Section 8

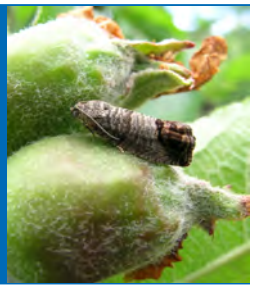
Cultural Practices

Washington State University

Apple Pest Management Transition Project

Tree Fruit Research & Extension Center

Airblast Sprayer Calibration



Determine proper speed of travel. For most airblast sprayers, driving from 1.0 to 2.5 miles per hour will ensure that coverage is obtained in the upper central portion of the tree. As the growing season progresses, and leaf and shoot growth add to the density of the trees, you may have to recalibrate. Sprayer coverage can be confirmed by applying Surround as a test product. Adjust the speed of travel until a visual check shows that you have adequately covered the hard-to-reach areas of the tree. Write down the gear and revolutions per minute (rpm) used, then measure the number of seconds it takes to drive 88 feet at this speed. Divide the seconds into 60 to get miles per hour.

$$\text{mph} = \frac{60}{\text{seconds to drive 88 feet}}$$

Determine gallons per acre. The number of gallons of spray mixture you apply affects the type of coverage more than the evenness. Low volume applications apply distinct droplets, while high volume sprays apply a sheet of water. Tree Row Volume (TRV) is one way to estimate the gallonage required to achieve a dilute application.

$$\text{TRV} = 0.7 * \frac{43{,}560 \text{ sq ft/acre} * \text{tree height (ft)} * \text{tree width (ft)}}{1000 * \text{distance between rows (ft)}}$$

For canopies of higher density multiply by 0.75, 0.8, etc., (up to 1.0) instead of 0.7. While these calculations can be helpful, there is no substitute for experience. When applying insecticides at water volumes less than dilute, use caution to ensure that coverage is not compromised. Less than 80 gpa is generally considered inadequate for airblast applications.

Set up sprayer nozzle manifold. Place the nozzles on the manifold in relation to the tree size and shape. Place the largest nozzles in line with the thickest part of the tree, then arrange the medium and small-sized nozzles so that the gallons per minute output tapers off on either end. Keep output per minute highest along the part of the manifold that lines up with the bulk of the tree.

Nozzle Calibration

- To determine proper nozzle size for your sprayer, first calculate the gallons per minute (gpm) to spray from each side of the sprayer by using desired gallons per acre (gpa), tractor speed (mph), and row space (ft).

$$\text{gpm} = \frac{\text{gpa} * \text{mph} * \text{row space (ft)}}{990}$$

- Use a nozzle chart and the output pressure from your spray pump to determine the disc and core that produce the desired output.

Checking Calibration

- Fill sprayer with water to overflowing.
- Run both sides for 3 minutes at operating pressure (2 minutes if spraying dilute).
- Use a calibrated bucket to refill sprayer and measure gallonage sprayed.
- Divide gallonage sprayed by 6 to determine output per side (divide by 4 if sprayer was only run 2 minutes).
- Compare actual sprayer output with calculated output. If necessary, alter pump pressure slightly to adjust sprayer output.
- Recheck your gallons per minute output regularly.

For more information please refer to WSU extension bulletin 1575.

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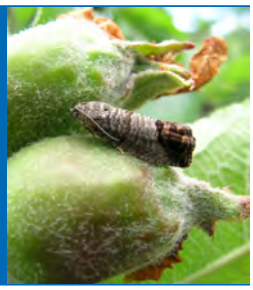


Example: You would like to calibrate your sprayer for trees that average 15 ft in height and 8 ft in width, with 18 ft between rows. You have already determined that 1.5 mph is the optimal driving speed. First calculate gallons per acre output using Tree Row Volume, then determine the gallons per minute per side that the sprayer must produce to achieve this calibration. Finally, using a nozzle chart, choose eight nozzles producing a total output per minute per side close to this amount that will place two-thirds of the output from the upper half of the manifold (the portion that lines up with the bulk of the tree).

Step 1: Use the formula to calculate Tree Row Volume: $TRV = 0.7 * \frac{43560 * 15\text{ ft} * 8\text{ ft}}{1000 * 18\text{ ft}} = 203$

Step 2: Use the formula to calculate gpm per side: $gpm = \frac{200\text{ gpa} * 1.5\text{ mph} * 18\text{ ft}}{990} = 5.45$

Step 3: Calculate 2/3 of this total for the upper half of the manifold: .667 * 5.45 = 3.64.

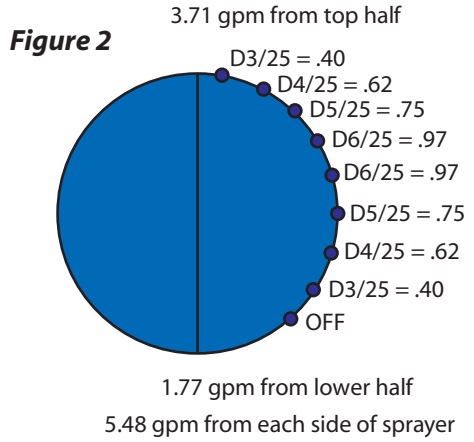
Step 4: Calculate 1/3 of the total gpm per side for the lower half of the manifold: .333 * 5.45 = 1.81.

Step 5: Use a nozzle chart like the one shown in Figure 1 (below) and the output pressure from your spray pump to determine the disc and core that will produce the desired output for each nozzle.

Figure 1

Orifice Disc No.	Core No.	GPM @ 200 psi
D2	25	0.34
D3	25	0.40
D4	25	0.62
D5	25	0.75
D6	25	0.97
D7	25	1.18

Figure 2



One possible arrangement to achieve this output is shown in Figure 3 (below). Nozzle arrangement on the manifold is pictured in Figure 2 (above).

Figure 3

Nozzle	1	2	3	4	5	6	7	8	9	Total
GPM	0.40	0.62	0.75	0.97	0.97	0.75	0.62	0.40	0.00	5.48
Disk/Core	25/3	25/4	25/5	25/6	25/6	25/5	25/4	25/3	Off	

Recheck calibration regularly throughout the season.