Evaluation of CIDETRAK® CMDA + LR DUAL MESO™ as a Mating Disruption Tool for the Management of Codling Moth and Obliquebanded Leafroller in Apple Orchards

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In eastern North America, apple orchards are often attacked by several insect pest species in the Lepidopteran family Tortricidae. Some common fruit pests of economic importance from this family are codling moth (*Cydia pomonella*) (CM) and obliquebanded leafroller (*Choristoneura rosaceana*) (OBLR). Two common management options used by growers to control tortricid pests are insecticide-based control and mating disruption. However, the application of synthetic insecticides is detrimental to the environment and to non-target species and there is a growing evidence of pest resistance to various types of insecticides. Mating disruption is a species- specific and environment friendly option for apple growers. Mating disruption utilizes sex pheromone dispensers deployed at high densities to confuse male moths so that they will not find females. The main idea is that the female will remain unmated so that the population levels are reduced, and crop damage diminishes. The goal of this study was to evaluate the field performance of a dual mating disruption tool targeting CM and OBLR.

Materials & Methods

This field study was conducted from May 6 to September 7, 2020, in three commercial apple orchards ("A", "B" and "C") in Massachusetts. The performance of the mating disruption system was compared against the grower standard approach (hereafter referred to as control). The mating disruption system evaluated was the commercial formulation CIDETRAK® CMDA + LR DUAL MESO™ targeting CM and OBLR. All mating disruption materials were provided by Trécé Inc. (Adair, OK). On May 6, 2020, two pheromone dispensers (one for each moth species) were deployed at the rate of 32 dispensers per acre and were hanged on the branches by the hook at upper 3rd of the tree canopy (Figure 1). This way mating disruption block in orchard "A" (area: 7.35 acres) received 230 dispensers, orchard "B" (area: 6.26 acres) received 200 dispensers, and orchard "C" (area: 9.89 acres) received 310 dispensers. The distance between pheromone dispensers were 10 yards on the perimeter and 15 yards in the interior. The grower control blocks were similar in size and they received standard grower CM and OBLR controls and did not receive any pheromone dispensers.

To monitor the moth populations various novel lures were used. Both the mating disruption and the control blocks received one CML2 lure and one CML2-P lure (improved Trécé lure formulation) for CM and one OBLR lure and one LR Combo lure for OBLR. All lures were installed at the central part of the mating disruption block and the grower control block in each orchard. The monitoring lures were placed

Figure 1. Trécé pheromone dispenser

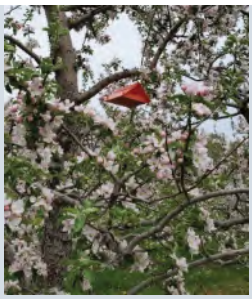

Figure 2. Monitoring delta trap

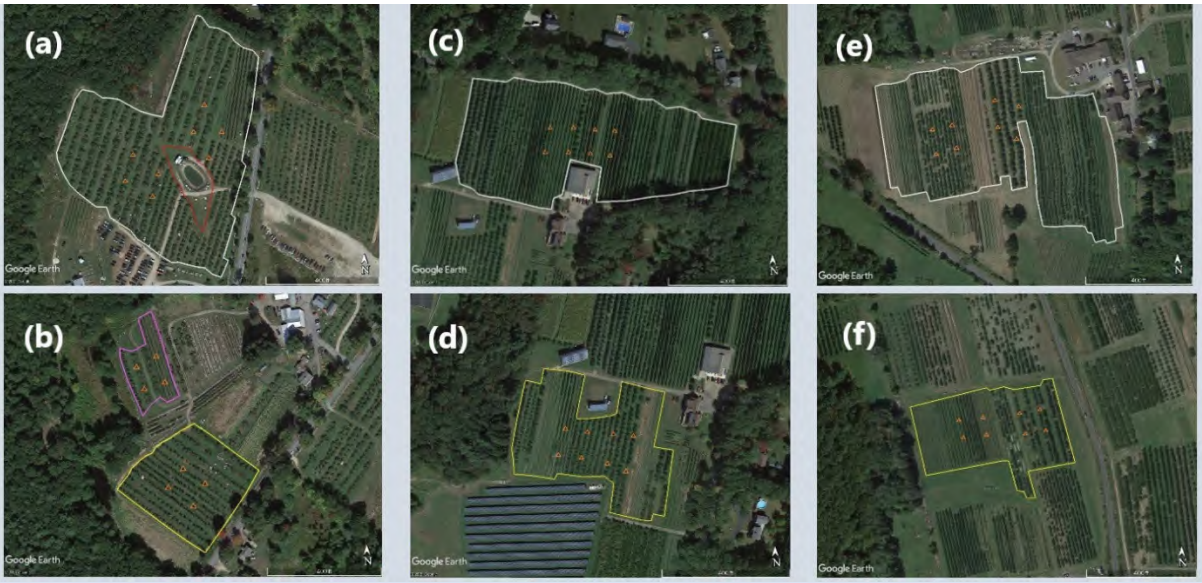

Figure 3. Mating disruption block (a) and control block (b) of orchard "A", mating disruption block (c) and control block (d) of orchard "B", and mating disruption (e) and control block (f) of orchard "C".

