



PURDUE PESTICIDE PROGRAMS

Purdue University Cooperative Extension Service

LANDSCAPE PESTICIDE APPLICATION EQUIPMENT A Guide to Selection and Calibration of Liquid Sprayers

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TABLE OF CONTENTS

PAGE

INTRODUCTION	3
RECOMMENDED CULTURAL PRACTICES	5
OWNER'S MANUAL AND INSTRUCTIONS	5
THREE BASIC STEPS TO PROPER CALIBRATION	6
USING LIQUID PRODUCTS	8
HOSE-END SPRAYERS	10
COMPRESSED AIR SPRAYERS	19
BUCKET SPRAYERS	28
CONCLUSION	36
ACKNOWLEDGMENTS	38
ADDITIONAL PPP PUBLICATIONS FOR THE HOMEOWNER	38
CONVERSIONS	INSIDE BACK COVER

INTRODUCTION

The old Victorian home had been neglected for decades. Once the governor's residence and the jewel of the block, it had become the neighborhood eyesore.

Deterioration had taken its toll over the years as owners and tenants came and went, and now the house was for sale once again.

Your family had grown larger and it was time to consider purchasing a bigger home, so you decided to view the old Victorian. The signs of neglect were shocking: peeling paint, falling wallpaper, crumbling ceilings, scarred wooden floors, and rotten window frames. But you knew that underneath there was a beautiful home just waiting to blossom. It would take a lot of hard work.

Several years and lots of elbow grease later, your dream of restoring the run-down old house had materialized; and, once again, it was

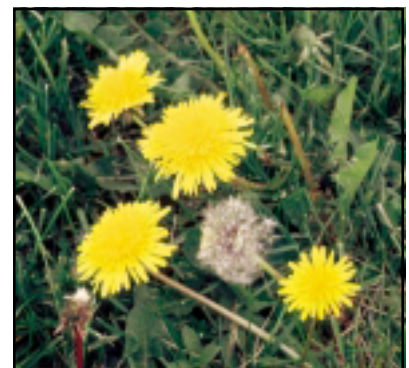
admired by neighbors and passersby. But the focus on the house had meant that other projects were set aside, and the lawn had fallen victim to neglect just as the house once had. Your new focus would be to create a beautiful landscape to complement your beautiful home.

First, you visit with your county Cooperative Extension Service representative and determine that you will need to change your lawn management practices by

- applying fertilizer at the appropriate rate in September and November instead of early spring;



- monitoring your lawn for moisture content and watering appropriately instead of letting it suffer through periods of dry weather;
- sharpening your lawn mower blades frequently;
- raising the deck on your mower to cut at a height of 3 inches; and
- mowing frequently, cutting off no more than one-third of the leaf blades each time you mow.



P. Sellers

Your extension educator also recommends applying a broadleaf weed killer during October or early November to control dandelions quickly. So you go to a garden center to purchase a suitable weed killer (herbicide) and the appropriate application equipment. When it's time to make the application, you read the product label to determine what safety precautions are necessary and what rate to use. You pour the herbicide into the sprayer, turn on the water, and wage your battle against the dandelions. In a couple of days the dandelion leaves are curled, but they never seem to die. You wonder how that can be when you did everything by the book!

The problem was caused by failure to calibrate the sprayer. Calibration is necessary to make sure that the herbicide is applied at the correct rate. Otherwise, the sprayer may apply too little, in which case you won't get good control, or it may apply too much and harm your turf. Not calibrating is analogous to placing a meal into the oven and setting the temperature randomly. Pesticide application accuracy is extremely important.

RECIPE

Roast Turkey
Cook the turkey 1 hour @ 350° for every 5 lbs.

Raw turkey in

Cooking

Heat x Time

Good dinner!

Too Little	Undercooked & Dangerous
Just Right	Nutritious & Delicious
Too Much	Overcooked & Inedible

Pesticide & water in

Use Directions:
4 oz. per gallon of water

Application

Rate x Time

Beautiful Landscape

Too Little	Pest Survives: Time Wasted
Just Right	Pest Controlled: Beautiful Lawn
Too Much	Product Wasted: Money Lost

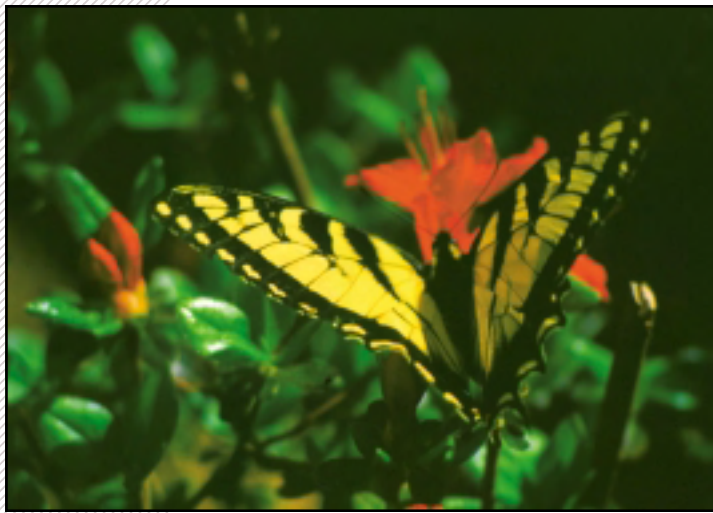
You might question your own ability to calibrate application equipment accurately, but calibration is not difficult. It is simply the process of measuring and metering the amount of product (pesticide or fertilizer) so that just the right amount is applied to the target area. Learning to calibrate is like learning how to use any new tool. It's a simple, step-by-step process. It takes time, at first, but with practice and experience it becomes faster and easier, your results predictably accurate.

