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WMREC Orchard Update

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As the season winds down I am sure everyone reading this is ready for a winter break. I guess I am getting old but I just can't help saying "I have never seen a season like this before, and I hope I will never see another like this again".

To me it began with the rapid onset of winter last season that made it awfully frustrating to get started pruning. Then the spring that would never come. Then the rain. Then the drought, then the rain again.

As a final research report for 2018 I can safely say, I have very little of good report; first I over thinned the apples. We went with our regular program that has worked well for many years, but this year we hit a window that was perfect for thinning. And when I say window I think it was about 8 hours between rains. So we began the season with a light crop. So, maybe we were lucky we could not get any herbicides to hold back horsenettle, bindweed or mares tail, (never mind the ten other weeds I missed), maybe this helped us reduce vigor since I removed most of the fruit. Then after it appeared we were safe, firebilght strikes began to appear. When we tried to remove strikes the temperature would dip to 82 degrees and it would rain. Thus, that didn't work, on the bright side I am amazed at the resilience of the trees on the Geneva rootstocks, they would take strike after strike and they seem to have pulled through most of the time. We did lose our first trees to fire blight since 2010 this season. We lost 3 out of 150 second leaf Crimson Crisp on G 11, so I am not going to complain.

To finish, as we moved closer to harvest, Bitter Rot has certainly taken its toll on our orchard as well. What crop we had remaining has been virtually scuttled by this disease which has been favored by this insidious season as well.

On the bright side we are prepping ground to continue rootstock evaluations and are in the process of building trellis for trees planted this season and look forward planting more apples in 2019, removing some trees that have had their day and hopefully planning an exciting Twilight meeting again for next August.

Winter Pesticide Storage

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Winter is coming soon the fields and orchards will be dormant and the tools will be put away till the spring. But one more crucial job remains -- organizing and properly storing unused pesticides. Proper storage of herbicides, fungicides, and insecticides is important for protecting the health of farmers, homeowners and their families who use these products. It is also important to remember

Optimizing Spray Coverage in Fall-Bearing Raspberries and Blackberries

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In small fruit production, spray coverage can strongly impact the efficacy of a given pesticide application. More uniform spray coverage improves control of fungal pathogens in fruit systems such as grapes and citrus and under laboratory conditions, researchers have also reported better suppression of Gray mold (*Botrytis cinerea*) with increased Fenhexamid spray coverage. Spray coverage may also be an important factor when managing key insect pests such as spotted wing drosophila (SWD). Recent studies in raspberries have reported higher adult SWD activity in both the inner and lower plant canopy, regions of the plant that typically receive poorer spray coverage. Similarly, surveys in blackberries found higher larval infestation in fruit collected from the center canopy.

However, achieving good spray coverage can be difficult. Many fruit crops, including raspberries and blackberries, produce dense foliage especially as they mature. This may block penetration of pesticide sprays, resulting in uneven pesticide deposition and creating a refuge for SWD and other pests. In this study, our primary objective was to improve spray coverage in red-raspberries and blackberries, particularly in the inner canopy, by optimizing carrier water volume and the type of sprayer equipment used. We thought increasing carrier water volume would improve spray coverage throughout the entire canopy.

Fig. 1. Airblast sprayer used in Keedysville spray trials in the 2017 red raspberry spray trials (left) and in the 2018 blackberry trials (right). In 2018, a two-sided row crop head was added to the airblast sprayer to better direct the pesticide spray.

Methods: Spray trials were conducted at WMREC (Keedysville, MD) in 2016-2017 using primocane red-raspberries and in 2018 using primocane blackberries. We also evaluated spray coverage on several commercial farms from 2017 - 2018; on-farm spray coverage rates (data not shown) were comparable to what we observed in the Keedysville spray trials.

Each year, fruit were treated with insecticides using two carrier water volumes: 50 and 100 gallons per acre (GPA). All treatments were applied using a Durand-Wayland 100 airblast sprayer, which had a 24-inch fan with the bottom three nozzles turned on, using a pressure of 300 PSI. To adjust the spray volume, we utilized two sets of nozzles; one calibrated for 100 GPA and the other for 50 GPA. To better direct pesticide sprays and minimize overhead drift, in 2018 we also attached a two-sided row crop head (Durand Wayland; #16-4935) to the airblast sprayer (Fig. 1).

Fig 2. Spray cards deployed in the inner (A) and outer (B) canopy of red raspberries at Keedysville at three different heights (High, Medium, and Low).

Pesticide deposition was visualized using white paper spray cards deployed in the inner and outer canopy of raspberries and blackberries at varying heights (Fig. 2). In raspberries, we measured spray coverage at three heights: "Low" (~1.5 ft. above ground), "Medium" (~3.0 ft. above ground), and "High" (~4.0 ft. above ground); in blackberries, we measured spray coverage at four heights: "Low" (~1.5 ft. above ground), "Medium" (~ 3.0 ft. above ground), "High" (~4.0 ft. above ground), and "Top" (~5.5 ft. above ground). Prior to application, Vision Pink foam marker dye (Garrco Products Inc.) was added to the tank mix at a rate of 32 oz. per 100 gallons. Once the pesticide re-entry interval passed, spray cards were collected, scanned, and the percentage of the card dyed pink was calculated using ImageJ software, providing a measure of the percent coverage.

