Investigating the Efficacy of Profuze on spotted wing drosophila (SWD) in tart cherry and cracking reduction in sweet cherry

N.L. Rothwell, K.L. Powers, E.A. Pochubay, Northwest Michigan Horticultural Research Center
Michigan State University

Objectives

I. Determine the effectiveness of Profuze for improved insecticidal control of spotted wing Drosophila (SWD) in Montmorency tart cherries.
II. Determine the effectiveness of Profuze to reduce cracking in sweet cherries, vars. Emperor Francis (light) and Black York (dark).

Methods

Two applied research trials were established at the Northwest Michigan Horticultural Research Center (NWMHRC), Traverse City, MI. The first trial was conducted in 13-year-old Montmorency tart cherries, and a second trial was set up in 13-year-old Emperor Francis and Black York sweet cherries.

In tart cherry, blocks of five rows with approximately 18 trees per row were treated with one of the following: 1) untreated control, 2) Profuze alone (1 L/acre), 3) OSA plus Mustang Maxx (4 oz/acre), and 4) Mustang Maxx alone. Treatments were applied four times with an FMC airblast sprayer at 60 gal of water per acre at the following timings: a) 29 May, b) 9 June, c) 29 June, and d) 6 July. Each treatment had two SWD traps baited with Scentry lures that were checked weekly during June and July, and the numbers of male and female SWD adult flies were counted each week.

On 21 July, we collected four gallons of tart cherry fruit from each treatment to test for SWD infestation using the brown sugar method. Fruit samples were brought back to the lab, lightly crushed just to break the cherry skin and covered with a brown sugar solution (7.5 lbs. brown sugar in 5 gal. water). Fruit was allowed sit in solution for 15 minutes before straining fruit from the liquid; the liquid was passed through a fabric mesh to catch all instars of SWD larvae. The fabric mesh was observed under a dissecting microscope, and number of larvae were counted.

In sweet cherry, blocks of two rows of two varieties of sweet cherry (vars. Emperor Francis and Black York) with approximately 14 trees per row were treated with the following: 1) untreated control and 2) OSA alone (1 L/acre). Treatments were applied four times with an FMC airblast sprayer at 60 gal of water per acre at the following timings: a) 26 May, b) 29 May, c) 25 June, and d) 6 July. Each treatment was monitored with one SWD trap baited with a Scentry lure and checked weekly during June and July and assessed for numbers of male and female SWD adult flies.

On 16 July, we collected 100 clean and intact fruit of Emperor Francis and Black York cherries with stems attached to test Profuze's influence on cracking. Fruit was placed in quart deli containers (Gordon Food Service, Traverse City, MI) with two cups water at room temperature.

Each quart container held 10 fruit and was replicated six times for each timing application. Fruit was observed for cracking after 1, 3, 6, 12, and 24 hours of immersion. This test was replicated again on 21 July.

Results

We averaged the trap numbers of adult SWD flies for Montmorency and the two varieties of sweet cherries (Figures 1 and 2). We saw the most flies in the Profuze treatment of tart cherry, almost an average of 90 flies per trap. The UTC treatment had an average of 62 flies per trap, and both Mustang Maxx treatments, with and without Profuze, had significantly less flies: an average of ~20 flies/trap.