RECOMMENDED CULTURAL PRACTICES

Remember that many landscape pest problems can be avoided by following recommended cultural practices:

- Select plants that are hardy in your climate.
- Plant them in the proper location.
- Provide timely and accurate fertilization, as needed.
- Prune, water, and mulch properly.

These practices will ensure that your lawn and landscape plants are as healthy as they can be; and healthy plants have fewer pest problems,



A. Blessing

thus minimizing the need to use chemicals. Good cultural practices, along with patience and perseverance, can dramatically improve even a really bad lawn, over time. Consult with your county Cooperative Extension Service representatives and local garden center professionals for advice on managing your landscape.

Even well-cared-for plants occasionally experience weed, insect, or disease problems. Some pests can

kill plants or stifle growth and flowering. Others may reduce a plant's vigor, leaving it susceptible to a variety of pests. Many render the landscape unsightly.

If you are interested in improving the appearance of your landscape but feel that you cannot make the necessary time commitment, consider hiring a professional to maintain it for a year or two until you are free to handle it yourself.

OWNER'S MANUAL AND INSTRUCTIONS

New pesticide application equipment generally is sold with the manufacturer's instructions on how to use it properly. They may be found in an owner's manual or come as loose-leaf papers; sometimes they are printed on the application equipment itself. Most equipment manuals provide

- a product registration card;
- the model number of the equipment;

- the phone number of the manufacturer's customer relations department;
- an address where a new set of instructions or an owner's manual can be obtained;
- a diagram and corresponding numbered parts list (and sometimes prices);
- instructions on how to set up and use the equipment;
- routine maintenance procedures needed to extend the life of the equipment;
- the manufacturer's warranty and related disclaimers.

Operating instructions for equipment used only occasionally are sometimes misplaced or inadvertently thrown away. Guard against these possibilities by designating a safe place where they can be accessed quickly and easily. A file box works well and can accommodate other household appliance and tool manuals, as well. Instructions printed directly on equipment can wear off or become scratched or soiled beyond recognition; copy the instructions onto a piece of paper when the equipment is new and place it in the file box for safekeeping.

THREE BASIC STEPS TO PROPER CALIBRATION

Calibration of pesticide application equipment is an integral part of the pest control process. The importance of applying the correct amount of product uniformly to a specific area, plant, or group of plants cannot be overemphasized.

Step 1

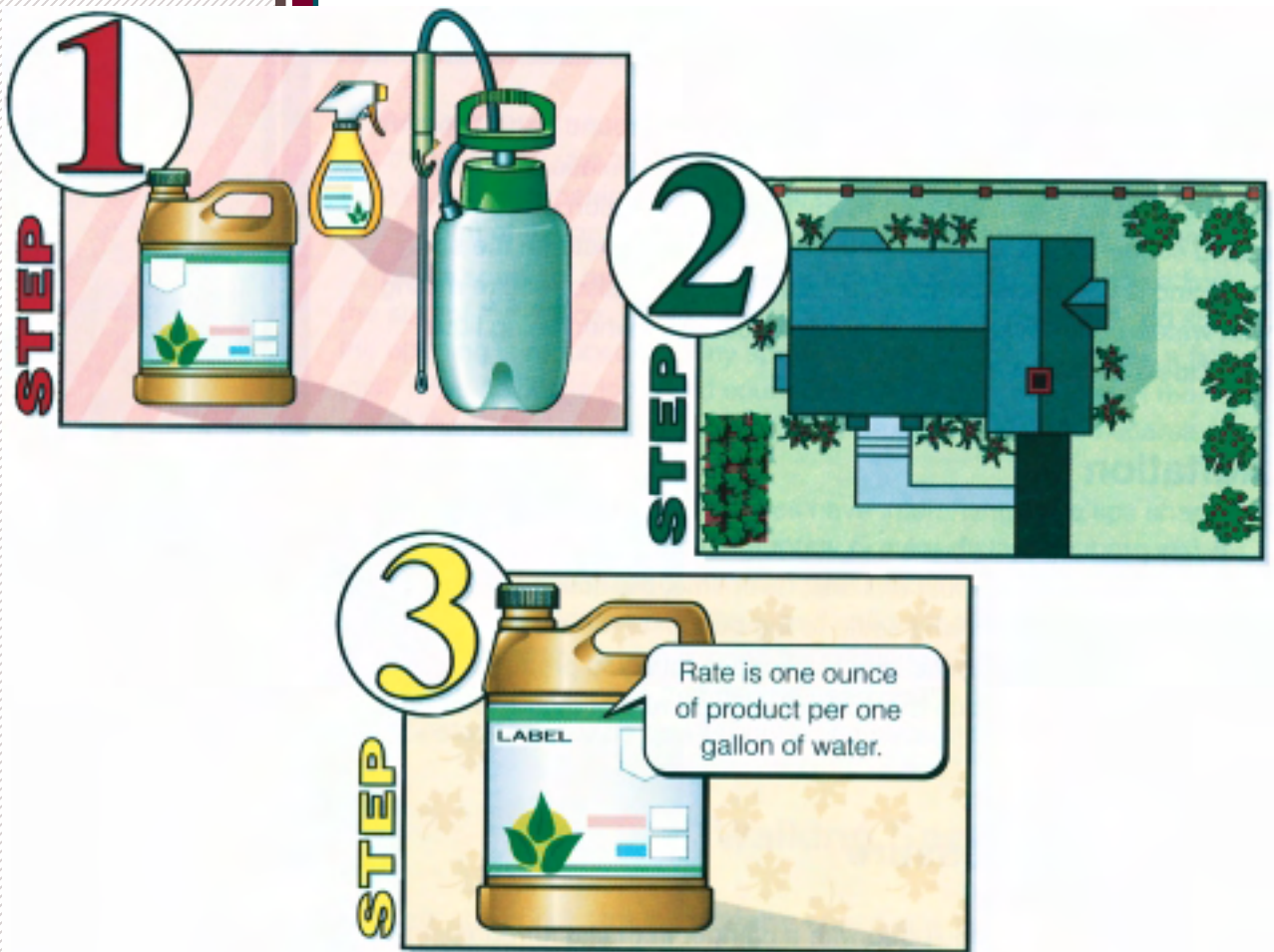
Select the Proper Pesticide Product and Application Equipment

