

Measuring Insecticide or Fungicide for Backpack Sprayers

Growers with diverse crops and small plantings often need to be able to apply pesticide to beds or plots of several hundred square feet. It can be difficult to figure out how to calibrate a backpack sprayer for spraying a small area. Some labels give rates for backpack sprayers (ie amount per gallon of water), but most only provide rates per acre (ie amount per land area treated). Rates may have to be calculated by converting from the rate per acre (ie, per 43,560 sq ft) to rates for a few hundred square feet. Careful division gives you the amount you need. However, it is also critical to properly calibrate your sprayer by determining how much water you use to cover a given area.

For some products, spraying small areas may mean that you need to measure extremely small amounts. Some labels provide conversions of volume to weight, but many do not. For example, if you are using spinosad (Entrust formulation, a dry powder) you may need to weigh product in grams. If a gram scale is unavailable, then it is possible to measure Entrust by volume. Based on repeated samples, we found that, on average, the volume was 1.7 gm per teaspoon (shaved level and tamped slightly) of Entrust powder. One ounce (dry weight) equals 28.45 grams.

Liquid measured in (fluid) ounces is already a volume so it is easier to measure. One fluid ounce equals 29.6 milliliters (ml). Some pesticides call for very low rates per acre and may need to be measured in ml when treating small areas. Nicotinoid insecticides are an example. An inexpensive measuring device for ml can be found in the children's medicine section of drug stores.

Even if you are using pesticide products that are relatively safe, always store in a safe place, handle carefully, follow the directions on the label, and use the required protective gear for mixing, spraying, and cleaning your sprayer. Mix in a designated area that is away from workers and the public.

When calibrating and using your sprayer, be consistent. The amount of spray you apply to an area will depend on four variables: your walking speed, the pressure you select, your spray swath width, and the nozzle tip you've chosen. *If you change any one of these, you change the amount of spray you apply.*

Walking speed. This constant walking speed should be one that you can comfortably maintain over the entire time you intend to spray. It also must be the same speed at which you calibrate the sprayer. If you double your walking speed while maintaining pressure and swath width, you'll apply half as much spray. You would then require twice as much pesticide per gallon (that is, a greater concentration) to apply the same amount of pesticide per acre.

Pressure. If you change the pressure while you spray, you change output. Increased pressure results in higher output; the exact relationship depends on your nozzle type.

Nozzle tip selection. The proper tip will depend on the situation. Tips are available that cover a wide range of output volumes, spray widths, and pressures. Most backpack sprayers come with a single flat fan nozzle, but a cone tip may be more appropriate for covering foliage.

Swath width/nozzle height. Tips are designed for use within certain heights and pressures. Within these ranges, some tips deliver narrow bands; others, like flooding tips, provide swath widths up to 7 feet. The wider each swath width, the less time the operator spends walking up and down fields. The height at which you hold the spray tip above the target influences the swath width. Spraying as close to the target as is practical minimizes drift and operator contact.

Below are examples of two different ways to calibrate and mix backpack sprayers.

First, check your sprayer coverage and operation. Select the spray tip or boom setup that provides the desired coverage. Add water, and spray the ground or dry pavement as if you were spraying your field. Check the spray pattern for uniformity (and proper spray pattern overlap if you're using a boom). You can also check it over the crop to see if you are getting good coverage. Adjust nozzle spacing and/or height until you achieve the desired pattern. Be certain you're getting uniform coverage before you proceed! Check fittings and hoses for leaks.

Method 1. Concentration: Using the Labeled Rate per Gallon for a Backpack Sprayer.

Pesticide labels for agricultural crops generally give the rate to use per acre. Some labels also provide a rate of product to use per gallon, or concentration, for backpack sprayers. If this is given, add that amount of insecticide to each gallon of water. Spray to cover the crop foliage, but not to runoff on the ground. Mix the amount you need to cover your crop area.

The following rates for two commonly used organic insecticides are listed on the product label:

Product	Amount per gallon	Amount per 3 gal (1000 sq ft)	Rate per acre
Entrust	.43 gm (0.015 oz)	1.3 gm (0.046 oz) (3/4 tsp)	2 oz
Surround WP	1 1/2 -3 cups	4.5-9 cups	50 lb

If a gram scale is unavailable, then it is possible to measure Entrust by volume. Based on repeated samples, we have found that there is 1.7 gm per teaspoon (shaved level and tamped slightly) of Entrust powder. For Entrust, do not use more than 3 gallons of water per 1,000 sq ft.

Converting Metric and English measures:

One ounce (dry weight) equals 28.45 grams. Liquid measure in (fluid) ounces is already a volume so it is easier to measure. One fluid ounce equals 29.6 milliliters (ml). An inexpensive measuring device for ml can be found in the children's medicine section of drug stores.

Method 2. Match the amount of pesticide to the amount of water needed to spray the crop area.

1. Calculate what portion of an acre is being sprayed. Determine sq ft of area to be sprayed (multiply bed or canopy width by row length by number of rows). Calculate how much of an acre this is (this may be a small fraction of an acre):

$$\text{acres to be sprayed} = \text{number of ft}^2 \text{ to spray} / 43,560 \text{ ft}^2 \text{ per acre}$$

2. Calculate how much pesticide to use. Multiply the rate per acre for the crop and pest (from the label) times the proportion of an acre to be sprayed.

Amount of pesticide needed = amount per acre X proportion of acre to be sprayed

3. Measure water needed per sq ft of crop. Add a known amount of water (eg 1 or 2 gallons) to the tank. Spray the water as if you were actually spraying your field. Remember, you must maintain constant pressure, constant walking speed, and consistent nozzle height and boom setup or wand motion to achieve the coverage you need. This amount will change with different crops and size of crop canopy. When the water is gone, stop and mark the spot. Measure the area you sprayed and calculate the square feet (length of swath x width). Calculate how many gallons needed per sq ft.:

Gallon per ft² = number of gallons used/ number of ft² sprayed

4. Determine total water needed:

Gallons of water needed = gal./ft² X number of sq ft to be sprayed.

5. Mix the required amount of pesticide in the required amount of water. It is best to add half the water, add the pesticide, agitate, then add the remaining water. Spray, using the walking speed, pressure, nozzle and boom setup or wand motion that you used for calibrating.

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