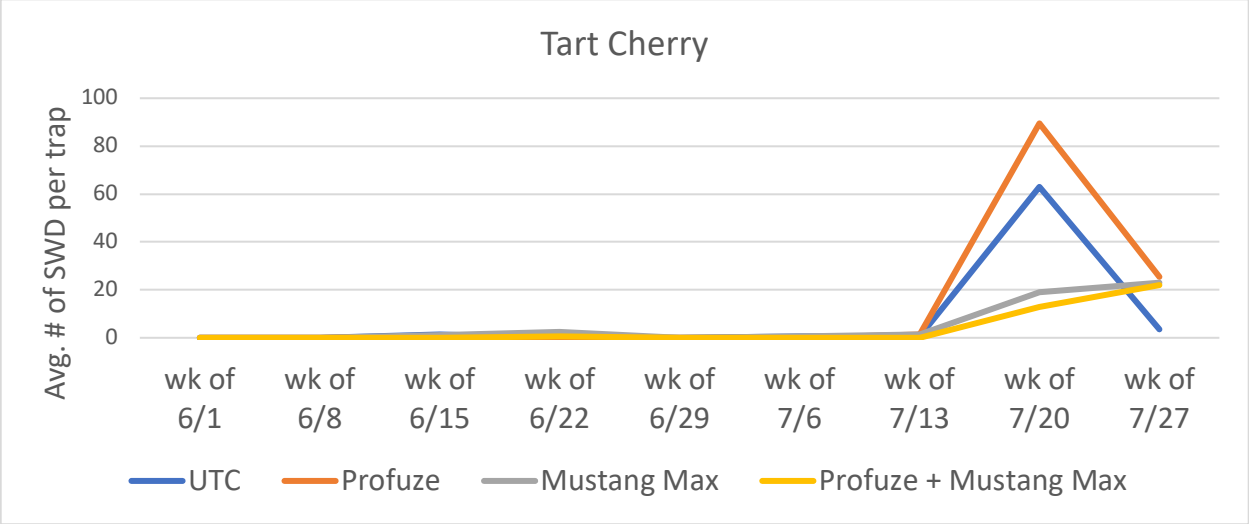

Figure 1. Average number of adult SWD flies trapped weekly under the four treatments in Montmorency tart cherry.

In sweet cherry, we had more flies in the UTC compared to the Profuze treatment, but the numbers were not significantly different. Overall, the tart cherry plots had more flies than the sweet cherry plots.

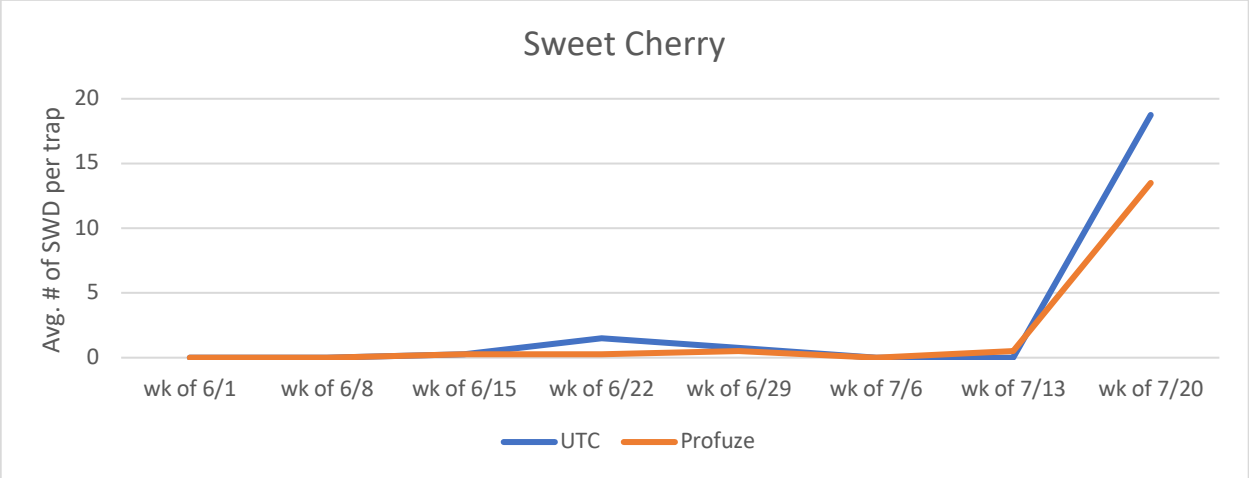

Figure 2. Average number of adult SWD flies trapped weekly under in the two treatments in both sweet cherry varieties.

We counted the number of larvae in the four treatments in tart cherry. Numerically, we had the most larvae in the Profuze alone treatments: an average of 1.5 larvae in a half gallon of fruit. We had less than one larva in the remaining three treatments. We had the fewest number of larvae in the Profuze + Mustang Max treatment, but these results were not significantly different from the other treatments.