Common pesticide products used to control home landscape pests include *insecticides* to control insects, *herbicides* to control weeds, and *fungicides* to control plant diseases. Fertilizer is not a pesticide because it is not used to control pests; its function is to provide essential nutrients for healthy plant growth. Sometimes one or more pesticides are mixed with fertilizer to form a combination product. This saves time and work, but *combination products must be handled as pesticides*.

Step 2

Determine the Size of the Treatment Area

The second step is to determine the total size of the area to be treated. This is a simple calculation when the shape of the area is a



square or rectangle and the area does not contain objects such as a sidewalk, driveway, or plant bed: Simply multiply length times width to determine the total area to be treated.

$$\text{TOTAL AREA TO BE TREATED} = \text{LENGTH} \times \text{WIDTH}$$

But many application sites contain objects that occupy space and do not require treatment: the house, a garden shed, flowers, shrubs, groundcover, mulched areas, trees, patios, fountains, pools, sidewalks, driveways, etc. The total space occupied by all such objects must be subtracted from the total area of the property to determine the area that actually will be treated.

Step 3

Determine the Amount of Product Needed

The final step in calibration is to determine the application rate. The product label will state how much to apply; but it will vary, depending on product formulation and application site. The label usually will tell you how much product to apply per 1,000 square feet, or how much product to add per gallon of water.

USING LIQUID PRODUCTS

Liquid pesticides are needed when the aboveground parts of plants require treatment to control pests. Some liquid formulations come packaged in their own sprayer, ready to use; no dilution is required. *Liquid concentrates*, however, must be diluted with water in the spray tank; and dry *wettable powders*, applied as liquids, also require mixing with water. Following are some points to consider when using liquid pesticide application equipment.

Agitation

A few products will dissolve in water and remain permanently in solution, but most form *suspensions*. Over time, the suspended particles separate from the water and settle to the bottom of the sprayer. Continual agitation during application will keep most liquid products suspended in the water inside the sprayer; a good rule of thumb is to agitate every five minutes.

Spray Tank Pressure

Tank sprayers are equipped with a plunger in the lid for pumping/forcing air into the tank to increase the pressure inside. An application wand and nozzle are attached to the tank with a hose; and when the trigger on the wand is squeezed, the air pressure inside the tank forces liquid out through the nozzle.

As the sprayer is used, the pressure inside drops; if you do not repump the tank, eventually the pressure will drop too low to force the liquid out of the tank. Therefore, it is important to pump the tank periodically during an application to maintain a consistent flow and ensure uniform coverage of the area being treated. When the tank is nearly full, it takes only a few seconds to pressurize it; but as the product is sprayed out and the pressure level drops, pumping it back to full pressure takes a little longer.

The amount of pressure inside the tank determines the force with which the spray exits the nozzle. When the pressure is high, the liquid exits rapidly as a fine mist; low pressure results in a slower exit of larger spray droplets. Controlling the pressure, and therefore the sprayer output, can facilitate applications where drift is a concern. Nozzle adjustments may be necessary, as well. For example, when spot spraying (treating individual weeds), low pressure and large nozzle openings help produce a thick stream of liquid that can be directed at the target. Conversely, when full coverage is needed, high pressure and small nozzle settings help produce a mist that covers the entire plant.

Never make pesticide applications under windy conditions. If there is only a slight breeze, use low pressure to prevent the spray from moving off-target.

Spray Nozzles and Tips

As described previously, pressure inside the spray tank forces liquid out through a nozzle on the end of the wand when the trigger is squeezed. The opening in the nozzle is called an *orifice*, and the diameter (width) of the orifice regulates how much liquid can pass through.

Some sprayers have adjustable nozzles that enable users to adjust the size of the orifice. When the nozzle is tightened clockwise, the size of the opening is reduced and tiny spray droplets exit the nozzle as a fine mist. If the nozzle is loosened counterclockwise, the diameter of the orifice increases, producing larger spray droplets that form a coarse spray pattern.

Some specially designed nozzles have interchangeable tips shaped to deliver the spray in a specific pattern. For example, a *fan tip* delivers the spray in a lens-shaped or rectangular pattern and is useful for broadcast spraying lawns. Hollow- and solid-cone tips deliver the spray in a circular pattern, which is good for spraying plants. Check with your equipment dealer for tips that can be used on the nozzle you have. In some instances, *nozzle tip kits* containing several types are available.

Walking Speed and Pattern

Walk at a consistent, comfortable speed when applying liquid products. The walking speed affects the amount of product that falls onto the treatment area: The faster you walk, the less product reaches the target.

Conversely, the slower you walk, the more product is applied. In addition to maintaining a consistent walking speed when applying a liquid product, it is important to walk back and forth across the lawn in a precise pattern.

Keep an eye on the amount of mixed product that is being applied as the job progresses; in particular, note how much has been used at the midway point. If more or less than half remains, slow down or speed up the rate of application, respectively.

Hand and Arm Movement

Some liquid applications require the applicator to swing the spray wand from side-to-side while walking in a straight line. Moving your arm quickly while spraying a broad swath gets the job done quickly, but the greater your speed, the less product is applied. A narrow swath and slow arm movement result in more product being applied.

