western North America. In northern Utah, infestations are particularly severe in sites with porous soils (higher content of sand or gravel). Sweet cherry has been particularly hard-hit by prionus attack. The large beetles require three or more years to complete their life cycle, and spend most of it as grubs feeding on the roots of trees. Initial symptoms are limb dieback and tree decline, and if severe, trees may be killed. The productivity and lifespan of the orchard is significantly reduced. There are few management options: fallowing soil for three or more years between orchard plantings and pre-plant fumigation. Neither option is highly effective or economically sustainable. In a previous study, application of systemic insecticides was generally ineffective as it is difficult to reach older larvae in large tree roots and crowns. Alternative management strategies are greatly needed for this pest.

Objective

To determine the efficacy of Isomate California prinous mating disruption dispensers in reducing trap catch of male prionus in pheromone-baited bucket traps in sweet cherry orchards in northern Utah.

Methods

Seven sweet cherry orchards (0.5 to 4.2 acres in size, and from 0.15 to 3.61 miles apart) in Perry and Willard, Box Elder County, UT, were used in the study. On July 1 and 2, 2013, four traps, spaced approximately equally in a square pattern, were deployed in each orchard. Traps were made from 5 gal plastic buckets buried with the rim even with the soil line. An aluminum funnel (12 inch diameter; universal black light funnel, Bioquip, Rancho Dominguez, CA) was placed in the opening of each bucket. The bail (handle) was held upright by a zip-tie inserted in a hole drilled on one side of the bucket and tightened around the bail. A pheromone lure was attached to the top of the bail with a binder clip. Two traps (alternately spaced) were baited with a 30 mg pheromone lure (prionic acid) in a brown press-seal plastic bag (Contech Enterprises, Victoria, BC, Canada). The other two traps were baited with a 0.1 mg prionic acid lure made by loading clear press-seal plastic bags (2 × 4 inch) with 100 µL of 1 mg/ml prionic acid. Traps were checked approximately weekly through September 18, male prionus beetles collected, and the lures rotated clockwise to the next trap. Contech (30 mg) lures were replaced every four weeks, and 0.1 mg lures were replaced every two weeks (trap design and optimal lure replacement intervals were determined in previous studies).

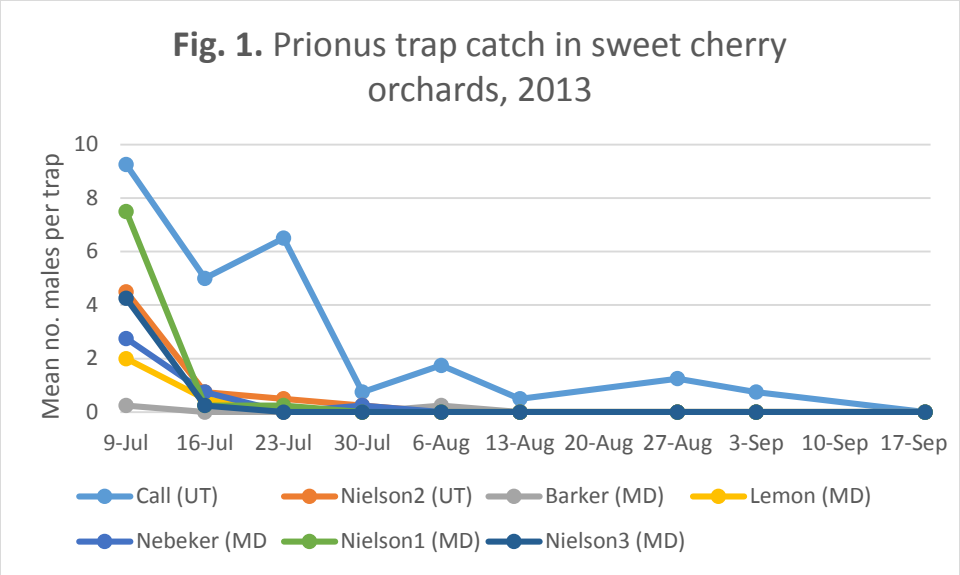
On July 9, Isomate California prionus mating disruption (MD) dispensers (Pacific Biocontrol, Vancouver, WA) were placed in five of the orchards. Dispensers were either stapled to the lower tree trunk, 4 to 8 inches above soil line (Barker and Lemon orchards), or placed on the ground near the trunk base (Nebeker, Nielson 1, and Nielson 3 orchards) at a rate of 100 dispensers per acre. Two orchards did not receive MD dispensers and served as untreated controls (Call and Nielson 2).