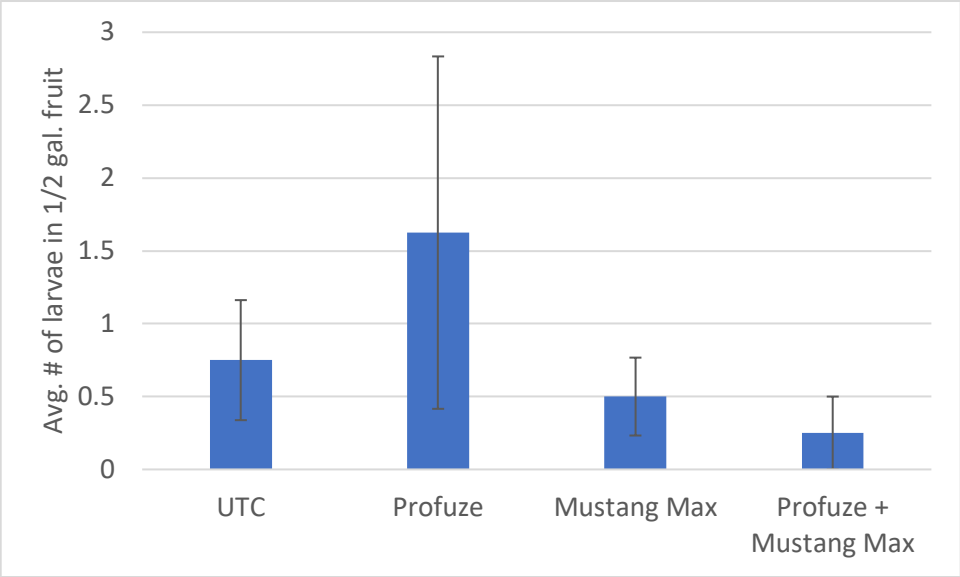

Figure 3. Average number of larvae in four treatments in Montmorency tart cherry.

We tested Profuze for cracking in two sweet cherry varieties on two different dates. On both dates, in var. Black York, we found the highest percentage of cracking at the 24h time period (Figure 4 and Figure 5). We also found significantly higher cracking in the Profuze treatment at all the timings. At 24h, the 16 July trial had an average of 20% cracking compared to 8% in the UTC. We found 14% cracking at 24h on 21 July compared to 6% in the UTC.

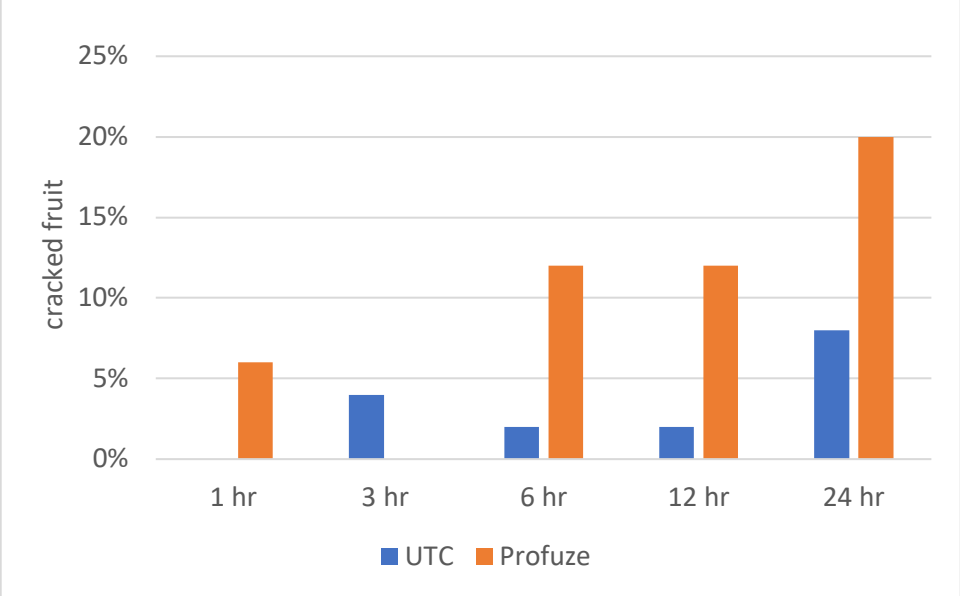

Figure 4. Average percent of cracking after Black York fruit was immersed 1, 3, 6, 12, and 24h from the 16 July sample comparing Profuze to the UTC.

