Extension Pesticide Applicator Training Series #4: Sprayer Calibration

Guide A-613

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Cooperative Extension Service • College of Agricultural, Consumer and Environmental Sciences

Sprayer Constants

There are four times when a sprayer must be recalibrated. The calibrated output of the sprayer will remain constant as long as ground speed, spray pressure, number of nozzles, and nozzle orifice are unchanged. Whenever any of these are changed, the sprayer must be recalibrated.

1. **Ground Speed**. The speed at which the sprayer travels over the ground will significantly affect sprayer output. Faster speeds produce lower output per surface area, while slower speeds increase output. However, adjusting ground speed is not the best way to adjust sprayer output. Speed should be dictated by evenness of the terrain, obstacles, condition of the equipment, etc. The primary consideration of ground speed is safety. The speed should be set to complete the operation as quickly as possible without risk to people or property.
2. **Spray Pressure**. Several considerations affect spray pressure decisions. Some product labels require pesticides to be applied within a specified pressure range. A number of products are low-pressure, low-volume pesticides applied under very low pressure. Applicators must also always be aware of drift potential from their operations. High pressures present greater risks from drift, so adjusting spray pressure to change sprayer output is usually not a good choice. Also, unless a significant change of 10 or more pounds per square inch (psi) can be accomplished, adjusting spray pressure will produce only minor changes in output.
3. **Number of Nozzles**. Nozzle number is determined by sprayer design. For sprayers that are equipped with directional boom control valves for partial boom applications, each arrangement of boom selection should be calibrated independently. In most cases, the number of nozzles will remain constant unless the sprayer is rebuilt or retrofitted.
4. **Nozzle Orifice**. The nozzle opening or orifice directly affects output and is the most practical way to adjust sprayer output. Several brands of nozzles are available with similar spray patterns (flat fan, cone, etc.) and with various orifice sizes for adjusting output.

Getting Started

Basic tools needed to calibrate a sprayer:

- Personal protective equipment: gloves, goggles, rubber boots, etc.
- Measuring tape 50 foot or greater
- Measuring beaker in fluid ounce graduations
- Stopwatch or watch with a second hand
- Calculator

These figures will be needed to make calibration calculations:

- 43,560 square feet (ft^2) per acre
- 128 fluid ounces (fl oz) per gallon

Calibration Procedure[2]

Sprayer calibration is accomplished by determining the effective spray width, using a test area to test the sprayer's output and time needed to cover the test area, and summing these values to determine the sprayer output per acre.

Step 1: Determine effective spray width (ESW) for broadcast applications. (ESW = nozzle spacing × number of nozzles)

Example: 20-inch spacing × 8 nozzles = 160 inches
160 inches / 12 inches = 13.3 feet ESW

Step 2: Measure and mark off a test area with a length of between 50 and 100 feet; any convenient length, such as a fence line or driveway, will work. The width of the test area will be the ESW as determined in Step 1. After measuring and marking off the test area, determine the square footage of the area. (Square feet of test area (TA) = length of TA × ESW)

Example: 50-foot TA × 13.3 feet = 665 ft^2 per TA

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[2]This sprayer calibration procedure applies to "over the top" ground equipment only.

Step 3: Determine number of TAs per acre. (TAs per acre = ft^2 per acre / ft^2 per TA)

Example: 43,560 ft^2 / 665 ft^2 = 65.5 TAs per acre

Note: Lawn and garden pesticide rates are often given per 1,000 ft^2. To determine the number of TAs in 1,000 ft^2, simply replace 43,560 with 1,000 in Step 3.

Step 4: Determine the time required to cover the TA. Use water only in the tank during this calibration.

- Operate the sprayer with speed and pressure at field operating conditions.
- Achieve operating speed before entering the TA course.
- Mark start and finish time from the same point on the machinery (e.g., driver's seat).
- Take an average of three timed trials for shorter TA lengths.
- Record the average or most accurate time required to cover the TA.

Step 5: Determine the sprayer output for the TA. Use water only in the tank during this calibration.

- Set parking brake or otherwise secure the machinery.
- Operate the sprayer at field operating pressure.
- Collect spray output from one nozzle for the same period of time required to cover TA (determined in Step 4). (Total sprayer output per TA = fl oz per nozzle × total number of nozzles)

Example: 6 fl oz per nozzle × 8 nozzles = 48 fl oz per TA

Note: While performing Step 5, it is a good time to compare nozzle wear by testing all nozzles. Nozzle output should be within ±5% of each other. Replace worn nozzles with those that have equal flow rates.

Step 6: Determine the sprayer output per acre. Sprayer output per acre = fl oz per TA × TAs per acre

Example: 48 fl oz per TA × 65.5 TAs per acre = 3,144 fl oz per acre

Conversion to gallons per acre: fl oz per acre / fl oz per gallon

Example: 3,144 fl oz per acre / 128 fl oz per gallon = 24.5 gallons per acre

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