Nozzle Height Above the Ground

When applying a liquid product, the height that the nozzle is held above the ground determines the swath (width) covered and the amount of product applied. Raising the nozzle farther from the ground creates a wider swath, and lowering the nozzle creates a narrower swath.

Hose-End Sprayers

Hose-end sprayers, which attach directly to the end of a garden hose and are easy to use, are constructed with three main parts: a plastic container to hold the product, a lid that attaches the hose to the container, and a siphoning tube.

Water moving through the hose creates a suction that pulls the product from inside the container up through the siphoning tube and distributes it uniformly into the water flow. Always obtain quality equipment that has an anti-siphoning device to prevent backflow into your water system; backflow can result if the water is turned off at the faucet or if a sudden drop in water pressure occurs. There are three main types of hose-end sprayers: *fine spray* (mixing required); *coarse spray* (mixing required); and *dial-in* (no mixing required).

Fine Spray Hose-End Sprayers (mixing required)

These sprayers deliver a fine spray of small droplets to coat the outer leaf surfaces of flowers, small trees, and shrubs. It is excellent for applying fungicides for disease control, e.g., black spot on roses, and for controlling insects that feed on plant leaves. Fine spray hose-end sprayers cannot be used to control soil-dwelling insects such as white grubs because the mist dries quickly on the blades of grass and does not make it down into the soil to contact the pest.

The product is diluted with water inside the hose-end container. The plastic container is marked conspicuously with two scales: fluid ounces and gallons. Read the product label to determine how many ounces are needed for the job. Pour the required amount into the container and add water to the level needed for the application.



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Coarse Spray Hose-End Sprayers (mixing required)

This type of equipment works similar to the fine spray type but delivers larger particles as a heavier spray. This is desirable when the spray material must reach past the grass plants, into the soil. Coarse spray hose-end sprayers have limited use in treating flowers, shrubs, and trees because the large droplets do not cover leaf surfaces uniformly. The large droplets also do not stick to leaf surfaces as well as fine spray particles; often, in fact, they bounce off.

The instructions for filling coarse spray hose-end sprayers are the same as those given previously for fine spray hose-end sprayers.

Dial-In Hose-End Sprayers (no mixing required)

These sprayers usually cost a little more than the fine and coarse spray hose-end sprayers, but the extra cost is justified by one distinct advantage: The need to measure and mix the product with water within the container is eliminated. Only the concentrated product is poured into the container; then the user simply dials in the rate on the sprayer. The dial mechanism meters the correct amount of concentrate for each gallon of water that passes through the sprayer.



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There are no markings on the sides of the container since no mixing is required. If unused concentrate is left in the sprayer after the job, it can be returned to its original container.

Good News About Hose-End Sprayers



- **They are easy to use.** Hose-end sprayers are uncomplicated, lightweight, and portable.
- **They require very little maintenance.** Rinsing after finishing the job is the only requirement.
- **They are versatile.** Hose-end sprayers can be used to apply products to the lawn, landscape plants, and vegetable plants.
- **They are inexpensive.** Hose-end sprayers cost between \$8 and \$20.

Bad News About Hose-End Sprayers



- **Leftover dilution creates a storage/disposal problem.** Leftover diluted material cannot be returned to the original product container.
- **The applicator's walking speed must be measured.**
- **Application accuracy requires measuring walking speed (when treating large areas) or determining the amount of time required to disperse the right amount of spray (when treating individual plants).** Failure to maintain a consistent walking speed for the proper length of time when treating lawns, bushes, or trees can result in too much or too little product being applied.

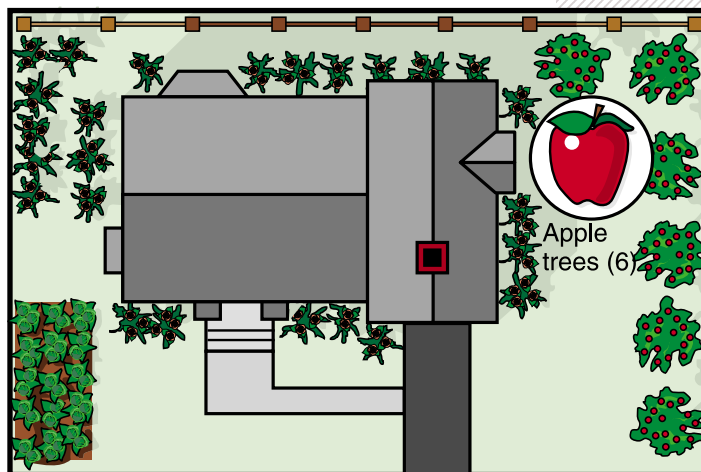
- **Your garden hose can become contaminated.** The outside surface of your garden hose can become contaminated with the product as it is pulled across treated areas of the lawn.
- **Extra garden hose may be required.** The cost of additional garden hose needed to reach the farthest point of the treatment area may offset the low initial cost of a hose-end sprayer.
- **Most hose-end sprayers are not flexible.** The simplicity of their design does not permit adjustment of nozzle tips or spray patterns.

Calibrating a Hose-End Sprayer for Spraying Plants

The pesticide label indicates how much of the product to mix per gallon of water. However, most labels don't tell you how many gallons of the *mixture* will be needed to treat a tree, shrub, flower bed, or row of vegetables. The correct amount varies according to the size, shape, and number of plants to be treated. As an example, more dilution (product plus water) is needed to spray a 20-foot tree than to treat a 3-foot shrub or a row of vegetable plants. Therefore, the first step in calibrating a hose-end sprayer is to determine how many gallons will be needed to complete the job.

