ALABAMA COOPERATIVE Extension SYSTEM
Alabama A&M and Auburn Universities

AGRONOMY AND SOILS SERIES

TIMELY INFORMATION
Agriculture & Natural Resources

Calculating herbicide amounts to add to backpack or hand sprayers

---

Agricultural or pasture herbicide recommendations are often given in terms of broadcast application rates such as product rate per acre (i.e., pints of product per acre). Since invasive plants are frequently controlled using backpack or hand sprayers, the herbicide rate is typically recommended as a percentage of the total spray volume and is often expressed as **percent solution** or **percent volume to volume (% v/v) or (%vol/vol).** These units can be confusing and the purpose of this information sheet is to explain how to calculate herbicide percentages and how much herbicide you need to add to the backpack spray tank.

To determine how much herbicide to add to a sprayer when rates are give in %v/v:

1) Based on the size your sprayer and how much you need to spray, determine the total volume of spray solution you want to mix. *Example:* I have a 3 gallon backpack sprayer and I want to mix 3 gallons total.

2) Determine what percent solution (%v/v) of herbicide recommended for the job. *Example continued:* Let's say we are going to spray blackberries along a fence and the recommendation is to spray Garlon 4® at 1% v/v. To make a 1% v/v solution for our 3 gallon mix size, we must calculate what 1% of 3 gallons is. To do this we multiply 3 gallons x (1%/100%). In other words: 3 gallons x 0.01 = 0.03 gallons. Unfortunately, 0.03 gallons is not easy to measure so we need better units.

3) Convert units to make measuring easier. *Example continued:* Fluid ounces are a commonly used unit of measure for liquids and there are 128 fluid ounces in one gallon. To convert from gallons to fluid ounces: 0.03 gal x 128 fluid ounces/gallon = 3.84 fluid ounces.

4) Measure and add the herbicide to the tank. *Example continued:* Now we pour 3.84 fluid ounces into a measuring container and then add it to our spray mix. We then add the water and herbicide to the backpack tank and fill to the three gallon mark. This gives us a 1% v/v solution of Garlon 4®.

Here are a few rules of thumb that may help.
1) Foliar treatment herbicide rates vary by herbicide but you can expect most to fall within the range of 0.5% to 5% v/v. To make one gallon of a 0.5% v/v solution, you would use 0.64 fluid ounces of herbicide. To make one gallon of a 5% v/v solution, you would use 6.4 fluid ounces of herbicide and 121.6 oz of water.

2) Surfactants are typically added when applying foliar treatments. They are used at very low rates that may range from 0.25% v/v for nonionic surfactants to 1 % v/v for crop oils and methylated seed oils. While it is tempting to add more than just an ounce or so to a gallon mix, higher rates of these do not help except in very special cases.

3) Basal bark and cut stump herbicides are typically mixed at much higher rates. They generally range from 20 to 25 % v/v for most products but some may be as high as 50 to 100.

Important conversion equivalents for volume: You can easily use these amounts to convert to different units depending upon the measuring units you need. These are some of the most useful units for small volume herbicide mixing. Note: Never use any pesticide measuring tool (cups, tablespoons, pint jars) for anything but that purpose to prevent poisoning.

1 gallon = 3,785 milliliters
= 3.785 liters
= 16 cups
= 128 fluid ounces
= 8 pints
= 4 quarts

1 cup = 8 fluid ounces
= 16 tablespoons
= 236 milliliters

1 fluid ounce = 6 teaspoons
= 2 tablespoons
= 29.5 milliliters

Authors: Stephen Enloe and Nancy Loewenstein
Questions? Contact your local Alabama Cooperative Extension Office. www.aces.edu