inside orange delta-shaped trap (Pherocon® VI, Trécé Inc., Adair, OK) and were kept at 6 feet high and at least 50 yards apart from each other (Figure 2). These traps were monitored on weekly basis for 18 weeks. All captured adult moths were identified according to the species and dissected under microscope to identify their respective sex.

At the end of the experiment, we conducted a harvest injury assessment. This was accomplished by by visual inspection of 100 fruits per tree from 20 trees (=2,000 fruits per block) from both mating disruption and control block. Figure 3 shows, for each orchard, the mating disruption and control blocks used for the study.

Results

Obliquebanded leafroller (OBLR): The first flight of OBLR was observed around June 15th and the second flight started around August 3rd. Overall, the populations of OBLR were comparatively low in orchards "A" and "C" (less than 5 moths in total were captured in the monitoring traps for the entire season). In orchard "B", the population of OBLR was higher,

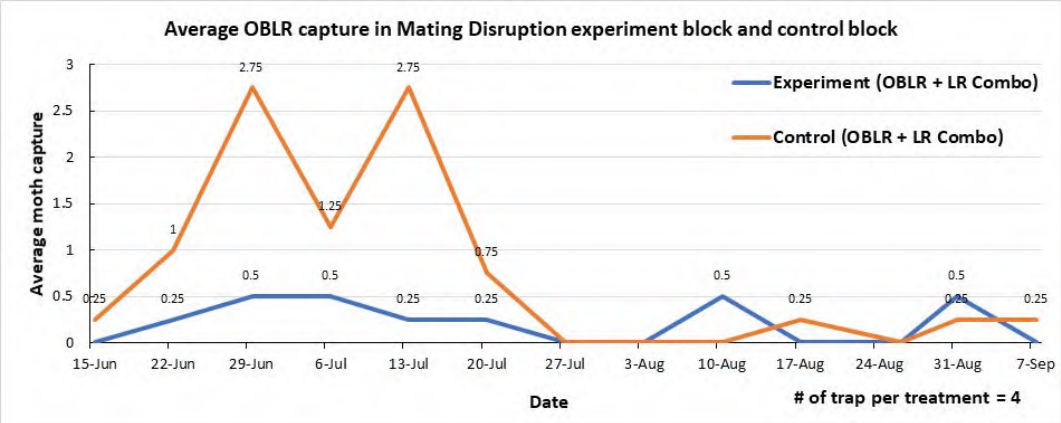

Figure 4. Average number of OBLR captured in trap baited with OBLR and LR Combo lure in Orchard "B".