Results

The mean trap catch of prionus males was highest before MD dispensers were deployed (pre-MD) in both untreated and MD-treated orchards and for traps baited with 0.1 or 30 mg lures (Table 1). Across all orchards and trap collection dates, more males were caught in traps baited with the Contech 30 mg lure than the 0.1 mg lure. In MD-treated orchards, mean trap catch declined to less than one beetle per trap within one week after dispensers were deployed on July 9 (Fig. 1; data shown are means for 0.1 and 30 mg lures). Post-MD deployment, trap catch remained very low through mid-September in all orchards except one of the untreated orchards, Call.

Table 1. Comparison of prionus trap catch in pheromone-baited bucket traps (0.1 and 30 mg prionic acid lures) pre- and post-application of mating disruption (MD) dispensers in untreated and MD-treated sweet cherry orchards, 2013 in Utah.

Timing	Treatment	Orchard	No. males per trap per wk	
			0.1 mg lure	30 mg lure
Pre-MD	Untreated	Call	2	16.5
		Nielson 2	0	9
		Mean	*1.0*	*12.75*
	MD-treated	Barker	0	0.5
		Lemon	0.5	3.5
		Nebeker	0.5	5
		Nielson 1	0.5	14.5
		Nielson 3	4.5	4
		Mean	*1.2*	*5.5*
Post-MD	Untreated	Call	1.5	2.2
		Nielson 2	0.11	0.22
		Mean	*0.81*	*1.21*
	MD-treated	Barker	0	0.06
		Lemon	0.06	0.06
		Nebeker	0.06	0.17
		Nielson 1	0.06	0.06
		Nielson 3	0.06	0
		Mean	*0.05*	*0.07*



The percentage of trap shutdown in orchards treated with MD as compared to untreated orchards averaged about 94% for both 0.1 mg and 30 mg lure-baited traps (Table 2). Trap shutdown comparisons were made only for post-deployment trap catch numbers.

Table 2. Cumulative capture of male prionus per trap and percent trap shutdown following application of mating disruption dispensers in sweet cherry orchards as compared to untreated orchards, 2013 in Utah.

Orchard	No. males per trap*		% trap shutdown^	
	0.1 mg lure	30 mg lure	0.1 mg lure	30 mg lure
Barker	0	0.5	100.0%	95.3%
Lemon	0.5	0.5	93.1%	95.3%
Nebeker	0.5	1.5	93.1%	86.0%
Nielson 1	0.5	0.5	93.1%	95.3%
Nielson 3	0.5	0	93.1%	100.0%
Mean	*0.4*	*0.6*	*94.5%*	*94.4%*

*Trap catch post-application of MD dispensers for nine weeks from July 9 to September 18.

^Percent trap shutdown as compared to cumulative catch in two untreated orchards post-application of MD dispensers from July 9 to September 18 (means = 7.25 and 10.75 for 0.1 mg and 30 mg lures, respectively).

Conclusions

The Isomate California prionus mating disruption dispensers reduced trap catch in pheromone-baited traps by an average of 94% across five sweet cherry orchards. Although the 30 mg Contech lures caught more male prionus overall, trap shutdown rates were similar for 0.1 mg and 30 mg lures. Capture rates were highest during the first week of trap deployment (early July) in all orchards and traps. The adults may have been active before traps were deployed, and thus, traps attracted a higher number of prionus during the first week after deployment.

If we assume that trap capture rates are a good indicator of disruption of the mating behavior of *Prionus californicus*, then the Isomate dispenser was highly effective. These results are similar to others we have collected during the two previous years in Box Elder County, UT. These and previous years' results suggest that the Isomate dispenser can be a valuable tool for reducing populations of this destructive root-boring pest in cherry, and likely in other species of tree fruit orchards as well.

The commercially available Contech 30 mg lure is an effective monitoring tool for California prionus and lasts at least four weeks in the field. Our results also suggest that the lure itself can be used as a mass-trapping tool to reduce populations of the beetle in agricultural crops. The Barker orchard has been trapped with prionic acid lures since 2009 and treated with MD dispensers since 2011. In 2009, a total of 265 prionus males were caught in four traps in the Barker orchard (two traps were baited with prionic acid and two were unbaited). A total of two beetles were caught in the Barker orchard in 2013, much lower than in the other orchards during 2013 with none (Call, Lemon, Nebeker, and Nielson 2 and 3) or two (Nielson 1) previous years of trapping. The very low trap catch in the Barker orchard in 2013, after five years of trapping and three years of MD, demonstrates the potential for mass-trapping and mating disruption with prionic acid to lower prionus populations over the long-term.