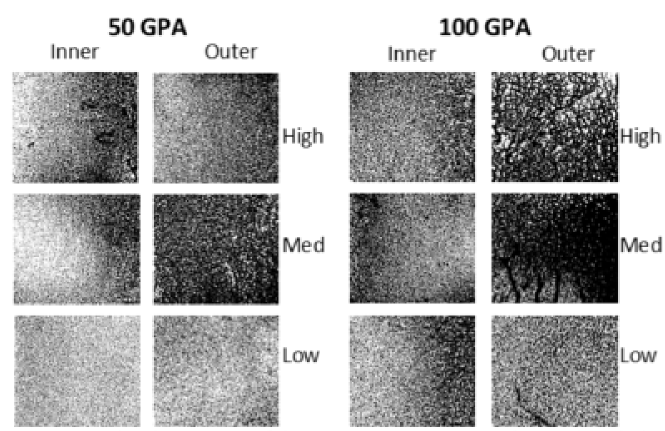

Figure 3. Visual summary of the mean spray coverage observed at six locations throughout the raspberry canopy at 2016 when raspberries were sprayed using two carrier water volumes (50 and 100 gallons per acre).

Results: During the first two years of this study (2016 – 2017), we observed significantly higher spray coverage in the outer raspberry canopy relative to the inner, suggesting that dense foliage can limit pesticide dispersion throughout the plant canopy. For example, in 2017, percent coverage (averaged across all heights and spray volume treatments), increased by 13% from the inner to the outer raspberry canopy (Table 1).

Location	Height	50 GPA	100 GPA
Inner	High	10.1 ± 5.2	45.2 ± 11.6
	Medium	17.7 ± 7.8	37.9 ± 11.5
	Low	34 ± 7.6	50 ± 13.1
Outer	High	16.6 ± 9.6	52.4 ± 13.7
	Medium	40.5 ± 11.8	59.5 ± 12.4
	Low	30.8 ± 8	76.2 ± 7.8

Table 1. Mean percent spray coverage ± standard error observed at six locations throughout the canopy of red-raspberries in 2017.

In 2016 and 2017, spraying with a higher carrier water volume significantly improved spray coverage in the outer plant canopy (Fig. 3; Table 1). However, effects of carrier water volume were less consistent in the inner canopy. In 2016 there were no significant differences in coverage between 50 and 100 GPA in the inner canopy on either trial date, regardless of height (Fig. 3). In contrast, carrier water volume impacted inner canopy coverage in 2017; percent coverage in the inner canopy (averaged across all heights) increased by 24% when we increased carrier water volume from 50 to 100 GPA (Table 1).

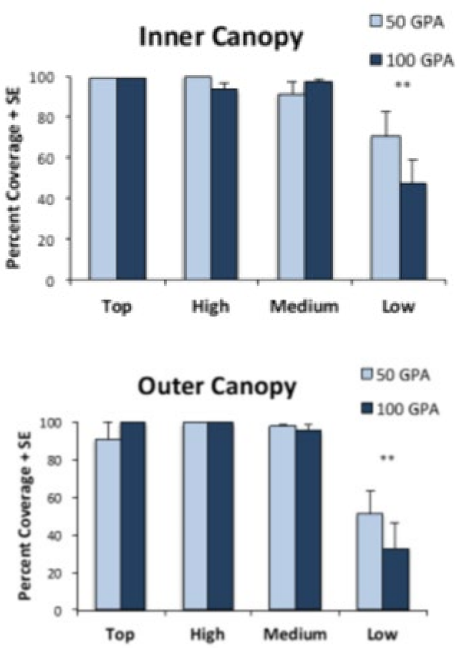

Fig. 4. Average percent coverage + standard error in 2018 airblast sprayed Keedysville blackberries. Two carrier water volumes were used in the Inner (left) and Outer (right) canopy at four different heights. There were no significant differences in coverage rates between canopy locations or carrier water volume treatments. However, spray coverage varied significantly by height, with the least coverage observed in the "Low" canopy.

In general, spray coverage rates were higher in 2018 (Fig. 4). With the row crop head attachment, the airblast sprayer appeared to direct the pesticide spray downwards (Fig. 1b), better targeting the blackberry canopy. In contrast to results from 2016 and 2017, we observed no significant differences in spray coverage rates between the inner and outer canopies, suggesting that the row crop head helped the pesticides effectively penetrate and better covered the entire plant (Fig. 4). Spray coverage patterns varied only by height, with the poorest coverage in the lower plant canopy, a trend that was consistent across different canopy locations and carrier water volume treatments (Fig. 4). Increasing the carrier water volume from 50 to 100 GPA did not affect spray coverage rates in either the inner or outer canopy.

Conclusions: Achieving good spray coverage throughout the plant canopy can be difficult, and it is important to calibrate sprayers for the crop that is being sprayed. Checking spray coverage with water sensitive cards (if rain and dew will not interfere) or with a marker dye can help identify and address issues to improve coverage. In our 2017 work, we found spray coverage to be consistently lower in the inner canopy. Increasing carrier water volume improved spray coverage rates in the outer canopy, but results were less consistent in the inner canopy. The addition of a row crop head to the airblast sprayer in 2018 improved overall spray coverage rates in our single blackberry trial. With the row-crop head, we found no differences in coverage rates between the 50 GPA and 100 GPA applications, suggesting that adjustments to the sprayer equipment may be sufficient for improving spray coverage. However, further testing across a wider variety of sites is needed to verify these conclusions. Bramble plantings with thicker canopies or different types of trellising may respond differently to carrier water volume treatments and different types of sprayers. We are currently evaluating how canopy density may impact spray coverage, and will be conducting laboratory bioassays this winter to correlate spray coverage with SWD and Botrytis fruit rot management.

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