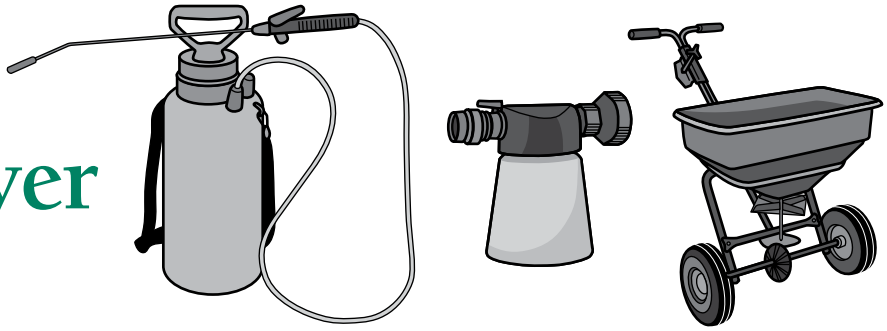
Small sprayer calibration



Pesticides are used to control various pests that cause undesirable effects on landscape elements (lawns, annual and perennial flowers, vegetable plants, fruit trees, and woody ornamentals). Each insecticide, fungicide, or herbicide must be applied uniformly at the labeled rate to achieve consistent results. It is essential for you to take time to properly calibrate a sprayer so that you to get the best product performance, diminish the possibility of injury, and reduce pest control costs.

Before applying a pesticide, read the label completely and follow its recommendations and safety precautions. The label will indicate on which plants and for which pests the pesticide can be used. It also will indicate if there are any special equipment requirements.

Using compressed-air sprayers

Home gardeners commonly use two types of compressed-air sprayers for applying pesticides: hand-pump units and backpack sprayers.

The standard compressed-air sprayer is made up of a tank, handle, shut-off valve, and a nozzle attached to a short hose. The tank will hold from one-half to three gallons and is made of galvanized metal, plastic, or stainless steel. The handle of a pump-up sprayer pressurizes the tank as well as serves to carry the sprayer. These sprayers are relatively inexpensive and provide an accurate way to apply most liquid pesticide mixtures.

Backpack sprayers have the same components as a hand-pump sprayer, with an added pump arm for keeping the pressure constant and straps to carry the sprayer on your back. Tank sizes vary from 2.5 to 5 gallons. Backpack units cost at least three times more than the hand-pump sprayer.

For pesticides that are applied directly to the plant foliage, calibration is a straightforward process. Product labels recommend adding a specific amount of the formulated pesticide per gallon of water. This dilute spray should be applied to the target plant as per label directions (often until foliage is completely wet or to runoff). Examples of this type of application are: malathion to control aphids on a *Pyracantha*, captan to control gray mold on strawberries, and postemergent glyphosate to renovate a section of lawn.

A more precise application is required when applying products such as preemergence herbicides to the soil. Rates of these products are normally given in quantity per unit area. Because most hand-pump sprayers have neither interchangeable nozzles nor a means of accurately regulating pressure, the output is controlled by altering walking speed or adjusting the concentration of the pesticide in the tank.

It is important to accurately weigh or measure the pesticide. Label a set of measuring spoons or cups specifically for pesticide use. When using hand-pump sprayers to apply chemicals that need to be suspended in water (e.g., wettable powders and dry flowables), regularly agitate the solution during application.

Once you know the size of the area to be treated and the sprayer output (fluid ounces/1000 square feet), you can calculate the amount of pesticide you need to add to the sprayer.

When spraying, hold the nozzle at a constant height and spray back and forth in swaths. It is essential to maintain a constant walking speed during the application.

IOWA STATE UNIVERSITY
Extension and Outreach

PM 1271 Revised March 2013

You can check your spraying technique by practicing with water in the tank. Pressurize your sprayer and make the application on a concrete or asphalt surface. Observe if the water evaporates evenly (preferable) or if there are distinct streaks. Practice until you are able to make a uniform application.

Unless your sprayer has a regulating device, you will need to frequently pressurize the tank to maintain a constant pressure. Recharge the tank before a change in the nozzle spray pattern is noticed.

Calibrating compressed-air sprayers

Properly calibrating a hand-pump (or backpack) sprayer should take only about 15 minutes when following these steps:

1. Measure a test area of 200 to 500 square feet (e.g., 10 feet x 20 feet = 200 square feet).

2. Fill the sprayer with water (either to a marked level or with a measured amount) and uniformly spray the area to be treated. Walk at the pace you normally use for spraying.

3. Carefully release the air pressure and determine the amount of water used. This is done either by measuring the water remaining in the tank and subtracting this amount from the total quantity required to fill the sprayer, ***or*** by measuring the amount of water required to refill the tank.