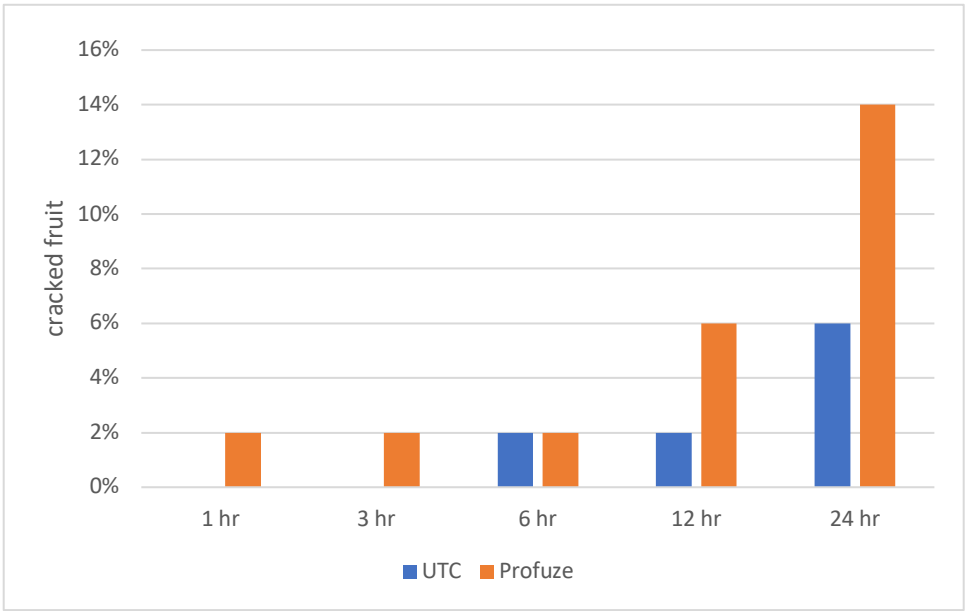

Figure 5. Average percent of cracking after Black York fruit was immersed 1, 3, 6, 12, and 24h from the 21 July sample comparing Profuze to the UTC.

On 16 July, in the variety Emperor Francis, we observed the highest percentage of cracking at 24h, and we observed 28% cracking in the Profuze treatments compared to 10% in the UTC (Figures 6 and 7). On the second sample date, 21 July, we found similar amounts of cracking at both the 12h and 24h with 14% and 12% cracking, respectively. However, we found no cracking in the 12h sample and 8% cracking in the 24h UTC treatment.

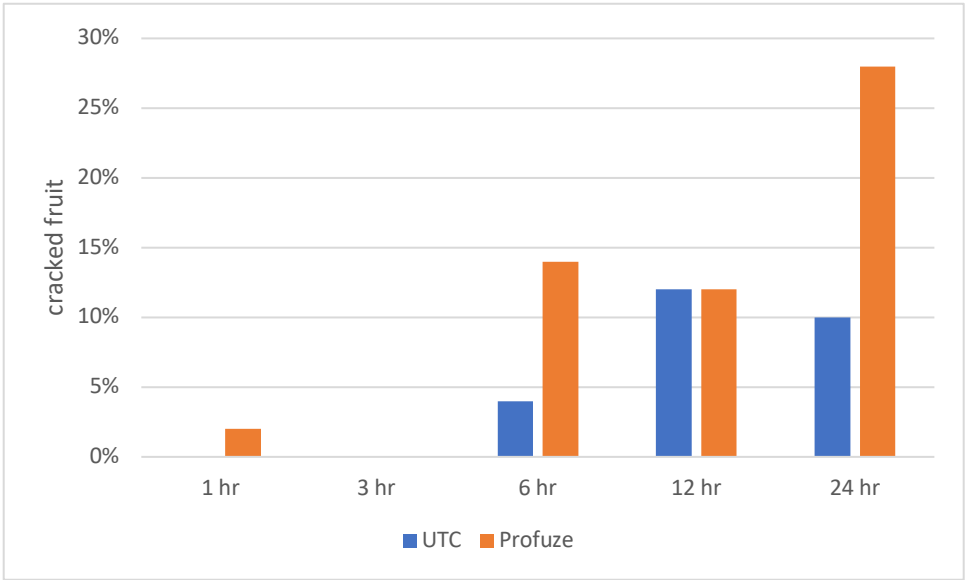

Figure 6. Average percent of cracking after Emperor Francis fruit was immersed 1, 3, 6, 12, and 24h from the 16 July sample comparing Profuze to the UTC.