Use the worksheet on pages 13–14 to determine how many gallons of water and how much product will be needed to complete the job described in the next paragraph.

You need to treat six apple trees, ranging in height from 8 to 12 feet, to control aphids. The insecticide label recommends a rate of one ounce of product per gallon of water. Record in the third column (pages 13-14) all available plant and product information; this information is critical in determining how much water and product will be needed for the job.



Calibrating a Hose-End Sprayer for Spraying Plants

Calibration Steps	Sample Problem	Calculations
<p>1. Select a single plant or a group of plants (e.g., a tree, a 20-foot row of vegetable plants, or a 100 ft² flower bed).</p>	<p>one 10-foot apple tree</p>	
<p>2. Do not add pesticide to the water used in this step because you are merely trying to determine how long it takes to treat the designated plant(s). Using plain water in your hose-end sprayer, spray the plant(s) designated in Step 1 until all of the leaves, stems, and trunks are completely covered. Record how much time it takes. Note: Many product labels instruct you to spray until runoff, i.e., until the spray material begins to drip off the leaves. However, it is better to stop just before that point is reached because the material that drips onto the ground is wasted.</p>	<p>35 seconds required to treat the 10-foot apple tree</p>	
<p>3. Spray water into a bucket for the amount of time determined in Step 2. Measure and record the amount of water collected in the bucket.</p>	<p>2 qt water collected in 35 seconds</p>	
<p>4. Determine the total number of plants or overall size of the planting that will be treated (e.g., 6 trees or a 100-ft row of vegetables).</p>	<p>6 apple trees will be treated</p>	

(continued)

Calibration Steps

Sample Problem

Calculations

5. Multiply the number of plants or length of the overall planting from Step 4 by the amount of water collected in Step 3. This will determine the total amount of water required for the job.

$$\begin{array}{r} 6 \text{ trees} \\ \times 2 \text{ qt water / tree} \\ \hline 12 \text{ qt} \end{array}$$

$$12 \text{ qt} \div 4 \text{ qt / gal} = 3 \text{ gal water required for the job}$$

6. Read the label to determine the proper rate (amount of product per gallon of water). Multiply the recommended rate by the amount of water determined in Step 5.

$$\begin{array}{l} \text{Rate} = 1 \text{ oz / gal water} \\ 3 \text{ gal water} \times 1 \text{ oz / gal} = \\ 3 \text{ oz of the product} \\ \text{required to treat 6 trees} \end{array}$$

Application with a Hose-End Sprayer

- Pour 3 ounces of product (as determined in Step 6) into the hose-end container.

If you have a hose-end sprayer in which product is mixed with water inside the container, add water up to the marking for 3 gallons (as determined in Step 5), and stir.

If you are using a dial-in sprayer, add the required amount of product and set the dial to the mark that corresponds to the rate on the label.



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- Visually check the mixture level in the container as you make the application. About half the amount that you start with should remain in the container when the job is half finished. Slow down if significantly more than half of the mixture is left; speed up, if less. Half the job is 3 trees; the time estimated for spraying each tree is 35 seconds:

$$3 \times 35 = 105 \text{ sec, or}$$

$$1 \text{ min } 45 \text{ sec}$$

Therefore, half the mixture should be gone after spraying for 1 minute and 45 seconds.



A. Blessing

Use a graduated cylinder or measuring cup to measure small amounts of the product. Inexpensive, plastic graduated cylinders can be obtained from stores that carry photograph developing supplies, but be sure to choose one marked in ounces. Rinse thoroughly, after use, and pour the rinsate into the hose-end container as part of the water required for dilution.

What to Do if There Is Pesticide Left Over

If the product has been mixed with water inside the container, it should not be saved for future jobs. Continue to apply leftover dilution to the labeled site until the container is empty, or use it immediately to spot spray the same kind of problem in another area of the lawn. (Note: If you are using a dial-in sprayer, the concentrated product can be returned to its original container.)

Complete your job by triple rinsing the sprayer, measuring cup or cylinder, and stirring spoon. Partially fill the empty container with water and shake it. Repeat this process twice to ensure that virtually all of the product is removed from the equipment. After the original application has dried, apply the rinsate to the plants just treated, being careful not to rinse off the original application.

Upon completion of the job, rinse equipment over the application site itself. Never rinse over pavement or concrete to avoid rinsate being directed into a drain or sewer.

Calibrating for Turf Applications

It is somewhat more complicated to apply pesticide products to lawns than it is to treat garden and landscape plants. Lawn products usually provide an application rate in terms of how much of the product should be diluted with a given amount of water for application to a specific square-foot area:

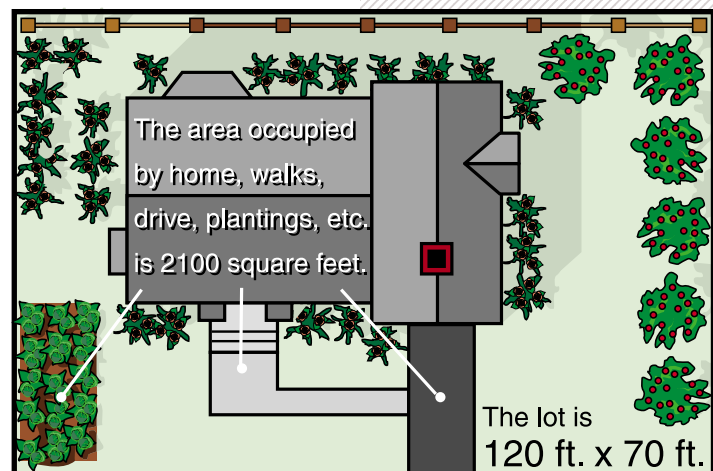
$\text{number of ounces of product PER number of gallons of water PER number of square feet (usually 1000)}$

The first step in calibrating your lawn sprayer is to practice on a premeasured 250-, 500-, or 1000-square-foot area. This will enable you to develop a feel for how long it takes to walk and cover the area, and it will provide a check to make sure the correct rate of product is applied. A paved or cement driveway is an excellent place to calibrate equipment.

