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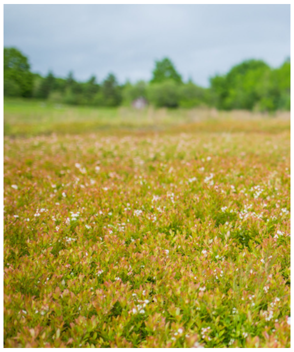
Spray Coverage Demo in Wild Blueberry

Field Services



Introduction

Spraying pest control products can be a challenge for pesticide applicators at the best of times. Dense crop canopies, variable wind speeds, fluctuating air temperatures and unpredictable rain make pesticide application challenging in an ideal field. For wild blueberry growers, it can be even more challenging to get the product to the target. Wild blueberry fields are typically rough and tend to be hilly in Nova Scotia. Applicators have a lot of ground to cover and have moved to larger booms to get across the ground quicker. Because of the rough terrain, applicators have had to raise the height of the boom to keep from breaking nozzles and damaging the booms themselves. As it is well known, the higher the boom the less coverage and canopy penetration you tend to get from the boom. So we are sacrificing efficacy to get across more acreage, in a shorter period of time. Many have also looked at decreasing spray volume in order to cover more acres with each tank load. Again, a lower spray volume can lead to sacrifices in spray coverage and sometimes control, particularly when you are working with dense canopies and the target pest is within that canopy.

Demonstration Set-up

We recently did a small trial to demonstrate how sprayer set-up can impact spray coverage and canopy penetration in wild blueberry. We looked at two different boom heights, 0.5 meters and 1 metre above the canopy. We looked at two different spray volumes, 200 L/ha (21.4 us gal/acre) and 300 L/ha (32.09 us gal/acre). Finally we looked at two different nozzles that gave different droplet sizes at the same pressure and spray volume, AI12002 (very coarse) and XR11002 (medium). We used a 2 metre hand held CO_2 sprayer and set the pressure at 40 psi.

A 2 by 12 metre treatment area was laid out in a wild blueberry field with solid plant coverage late on July 22nd of the sprout year. The weather during the treatments was 22°C with a wind of 10 km/h. Within the treatment area six spots were selected to place water sensitive spray strips (three at the top of the canopy and three at the bottom of the canopy). The strips were put in the same positions for each treatment.

After each treatment, the strips were removed and replaced by a new one. The strips were taken to the Engineering Department at Dalhousie University where Dr. Travis Esau calculated the percent coverage based on scanned image analysis.

(a) (b)

Figure 1: Spray coverage, high in canopy (a) and low in canopy (b)

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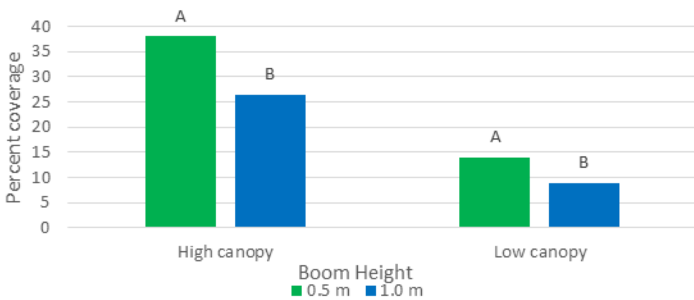
Results and Discussion

To no surprise, boom height had a statistically significant effect on leaf coverage both low in the canopy and at the top of the canopy. (Table 1)

Table 1: Spray boom height effect on spray coverage

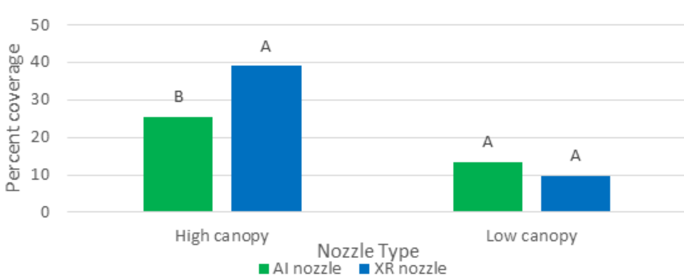


Means followed by the same letters are not significantly different at α = 0.05.

For most of the products we use in wild blueberry, we don't need 100% leaf coverage to get effective control of a given pest, but this data shows that as boom height increases coverage decreases. Also our boom height of 1 metre would not be considered excessively high in most wild blueberry operations, so as the boom height increases to above 1 metre, it is expected that consistency of coverage will decrease as well.

When looking at the nozzle specific data, under the conditions at application, the XR nozzle does provide better coverage at the top of the canopy. We would expect this to happen in good spray conditions, as the smaller droplets of the XR nozzle will provide better coverage in ideal conditions. As wind speed increases however, the coverage of the XR nozzle will become more inconsistent as its droplets will be more prone to drift than the larger Air induction nozzle droplets. However, the effect of AI (air induction) nozzle is not statistically different than the effect of XR nozzle in the lower canopy (Table 2). It may suggest the larger droplets can make it through the dense canopy.