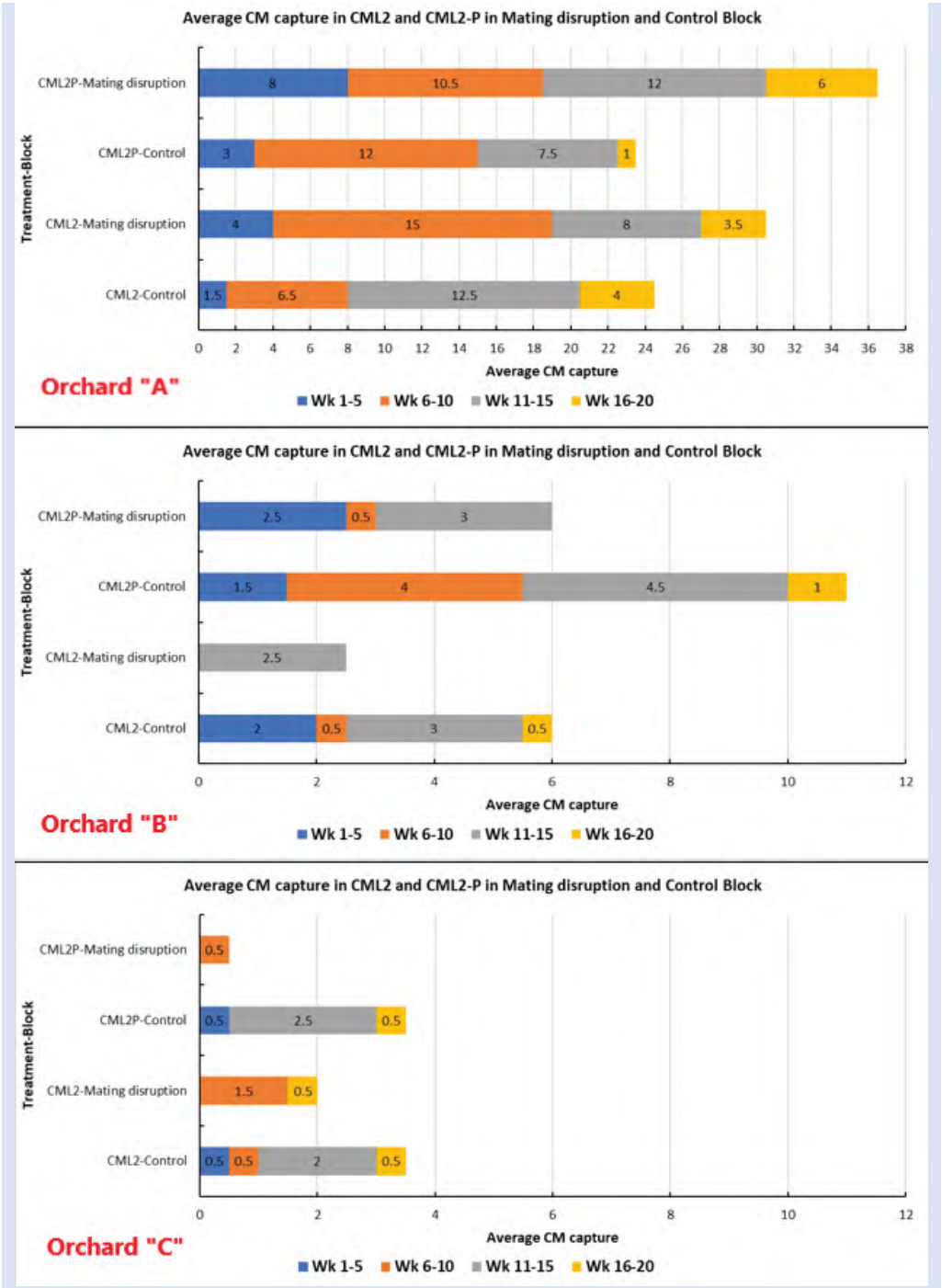

Figure 5. Average number of CM captured in monitoring traps baited with CML2 and CML2-P lures in orchards "A", "B" and "C". The CM season was divided into 4 periods (Weeks 1 -5; weeks 6-10; weeks 11-15; weeks 16-20).

with 49 moths captured in all. Comparatively, the average number of OBLR was higher in the control block compared to the mating disruption block earlier in the season (Figure 4).

In orchard "A", there was 0.1% suspected injury in the mating disruption block and 0.15% suspected injury in the control block. In orchard "B", there was zero injury in the mating disruption block and 0.15% suspected injury in the control block. In orchard "C", there was 0.15% suspected injury in both the mating disruption and the control blocks.

The LR Combo lure used in the experiment was attractive to both sexes of OBLR. Upon dissection, it was found that 40% of the captured female in control block were mated but in mating disruption block none were mated. The monitoring trap that was placed for OBLR also captured redbanded leafroller (RBLR) in substantial numbers. This may be due to the overlap of compounds present in the pheromone lure of both species.

Codling moth (CM): In general, captures of CM

in orchard "B" and "C" were higher in the control block than in the mating disruption block (Figure 5A-C). In contrast, CM populations in orchard "A" were higher in the mating disruption block than in the control block (Figure 5A). The likely reason may be higher pest pressure in the mating disruption block of the orchard. In terms of fruit injury, zero injury was CM was recorded in mating disruption and grower standard blocks in all orchards and blocks, except for orchard "A" where we recorded 0.05% fruit injury in the mating disruption block and 0.1% injury in the control block.

Conclusions

Under the conditions of this study involving low moth populations, the Trécé dual mating disruption system marketed as CIDETRAK® CMDA + LR DUAL MESO™ for CM and OBLR seems to be working well as determined by low injury and low moth captures in mating disruption blocks relative to the grower standard (control) blocks. The higher OBLR populations recorded in orchard "B" indicated that the LR combo lure can be used as a lure to monitor both sexes of OBLR.

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