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Herbicide Sprayer Calibration Guidelines

Practical guidelines for calibrating large and small volume sprayers and equipment with boomless nozzles.

by Celestine Duncan. February 2012. Updated 9/2015. http://techlinenews.com

HOW DO I MAKE THE MOST OF MY HERBICIDE SPOT TREATMENTS?

Accurate timing, careful measurements of herbicide and uniform spray motions are essential to proper, economical application. Consistent spray motions can help obtain good coverage of troublesome weeds. Soaking scattered weeds rather than using regular spray motions may result in excessive rates that could injure desirable species.

HOW MUCH HERBICIDE DO I PUT IN MY TANK?

The mix amount is dependent on your spray volume and your application rate. Therefore, this question cannot be answered until we know the volume that is being applied with your particular spraying style in gallons per acre (GPA). The following step-by-step procedure will allow you to calibrate your spray volume (see answer at end).

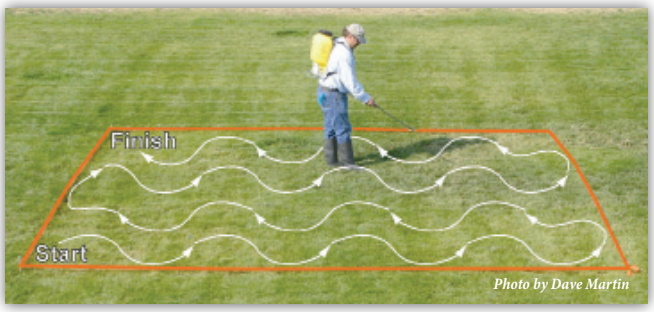
SIX SIMPLE STEPS FOR SPRAYER CALIBRATION

The following step-by-step method of calibrating a backpack or hand-gun sprayer involves very little math or formulas. It is based on the following principal:

> ***One gallon = 128 fluid ounces and your calibration area to be sprayed is 1/128 of an acre, thus fluid ounces collected = gallons per acre (GPA).***

STEP 1. Clean sprayer and nozzle thoroughly. Then, fill the spray tank with clean water. Spray with water only to check to see that the nozzle forms a uniform spray pattern. If the pattern is uneven, check to make sure the nozzle is clean and replace it if needed. Adjustable nozzles should be set and marked to permit repeated use of the selected spray pattern. If necessary, add a marker dye to the water to more easily see your spray pattern.

STEP 2. Measure an area 18.5 feet by 18.5 feet, which is equal to 1/128th of an acre. ***If possible, this should be done in the field on which you will be spraying.***



STEP 3. Time the number of seconds it takes to spray the measured area uniformly with water using gentle side-to-side sweeping motion with the spray wand similar to spray painting a home or automobile. Record the number of seconds required to spray the area. During application be sure to maintain a constant sprayer pressure and cover the entire area uniformly one time. ***You should repeat step 3 at least twice and use the average of the two times.***

STEP 4. Spray into a container for the average time calculated in step 3. Be sure to maintain constant sprayer pressure while you spray into the container.

STEP 5. Measure the number of fluid ounces of water in the bucket. The number of fluid ounces collected from the bucket is equal to the number of gallons of water per acre the sprayer is delivering. ***Volume sprayed in fluid ounces = gallons of water per acre (GPA).***

STEP 6. Add the proper amount of herbicide to the tank.

FOR BACKPACK OR OTHER SMALL VOLUME SPRAYERS:

- Use Table 1 to determine how much ***liquid herbicide*** to add to ***1 gallon*** of water.
- Use Table 2 to determine how much ***dry herbicide*** to add to ***2 gallons*** of water.

FOR LARGER HAND-GUN SPRAYER:

- Use Table 3 to determine the amount of liquid herbicide to add to your spray tank.

Find your spray volume in gallons per acre (GPA - calculated above) and read across the tables below to determine the amount of herbicide to add to each gallon of water based on the recommended herbicide application rate (amount of herbicide per acre) for the weeds you are spraying.

1 BACKPACK OR OTHER SMALL VOLUME SPRAYERS
Liquid Herbicide Formulations

TABLE 1. The amount of liquid herbicide you need to add to 1 gallon of water based on the recommended rate for the weeds you are spraying.