4. Calculate the application rate of the sprayer.

Example

Measured area = 200 square feet
Water sprayed = 1 quart (0.25 gallons)
Application rate = 0.25 gallons/200 square feet
= 1.25 gallons/1000 square feet

5. Calculate and measure the amount of material needed to uniformly cover the treatment area. Label recommendations are sometimes given only in pound or quart of product per acre rather than ounce per 1000 square feet, so you may need to use one of the following conversion factors:

When using dry products:
ounces/1000 square feet = recommended pounds/Acre x 0.37

When using liquid products:
ounces/1000 square feet = recommended quarts/Acre x 0.73

Example

Garden area = 690 square feet (23 feet x 30 feet)
Dacthal® 75WP rate = 13.5 pounds/Acre
(13.5 x 0.37 = 5 ounces/1000 square feet)

$$\frac{\text{X ounces}}{\text{690 square feet}} = \frac{\text{5 ounces}}{\text{1000 square feet}}$$

1000 • X = (690 x 5)
X = 3.5 ounces

6. Fill the tank with the quantity of water determined in step 2. Add the measured pesticide to the tank and apply the pesticide to the area.

Note: A more uniform application can be achieved by doubling the volume of water required and spraying the area twice, the second at right angles to the first spray pattern. This method applies half the required rate with each pass over the entire area.

Using and calibrating hose-end sprayers

Hose-end sprayers attach to the end of a garden hose and use the suction created by the flow of water to mix the chemical into the spray pattern. Hose-end sprayers are less versatile than compressed-air equipment.

Hose-end sprayers are best suited for foliar applications of insecticides and fungicides. Their distribution pattern can be inadequate for herbicide applications. The higher pressures at which these sprayers operate allow better coverage of tall ornamentals in comparison to compressed-air sprayers. However, these high pressures also result in the formation of small spray droplets that are prone to drift from the target site. With this in mind, most hose-end sprayers should not be used to apply postemergence broadleaf herbicides (e.g., 2,4-D, MCPP, and dicamba) on turfgrass.

The instruction sheet enclosed with the sprayer should provide directions on proper use. If necessary, the application rate can be calculated if the dilution ratio (amount of pesticide the sprayer mixes with water) is known. Common ratios are 24:1 and 60:1. A sprayer with a spray ratio of 24:1 will mix 1 ounce of concentrated pesticide with 24 ounces of water sprayed. Some pesticides may recommend a lower application rate and require dilution with water before adding them to the sprayer's jar. To determine the dilution required for a product, first calculate the amount of dilute spray a full jar will apply. Then set up a ratio to calculate the amount of pesticide to add to the jar and then fill the rest with water.

Example

A hose-end sprayer (24:1 ratio) will be used to apply captan to control apple scab. The label recommends using 3.3 tablespoons of wettable powder per gallon of water. The jar of the sprayer holds 16 fluid ounces. At a 24:1 ratio, 3 gallons of dilute spray will be produced for every 16 ounces of concentrated pesticide in the jar.

$$\frac{16 \text{ ounces concentrate}}{\text{jar}} \times \frac{24 \text{ ounces dilute}}{1 \text{ ounce concentrate}} \times \frac{1 \text{ gallon}}{128 \text{ ounces}} = \frac{3 \text{ gallons dilute}}{\text{jar}}$$

Since a full jar will produce 3 gallons of dilute spray, solve for X to calculate how much product to add to the jar.

$$\frac{3.3 \text{ tablespoons}}{1 \text{ gallon dilute}} = \frac{3 \text{ gallons dilute}}{X \text{ teaspoons}}$$

X = 10 teaspoons (or 3 tablespoons plus 1 teaspoon)

Ten teaspoons of captan should be placed in the jar, and water added so that the mixture comes to the 16-ounce line. Be sure that you mix the wettable powder well in the jar prior to use. If only 1.5 gallons of dilute spray is needed, 5 teaspoons of captan would be added to water for a total of 8 ounces in the sprayer jar.

If you are using a hose-end sprayer to apply pre-emergence herbicides or other products to bare soil at rates given in quantity per area (e.g., ounce per 1000 square feet), calibrate the sprayer using the technique described for compressed-air sprayers.

Using and calibrating granular spreaders

Calibration of granular spreaders is required for an accurate application of fertilizers and herbicides. Granular formulations are easy to apply and have a low drift hazard, but are also more expensive. The active ingredient of the pesticide either coats the outside of clay particles or is absorbed into them.