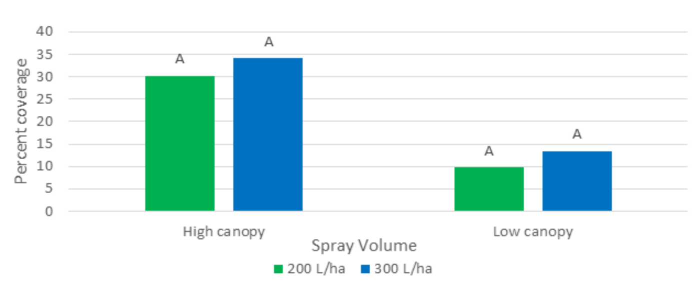
Table 2: Nozzle type effect on spray coverage



Means followed by the same letters are not significantly different at α = 0.05.

We also looked at spray volume and its impact on spray coverage. Table 3 shows no statistically different results, however the means for the 300 L/ha treatments are higher than the lower spray volume both in the lower and higher canopies. This supports existing literature that states higher spray volume allows for better spray coverage.

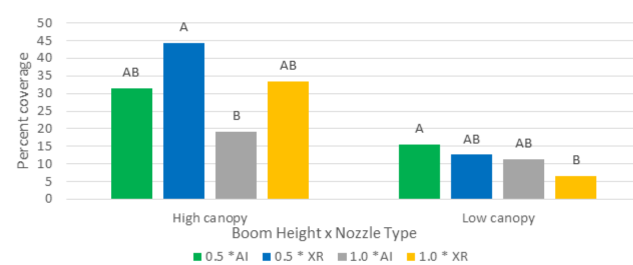
Table 3: Spray volume effect on spray coverage



Means followed by the same letters are not significantly different at α = 0.05.

Next, we wanted to compare the boom height and nozzle interaction. Table 4 shows two trends. As boom height increases, spray coverage decreases, irrelevant of the nozzle or where in the canopy you are looking. The lower you can keep your boom, the better the coverage you are going to get. In decent wind conditions (10 km/h), the XR nozzle provided better coverage than the AI nozzle at each boom height in the high canopy. However, in the lower canopy the data is suggesting the AI nozzle provides better coverage at each boom height compared to the XR nozzle. More study should be done to prove this in a wild blueberry canopy.

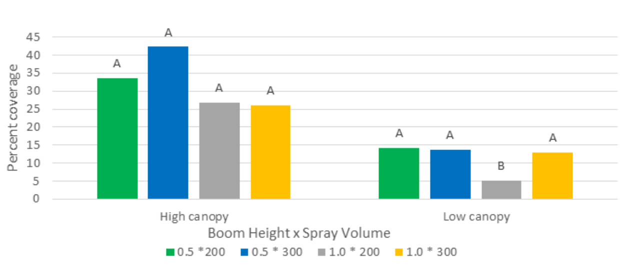
Table 4: Boom height and nozzle type interaction effect on spray coverage



Means followed by the same letters are not significantly different at α = 0.05.

Finally, we looked at boom height and spray volume interaction. Although there is not a lot of statistically different data in Table 5, it does show that a high boom (1m) with 200 L/ha of spray volume has significantly low coverage in the low canopy compared to the other interactions. This is particularly significant as the average sprayer, in wild blueberry, is typically calibrated for 200 L/ha (around 20 gallons/acre). Also, most sprayers have an average height of 1 metre or above. A high boom with lower water volumes provides very little canopy penetration.

Table 5: Boom height and spray volume interaction effect on spray coverage



Means followed by the same letters are not significantly different at α = 0.05.

Conclusions

In a wild blueberry environment, it is unrealistic to have a boom 50 cm off the canopy at all times. However, it is clear that coverage and canopy penetration is improved by keeping the boom as low as possible. To do this in wild blueberry, it may require driving slower, using a smaller boom or investing in boom leveling and ground sensing technologies.

These data clearly show, no matter the height, spray volume or nozzle type there is a significant coverage reduction in the lower canopy compared to the top of the canopy (50-75%). It is difficult for spray droplets to penetrate a canopy no matter the set-up. When we are targeting a pest that is in the canopy, like botrytis in the crop year or leaf rust in the sprout year, we need to adjust our spray parameters to try and increase coverage. Given the average height of booms in the industry, the data supports a higher spray volume (>200 L/ha) for applications that are made when a dense canopy is present.

As with any trial like this, the data only really describes how the spray parameters performed under the given conditions at the time of the treatment. As climate conditions change, coverage will as well. What this trial does do is support the basic principles of spraying; 1) a lower boom helps provide better coverage and canopy penetration; 2) higher spray volume (there are upper limits) will provide better coverage and canopy penetration; 3) Drift reduction nozzles can provide more consistent coverage in variable wind conditions.

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