GPA (from step 5)	Recommended Application Rate per Acre (A)				
	5 fl oz/A	*7 fl oz/A*	*1 pint/A*	*1 quart/A*	*2 quarts/A*
20	7.5 cc/gal	10.5 cc/gal	5 tsp/gal	10 tsp/gal	3 1/4 fl oz/gal
30	5 cc/gal	7.0 cc/gal	3 tsp/gal	6 tsp/gal	2 fl oz/gal
40	3.8 cc/gal	5.3 cc/gal	2 1/3 tsp/gal	4 3/4 tsp/gal	1 2/3 fl oz/gal
50	3.0 cc/gal	4.2 cc/gal	2 tsp/gal	3 3/4 tsp/gal	1 1/4 fl oz/gal
60	2.5 cc/gal	3.5 cc/gal	1 2/3 tsp/gal	3 1/4 tsp/gal	6 1/3 tsp/gal
70	2.1 cc/gal	3.0 cc/gal	1 1/3 tsp/gal	2 3/4 tsp/gal	5 1/2 tsp/gal
80	1.9 cc/gal	2.6 cc/gal	1 1/4 tsp/gal	2 1/3 tsp/gal	4 3/4 tsp/gal
90	1.7 cc/gal	2.3 cc/gal	1 tsp/gal	2 tsp/gal	4 1/4 tsp/gal
100	1.5 cc/gal	2.1 cc/gal	1 tsp/gal	2 tsp/gal	3 3/4 tsp/gal

2 BACKPACK OR OTHER SMALL VOLUME SPRAYERS
Dry Herbicide Formulations

Dry formulations can be either measured (in teaspoons) or weighed (ounces) and added to the tank. Both options are shown below.

TABLE 2A. Teaspoons (tsp) of dry herbicide you need to add to 2 gallons of water based on the recommended rate for the weeds your are spraying.

GPA (from step 5)	Recommended Application Rate per Acre (A)			
	1 oz/A	*2 oz/A*	*2.5 oz/A*	*3.3 oz/A*
20	1.00 tsp/2 gal	2.00 tsp/2 gal	2.50 tsp/2 gal	3.30 tsp/2 gal
30	0.7 tsp/2 gal	1.33 tsp/2 gal	1.67 tsp/2 gal	2.20 tsp/2 gal
40	0.50 tsp/2 gal	1.00 tsp/2 gal	1.25 tsp/2 gal	1.65 tsp/2 gal
50	0.40 tsp/2 gal	0.80 tsp/2 gal	1.00 tsp/2 gal	1.32 tsp/2 gal
60	0.30 tsp/2 gal	0.67 tsp/2 gal	0.83 tsp/2 gal	1.10 tsp/2 gal

TABLE 2B. Ounces (oz) of dry herbicide you need to add to 2 gallons of water based on the recommended rate for the weeds your are spraying.

GPA (from step 5)	Recommended Application Rate per Acre (A)			
	1 oz/A	*2 oz/A*	*2.5 oz/A*	*3.3 oz/A*
20	0.1 oz/2 gal	0.20 oz/2 gal	0.25 oz/2 gal	0.33 oz/2 gal
30	0.07 oz/2 gal	0.13 oz/2 gal	0.17 oz/2 gal	0.22 oz/2 gal
40	0.05 oz/2 gal	0.10 oz/2 gal	0.13 oz/2 gal	0.17 oz/2 gal
50	0.04 oz/2 gal	0.08 oz/2 gal	0.10 oz/2 gal	0.13 oz/2 gal
60	0.035 oz/2 gal	0.07 oz/2 gal	0.08 oz/2 gal	0.11 oz/2 gal

ABBREVIATIONS

1 cc=1 milliliter (ml)
gal=gallon
GPA=gallons per acre
fl oz=fluid ounces
oz=ounces
A=acre
tsp=teaspoon
TBS=tablespoon
pt=pint
qt=quart

CONVERSIONS

1 tsp=5 cc
1/2 tsp=2.5 cc
1/4 tsp=1.3cc
3 teaspoons = 1 tablespoon
2 tablespoon = 1 fluid ounce
8 fluid ounces = 1 cup
1 cup = 16 tablespoons
1 pint = 16 fl oz
1 quart = 32 fl oz

EXAMPLE 1. For backpack sprayers with LIQUID HERBICIDE formulations

You have completed the calibration procedure and applied 30 fluid ounces in the measured area. Therefore, your spray volume is 30 GPA. Look at Table 1 for the amount of liquid herbicide to mix in 1 gallon of water. Assume you want to apply 5 fluid ounces of Milestone® per acre; the amount listed for your spray volume (GPA) and this application rate is 5 cc in each gallon of water. If you are filling a 3-gallon backpack sprayer take this amount times 3 and you would need to measure 15 cc (**with a syringe**) or 3 tsp (teaspoons) of Milestone® for your 3 gallon mix. It doesn't take much.