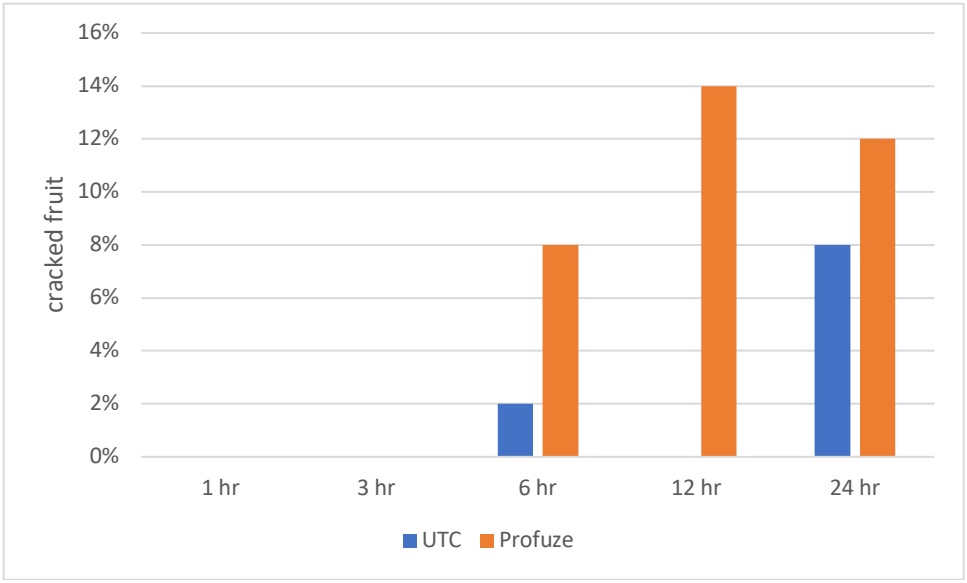

Figure 7. Average percent of cracking after Emperor Francis fruit was immersed 1, 3, 6, 12, and 24h from the 21 July sample comparing Profuze to the UTC.

Conclusions

Based on two years of data, we cannot conclude that Profuze significantly improves SWD control in tart cherry when in combination with an effective insecticide. We increased the number of applications from three in 2019 to four in 2020 because SWD infestation pressure is high at the NWMHRC where many blocks are not sprayed with insecticide for other SWD trial purposes. Despite increasing the number of insecticide sprays in 2020, we found only a small numerical improvement in SWD control with Profuze + Mustang Maxx. Past research in blueberries has shown an additive effective in reducing SWD infestation when Profuze was mixed with an insecticide compared to the insecticide alone. In our 2019 trial, the insecticide alone worked numerically better for SWD control than either the Profuze alone or with the combination of Profuze and Mustang Maxx. In 2020, the Profuze + Mustang Maxx had numerically better control, but no conclusions can be drawn from the two years of data. Again, the SWD pressure in tart cherry at a research station with many unsprayed blocks may be too high and mask the different treatment effects.

The 2019 preliminary data suggest that Profuze had activity to reduce cracking in sweet cherry var. Emperor Francis. We saw a significantly lower percentage of cracked cherries in fruit treated with Profuze compared to the UTC. After 24H in water, the percentage of cracked fruit in the Profuze treatments was 24% compared to 65% cracked fruit in the UTC. The 2020 data, however, did not replicate these results. We tested Profuze in two varieties, and we had higher cracking in both varieties in the Profuze treatments this season. We were not able to replicate similar results of reduced cracking with Profuze use in Emperor Francis in 2020. Percent cracking was considerably higher in 2019 than 2020; Emperor Francis in the UTC treatment had 70% cracking compared to 12-14% cracking in the UTC treatment in 2020.

Overall rainfall amounts were similar in both 2019 and in 2020 when we consulted the Michigan State University Enviroweather station located at the NWMHRC: 16.54” in 2020 and 17.45” in 2019. These rainfall totals began on 1 May and end at the harvest timing for both years: 16 July in 2020 and 29 July in 2019. However, rainfall was much more sporadic in 2020 with longer periods of dry, hot weather—the rainfall events also brought more intense rains with more time in between events than in 2019. In 2019, rainfall was much more consistent over the summer growing season. Additionally, 2020 was a hotter year whereas we accumulated ~230 more growing degree days (GDD) than we accumulated in 2019, both base 42 and base 50F. Environmental conditions were dramatically different in the two years of testing, which may have influenced the Profuze activity and results. For example, when we had significant cracking in 2019, Profuze performed significantly better than in the UTC. In 2020, we have overall less cracking, which may have resulted in different results for this season. Additionally, we harvested 8-13 days later in 2019, and the later harvest dates may stretched the effectiveness of Profuze.