Calculating Gallons of Water and Ounces of Product Needed

Suppose that you are applying a weed control product on a 6300-square-foot lawn. The label says to use 4 ounces of the product in 2–4 gallons of water for each 1000 square feet.

Measure a practice area that can be divided evenly into 1000 square feet. Assume that as you swing the sprayer wand back and forth you will cover a 5-foot-wide swath. A good size test strip is 5 feet by 25 feet, or 125 square feet. Make two passes across the area, side-by-side, for a total test area of 250 square feet (a larger test area always increases accuracy).



Calibrating a Hose-End Sprayer for Spraying Turf

Calibration Steps	Sample Problem	Calculations
<p>1. Attach the hose-end sprayer (container empty) to the hose and open the water faucet fully.</p>		
<p>2. Spray the test area with plain water and record the amount of time it takes to cover the test area while walking at a comfortable, consistent speed.</p>	<p>20 seconds to walk and cover 250 ft²</p>	
<p>3. Using the hose-end sprayer, spray plain water into a bucket for the time recorded in Step 2, then measure the amount of water collected.</p>	<p>1.25 gal of water collected in 20 seconds</p>	
<p>4. Divide the total area to be treated by the area covered in Step 2.</p>	<p>$1000 \text{ ft}^2 \div 250 \text{ ft}^2 = 4$</p>	
<p>Multiply the result by the number of gallons collected in Step 3 to determine the total gallons of water that would be applied to a 1000-square-foot lawn at your walking speed.</p>	<p>$4 \times 1.25 \text{ gal} = 5 \text{ gal of water}$</p>	
<p>5. Check the product label for the required amount of water per 1000 square feet (this is not always provided) and compare it to the amount obtained in Step 4. In this example, the label said to use 2–4 gallons of water per 1000 square feet.</p>	<p>5 gallons of water will be too much based on the label requirement</p>	

(continued)

Calibration Steps

Sample Problem

Calculations

6. Recalibrate your sprayer by walking over the test area somewhat faster than in Step 2, and remeasure the amount of water as in Step 3.

During the second test, you walked the 250 ft² test area in 15 seconds and sprayed 0.75 gal of water into a bucket.

For 1000 ft²:

$$4 \times 0.75 \text{ gal} = 3 \text{ gal} / 1000 \text{ ft}^2$$

7a. Compute the amount of water that will be required to treat the lawn by first dividing its total area by 1000 square feet.

$$6300 \text{ ft}^2 \div 1000 \text{ ft}^2 = 6.3$$

7b. Multiply the amount of water required per 1000 sq ft times the number in 7a.

$$3 \text{ gal} / 1000 \text{ ft}^2 \times 6.3 = 18.9 \text{ gal required}$$

8. Compute the amount of product needed to treat the lawn by multiplying the amount of product required per 1000 sq ft times the number in 7a.

$$4 \text{ oz} / 1000 \text{ ft}^2 \times 6.3 = 25.2 \text{ oz of product needed}$$

(round off to 25 oz)

Spraying Your Lawn

Dial-In Sprayers

Your dial-in sprayer holds 32 fluid ounces. Pour 25 ounces of product into the container and set the dial to 1 ounce. It is important to remember that the dial is set to apply a given amount of product per gallon of water, *not* per 1000 square feet of area. Therefore, you must first convert the total amount of product and water required per 1,000 square feet of area into ounces needed per gallon of water. In the example on the worksheet, the label says to apply 4 ounces of product per 1000 square feet. In Step 6, it was determined that 3 gallons of water per 1000 square feet are needed:

$$4 \text{ oz} \div 3 \text{ gal} = 1.33, \text{ or } 1 \frac{1}{3} \text{ oz of product per gallon of water}$$

Carefully calculate and measure exactly the right amount of concentrated pesticide required for the job when using a dial-in hose-end sprayer. Check the level of the spray mixture periodically during application; half should remain when half the job is finished.

Since you can't set the dial to this exact amount, set it to 1 ounce, which is the closest whole increment. [Note that if you had set the dial on 4, using the rate on the label (4 oz per 1000 sq ft), the sprayer would have applied almost 5 times the recommended amount of product since approximately 1 1/3 ounce is required per gallon of water.]

Compressed Air Sprayers

Two common types of compressed air sprayers for home use are the backpack and hand-held tank sprayers. Both are extremely useful for small jobs where only a few gallons of material are needed. Generally, these sprayers hold 1–3 gallons of water.

Both types work on the same principal. The user rapidly pushes and pulls a plunger, on the top or side of the tank, that is much like the plunger on a bicycle tire pump. The force of the plunger pumps air into the empty space inside the tank and compresses it. When the space is full of air, it becomes nearly impossible to push the plunger into the tank.

Sprayers used for applying herbicides must be clearly labeled and used *only for that purpose*. Never use more than one type of pesticide in a sprayer; that is, use one for herbicides and a separate one for insecticides and fungicides. Label each sprayer for its intended type of pesticide. The cost of extra sprayers is nominal compared to the replacement cost of valuable landscape plants, and cost is not the only inconvenience. It may take years for replacement plants to reach maturity.

Never loan your sprayer or borrow your neighbor's.

At this point, the tank is pressurized, i.e., the pressure inside is greater than the pressure outside.

As the air pressure inside the tank drops, the amount of liquid being expelled through the nozzle also decreases. Therefore, it is important to maintain a constant pressure inside the sprayer by pumping it regularly during application.