EXAMPLE 2. For backpack sprayers with DRY HERBICIDE formulations

You have completed the calibration procedure and applied 40 fluid ounces in the measured area. Therefore, your spray volume is 40 GPA. Look at Table 2 for the amount of dry herbicide to mix in 2 gallons of water based on your spray volume. Assume you want to apply the 2.5 ounce rate of Opensight®. Referencing Table 2, the amount of Opensight needed for your spray volume (GPA) and the 2.5-ounce application rate is 1¼ teaspoons. Add 1¼ teaspoons of dry product (it doesn't take much) into 2 gallons of water **plus 2 tablespoons of a quality agricultural surfactant.** Make sure the herbicide is in solution with agitation. Shake the backpack periodically to maintain solution.

TIP: Use a syringe to measure herbicide if you are applying a low-rate product like Milestone (e.g., 5 to 7 fl oz/ac). See page 3. [1 tsp=5cc, 1/2 tsp=2.5 cc, 1/4 tsp=1.3 cc]

3 LARGER HANDGUN SPRAYERS *Liquid Herbicide Formulations*

TABLE 3. The amount of LIQUID HERBICIDE you need to add to 100 gallons of water based on the recommended rate for the weed you are treating.

GPA (from step 5)	Recommended Application Rate per Acre (A)				
	5 fl oz/A	***7 fl oz/A***	***1 pint/A***	***1 quart/A***	***2 quarts/A***
20	25.0 fl oz	35.0 fl oz	5 pt	5 qt	10 qt
30	16.7 fl oz	23.3 fl oz	3.3 pt	3.3 qt	6.6 qt
40	12.5 fl oz	17.5 fl oz	2.5 pt	2.5 qt	5 qt
50	10.0 fl oz	14.0 fl oz	2 pt	2 qt	4 qt
60	8.3 fl oz	11.7 fl oz	1.6 pt	1.6 qt	3.2 qt
70	7.1 fl oz	10.0 fl oz	1.4 pt	1.4 qt	2.8 qt
80	6.3 fl oz	8.8 fl oz	1.25 pt	1.25 qt	2.5 qt
90	5.6 fl oz	7.8 fl oz	1.1 pt	1.1 qt	2.2 qt
100	5.0 fl oz	7.0 fl oz	1 pt	1 qt	2 qt

EXAMPLE 3. For larger handgun sprayers withliquid herbicide formulations

You calibrate your sprayer and the output is 50 GPA, and your sprayer holds 100 gallons. The area you can treat is 2 acres with your full spray tank. The label requires an herbicide application rate of 5 fl oz/acre for the target weed. Look at Table 3 for the amount of liquid herbicide to mix into 100 gallons of water. You would add 10 fl oz of liquid herbicide to your tank since you are treating 2 acres with each full tank mix.

Calibrating equipment with boomless nozzles* with a refill method

(*e.g., boom-buster or boom-i-nator)

The refill method of calibration is simple and easy to understand. This should always be done in the field on terrain similar to where you plan to make the herbicide application. Field surface conditions can greatly affect sprayer speed, which in turn affects application rate. Basic steps for the refill method are as follows.

STEP 1. Park the sprayer on level ground, then fill the spray tank with water to an easily determined point (mark this on the tank).

STEP 2. Adjust the pressure to recommended level. Most nozzles work best between 30 and 35 psi (pounds per square inch).

STEP 3. Select a speed that can be easily maintained for field conditions. Field conditions will have a large effect on speed, which affects application rate. For example a sprayer calibrated at 4 mph but driven at 3 mph will over-apply by 33% potentially damaging non-target vegetation!

STEP 4. Spray a measured area (spray swath width and length). Measure a length to spray--such as 200 feet--and drive that length at a speed that negotiates terrain and minimizes drift. Measure the spray swath width during this step.

STEP 5. Return to the filling point. Be sure to park equipment in the same location to refill the tank.

STEP 6. Measure the amount of water required to refill the tank. Use a calibrated pail so you can accurately measure water required to fill the sprayer to the original mark.

STEP 7. Calculate the spray rate. The final step is to determine the spray rate; in this case it will be in gallons per acre (GPA).

$$GPA = \frac{\text{gallons sprayed [from Step 6] X 43,560 sq ft/acre}}{\text{swath width (ft) X swath length (ft) [as measured in Step 4]}}$$

STEP 8. Add the proper amount of herbicide to the tank. Example: Your spray tank holds 30 gallons total. If you want to apply one pint of herbicide per acre, and your spray rate is 15 gallons per acre (as calculated in Step 7), then you would add two pints of herbicide to the tank. The best way to mix is to add half of the amount of water to the tank, then add the herbicide, then fill the sprayer with water to the 30-gallon mark.

READ MORE ABOUT BOOMLESS NOZZLES:
http://bit.ly/boomless