There are two types of granular spreaders: broadcast and gravity flow. Broadcast (also called rotary) spreaders have from one to three metering ports in the bottom of the hopper from which the product is dropped onto or into the distribution mechanism (e.g., rotary impeller) that flings the material out. Broadcast spreaders cover a wider area faster with less overlap and fewer missed areas than do gravity flow spreaders. However, they do not apply a product evenly across the swath because the outer edges of the broadcast pattern receive less material.

Gravity flow or drop spreaders have a hopper with a series of metering ports in the bottom or rear of the hopper. The product is metered out of each hole, producing a uniform application across the entire width of the hopper. Because the deposit ends at the edges of the spreader, it is important that each pass touches another pass exactly with no space or overlap.

When calibrating a rotary granular spreader for the first time, you must determine the effective swath width of the spreader. This can be done using a blank product, such as kitty litter, to make the calibration of granular spreaders safer. Place seven aluminum pie pans or shallow boxes on the ground two feet apart in a straight line (see diagram 1). Fill the hopper about half full of kitty litter and drive the spreader several times over the center pie pan until plenty of material has accumulated to determine the effective swath width.

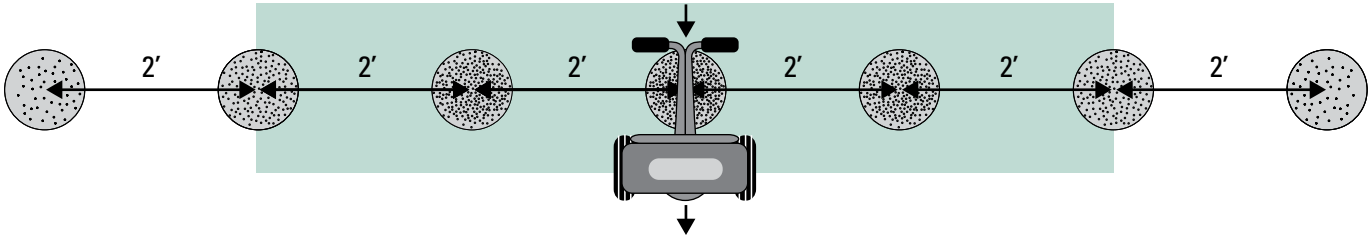


Diagram 1. If the most kitty litter falls in these pans, you can assume swath application width is 8 feet.

The opening of the metering gate setting is the most important factor influencing the effectiveness of a pesticide applied with a granular spreader. Ground speed is the second critical factor significantly affecting the application rate.

1. Read the pesticide label to determine the application rate. Set the metering gate as recommended by the manufacturer.

2. Measure a test area to be treated using the width of the spreader or the swath width of a rotary spreader, as the width of the area. Determine the amount of product to catch in the test area.

Example

Preen® Garden Weed Preventer recommended application rate is 6 pounds/1000 square feet

The test strip is 200 square feet
50′ long x 4′ width of the spreader).

$$\frac{\text{X pounds}}{\text{200 square feet}} = \frac{\text{6 pounds}}{\text{1000 square feet}}$$

$1000 \bullet X = (200 \times 6)$

X = 1.2 pounds (19 ounces)

3. Attach a calibration pan (if available) or a sheet of heavy craft paper to the spreader so the granules will be collected while passing over the test area. Make sure the granules can drop freely and that nothing spills out the sides if craft paper is used.

4. Make sure the feed mechanism is closed. Then fill the hopper of the spreader with pesticide. Open the feed mechanism and push the spreader the length of the test strip. Shut off granule flow.

5. Carefully remove the pan or paper and weigh the pesticide to determine the amount used.

Example

Test area = 200 square feet
Amount of herbicide applied = 0.5 pounds
Application rate = 0.5 pounds/200 square feet
= 2.5 pounds/1000 square feet

6. Compare the recommended application rate to the spreader rate. If the spreader application rate determined in step 5 is not the desired rate, adjust the spreader's meter setting and repeat the steps until the desired application rate is obtained.

Note: The best way to obtain a uniform application is by calibrating the granular spreader so that half the recommended rate is to be applied and to cover the area twice, making the second application at right angles to the first.

Useful Conversion Factors

3 teaspoons (tsp.) = 1 Tablespoon (Tbsp.)
2 tablespoons (tbsp.) = 1 fluid ounce (oz.)
16 ounces (oz.) = 1 pint (pt.)
2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)
128 ounces (oz.) = 1 gallon (gal.)
16 ounces (oz.) = 1 pound (lb.)
43,560 square feet (sq. ft.) = 1 acre (A)

Revised by Mark H. Shour, extension program specialist.

Originally prepared by Linda Naeve, extension program specialist, and Bob Hartzler, extension weed specialist.