A. Blessing



A. Blessing

Pump lever on backpack sprayer

Backpack Sprayers

Backpack sprayers are carried on the back of the user and held by adjustable shoulder straps that allow the weight of the tank to be distributed evenly. A hose extends from the bottom of the tank around one side of the user. Attached to the hose is a spray wand with a trigger mechanism that the user squeezes to expel the tank mixture. Many backpack sprayers are equipped with a pump lever that extends from the bottom of the equipment around one side of the user. This permits the applicator to pump the sprayer regularly, with one hand, while moving the spray wand with the other hand. This maintains the pressure inside the tank and keeps the flow rate uniform.

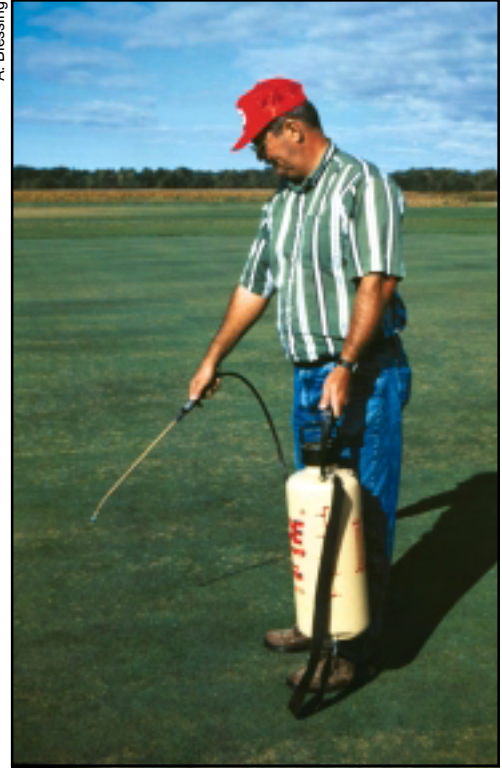
Always put a little water in a backpack sprayer before adding the liquid pesticide; diluting the concentrate in this manner makes it mix more readily and uniformly once the remainder of the water is added. Stirring while mixing also helps keep the pesticide suspended in the water, as does shaking the sprayer occasionally during application.

The nozzle tip on backpack sprayers usually can be adjusted to create various spray patterns. This important feature allows the user to select the pattern most appropriate for uniform coverage of the target weed,

plant, etc. Backpack sprayers generally are sold with a *hollow cone tip* which expels spray in a circular pattern; it is often the best choice for spraying shrubs or other plants.

A *fan tip*, which creates a rectangular spray pattern, is best for spraying lawns. Check with the dealer where you bought your equipment to obtain this special tip.

A. Blessing



A. Blessing



Hand-Held Tank Sprayers

The only real differences between a hand-held tank sprayer and a backpack sprayer are the size of the tank and how it is carried by the user. A hand-held tank sprayer typically holds 1–3 gallons of liquid and is carried in one hand while operating the spray wand with the other.

When the pressure inside the sprayer

begins to decrease, the user must set the sprayer down and pump it. As with backpack sprayers, hand-held sprayers come with adjustable nozzles.

Mini-Tank Bottle Sprayers

When only a small amount of pesticide is needed, such as for spot treating a few weeds in a lawn, you might prefer a one-quart bottle sprayer similar to those in which window cleaning products are sold. Empty spray bottles are available at discount and department stores as well as your neighborhood garden center. Purchase one that has an

adjustable nozzle that will allow you to select the setting most appropriate for the job at hand. Label the sprayer in LARGE LETTERS for the product used, and always store it in a locked cabinet with other pesticide products and equipment. *Do not use a bottle that has previously held, or is labeled for, any other product!*

When dealing with very small quantities of pesticide, there is no room for error. It is important to carefully measure the amount of pesticide that you put into a bottle sprayer. Too little or too much can render your application useless—or disastrous.

Since it's usually not practical to calibrate a bottle sprayer, you must estimate the total amount of product needed for a job, and it is important to use the entire quantity mixed. Never save and store pesticide products that have been mixed with water; they lose their potency, over time.

Pressure is created in a bottle sprayer by squeezing a trigger on the lid. Each time the trigger is squeezed, pressure forces a small amount of liquid through the nozzle.



Good News About Compressed Air Sprayers

- **Compressed air sprayers are portable.** Backpack and hand-held compressed air sprayers allow the user to move about freely.
- **They're efficient.** Compressed air sprayers allow more precision than larger equipment in treating individual or small groups of plants.
- **Their flexibility is a plus.** Adjustable nozzles and interchangeable nozzle tips allow the applicator to select the spray pattern most appropriate for the job.
- **They're easy to use and affordable.** Most tank sprayers are moderately priced: \$20 and up. Factors that affect price are the material they're made of (plastic, brass, or stainless steel); features such as adjustable nozzle tips and pressure gauges; size; and overall quality.
- **Compressed air sprayers allow precise direction of the spray.** A predictable spray pattern permits the user to accurately place the product where it is needed, such as along sidewalks or around flower beds.
- **They're durable.** When maintained according to the manufacturer's instructions, compressed air sprayers will last for many years. Individual parts usually can be obtained, permitting repair rather than replacement when the sprayers malfunction.

