

USING AND CALIBRATING backpack sprayers

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Managing weed and insect pests may seem daunting to many small acreage landowners who are hesitant to spray pesticides. A pesticide application doesn't need to be applied with large vehicle mounted boom / broadjet sprayers and can often be accomplished without contracting and low input costs. Proper use of an inexpensive backpack sprayer can save a small acreage landowner money and time while maintaining effective control of pests.

An applicator may assume that recently purchased sprayers will be calibrated to apply the proper amount of pesticide for their application, or that properly calibrated equipment stored in the fall will be calibrated the next season. These assumptions often lead to plugged or damaged nozzles which result in poor control, expensive re-applications, and damage toward beneficial plants. Backpack sprayers can be an effective management tool, if calibrated at least once a year using a few simple steps. Calibration tools include a stopwatch, measuring tape, source of fresh water, measuring container, pencil and paper.



Pre-calibration

It is not uncommon for a leaky backpack sprayer to saturate unwary applicators with pesticide product while spraying. This dangerous situation can be alleviated if an applicator takes a few minutes to inspect equipment. Check pumps, lines, hose clamps and fittings for leaks while assessing entire sprayer for rust, wear and breakage.

An applicator should inspect nozzles as well. A nozzle is composed of four items including a spray tip, screen (strainer), cap, and nozzle body. Screens should be

inspected for debris and replaced if necessary. Spray tip pattern should be assessed for uniformity by simply spraying over concrete in a sweeping motion (6 – 20" from surface depending on type of nozzle) and inspecting the spray pattern. Nozzle tips should be replaced or cleaned if the spray pattern seems uneven. Select nozzle tips that are rated for your application type (Table 1).

Table 1. Common backpack sprayer nozzles, uses, and swath width.

NOZZLE TYPE	SITE / USE	SWATH
Adjustable	Tree Spraying or Long distance Spot	Narrow
Flat Fan Spray	Paths, Gardens, and General	Moderate
Hollow Cone	Spot spraying, brush and small trees	Moderate
Jet Stream	Longer Range Spot Spraying	Narrow
Flood	High output nozzles	Wide Swath
No drift nozzles	Applying at low pressure	Moderate

Calibration of Output

The goal of calibration is to ensure that the output (gallons per acre; GPA) of a sprayer equals the output that is recommended on the pesticide product label. The 128th-acre shortcut method can be used for calibrating a backpack sprayer.

Measure an 18.5 ft. by 18.5 ft. area, which represents a 128th-acre.

Fill the backpack sprayer with water and increase pressure in the tank to a level that will be consistently maintained while spraying.

Time how long it takes to spray this 128th acre area with water at a constant speed and pressure (Note: Ensure uniform coverage without dripping). Repeat three times and calculate the average time required. (Example: 92 seconds to spray 128th acre).



Spray into a measuring container for that amount of time. The number of ounces collected can be converted directly to GPA (Example: Collected 40 ounces from nozzle in 92 seconds, which equals 40 GPA).

Inaccurate calibration often is caused by not maintaining a consistent spray routine that is identical to the actual spray situation. It may be necessary to calibrate your sprayer while walking backwards, as walking backwards while spraying pesticides will minimize exposure. Always remember to keep pressure as even as possible while using gentle arcing patterns.

An applicator may adjust the output of the backpack sprayer by adjusting spray speed or pressure. Doubling your spray speed will decrease the output of the sprayer by half, while decreasing spray speed will increase output of sprayer. Pressure may be adjusted to fine-tune your calibration. Nozzles can only operate between recommended pressure ranges.

Table 2. Conversions for measuring pesticides.

MEASUREMENT	= OUNCES
Teaspoon	.17
Tablespoon	5
Cup	8
Pint	16
Quart	32
Liter	34
Gallon	128
Grams	0.035 oz dry weight
Pound	16 oz dry weight
Kilogram	32 oz dry weight

Proper Tank Mixing. Once calibrated, it is necessary to determine amount of solution to mix, amount of pesticide product to add to the tank and area that can be covered. You can also use the conversion chart to aid in tank mixing (Table 2).

Step 1. Backpack sprayers hold between two and five and one-half gallons. Use this formula to determine the number of acres you wish to cover with your tank.

$$\frac{\text{Gallons in Tank}}{\text{Gallons Per Acre (GPA)}} = \text{Sprayable Acres}$$

Step 2. To determine the amount of spray solution needed in tank, an applicator should multiply the output of the sprayer (GPA) by the number of acres to spray.

$$\text{Spray Mix Needed} = \text{GPA} \times \text{Acres}$$

Step 3. To determine amount of pesticide product to add to the tank, divide the recommended rate (must be in acres) by the output of the sprayer.

$$\text{Amount of Pesticide Product to add per Gallon of Solution} = \frac{\text{Product Label Recommendation (per acre)}}{\text{GPA (Gallons Per Acre)}}$$

For example: Your product label recommends a rate of 8 oz. / acre and your sprayer is calibrated at 20 GPA. 8 oz. / 20 GPA = 0.4 ounces of pesticide product per gallon of solution. Add .4 ounces of pesticide product per gallon of pesticide solution.

Conclusion

By calibrating your backpack sprayer annually, you can effectively manage your small acreage pest populations in a less expensive and timely manner.

Additional resources are available online at www.pesticides.montana.edu by selecting 'Reference Materials.' At that web site, you may download a more detailed calibration MontGuide titled Calibrating Ground Sprayers Using Shortcut Methods (MT200915AG). You may also download an interactive program, 'The MSU Calibration Assistant,' which aids applicators in using shortcut methods. If you have any further questions contact Pesticide Education Specialist Cecil Tharp, 119 Linfield Hall, Montana State University, Bozeman, MT 59717, or (406) 994-5067 or ctharp@montana.edu. ■