Bad News About Compressed Air Sprayers

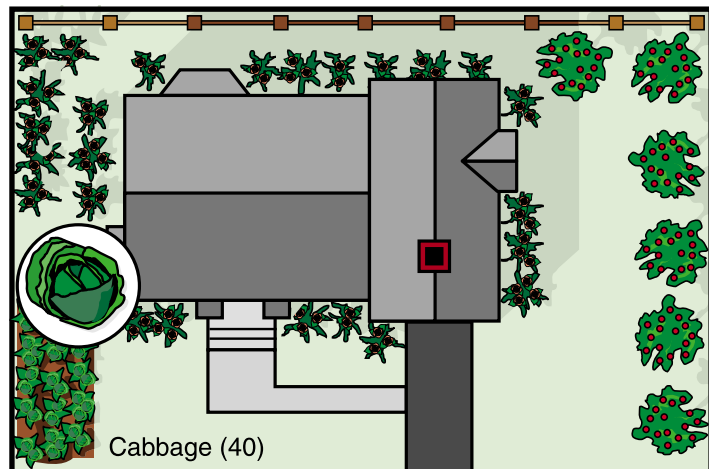


- **Usefulness of compressed air sprayers is limited.** Due to their small tank capacity, they are inefficient for treating large areas or large groups of plants.
- **Experience governs effectiveness.** The user has to develop a feel for the amount of pressure that must be maintained to insure uniform and complete coverage.
- **Proper maintenance is essential.** Backpack and hand-held compressed air sprayers generally require more maintenance than hose-end or bucket sprayers.
- **Compressed air sprayers are cumbersome.** Lifting and carrying a full, compressed air sprayer—especially a backpack sprayer—can result in muscle strain and fatigue.

Calibrating a Compressed Air Sprayer for Spraying Trees, Shrubs, and Plants

Calculating Gallons of Water and Ounces of Product Needed

You need to apply an insecticide to control cabbage worms on 40 cabbage plants. The label of the insecticide says to use 4 teaspoons of the concentrated product per gallon of water.



Calibrating a Compressed Air Sprayer for Spraying Trees, Shrubs, and Plants

Calibration Steps	Sample Problem	Calculations
<p>1. Select a single representative plant or group of plants.</p> <p>2. Add plain water to the tank and pump it to capacity. <i>Do not add the pesticide product at this time.</i></p> <p>Put a hollow cone tip in the nozzle and adjust the nozzle to deliver a fine spray (small droplets are less apt to roll off the leaf surface).</p> <p>Apply the water so that all parts of the plants are covered uniformly. Be sure to treat the underside of leaves as well as the upper side. Record the amount of time required to achieve adequate coverage.</p>	<p>10 cabbage plants</p> <p>60 seconds to properly treat 10 cabbage plants</p>	
<p>3. Spray plain water into a bucket for the amount of time recorded in Step 2. Measure and record the amount of water in the bucket.</p>	<p>1 qt of water sprayed into bucket in 60 seconds</p>	
<p>4. Compute the amount of product needed to treat the test plant or group of plants.</p>	<p>One quart of spray will treat 10 cabbage plants. If 1 quart will treat 10 plants, 4 quarts (one gallon) will treat 40 plants. The label says to use 4 tsp / gal water</p>	

Spraying Plants with a Compressed Air Sprayer

- Pour about a half gallon of water into the spray tank. Add 4 teaspoons of the product and stir to mix. Add additional water to fill the tank to the one-gallon level, which is the total amount needed for 40 plants. Pump the sprayer to full capacity.

When it is difficult to see the level of liquid inside a plastic spray tank, press your finger on the outside and look inside, through the top opening; you will be able to see the shadow of your finger on the outside of the tank. Move your finger up or down the outside of the tank to the actual level of contents. Then see where your finger is on the scale on the outside of the tank to determine how much is left.

- Check the level of liquid in the tank after spraying half (20) of the plants. It should have taken you about two minutes (2 x 60 seconds for 10 plants). Adjust your application speed: slower if less than half the mixture remains; faster if more than half is left in the sprayer at the midway point. As you spray, agitate the tank from time to time to keep the product distributed uniformly in the water.

- Use all of the mixture in the tank. If the tank is not empty after treating the entire area, repeat the application until all of the mixture is used. *Never store mixed product for later use.*
- Complete the job by triple rinsing the sprayer. Pour water into the tank and shake it; dispose of the rinsate by putting it on the plants that you just treated. Repeat this process twice to make sure all of the pesticide is removed from the sprayer.
- Allow the sprayer to dry before replacing the plunger. Store it in a clean, tight container, away from dirt. Follow the manufacturer's instructions for general maintenance and for lubricating the plunger. When preparing a compressed air sprayer for winter storage, be sure to remove absolutely all of the liquid from inside the nozzle and hose as well as from the tank, especially if it will be stored at temperatures below freezing.

Calibrating a Compressed Air Sprayer for Spraying Small Areas of Turf

Calculating Gallons of Water and Ounces of Product Needed to Treat a Small Area

You want to kill dandelions on a portion of your lawn that measures approximately 250 square feet. The label on the product says to use 5 ounces per 1,000 square feet.

Calibrating a Compressed Air Sprayer for Spraying Small Areas of Turf

Calibration Steps	Sample Problem	Calculations
<p>1. Pour one gallon of plain water into the tank and pump the sprayer to capacity. <i>Do not add pesticide at this time.</i></p> <p>Put a fan tip in the nozzle and adjust it to deliver a coarse spray; large droplets are less apt to drift off-target and heavy enough to penetrate through the grass.</p> <p>While standing still on dry pavement, hold your arm extended while moving the spray wand back and forth just as you would while spraying the lawn. Measure the width of the area that received the spray.</p>	<p>width of sprayed area on pavement is 4 ft</p>	
<p>2. Spray the pavement, moving in a straight line and maintaining the 4-foot swath width, for 15 seconds. Measure the length of the strip covered in 15 seconds.</p>	<p>length of sprayed strip is 25 ft</p>	
<p>3. Compute the total area covered by multiplying the width of the strip (Step 1) by the length (Step 2).</p>	<p>4 ft x 25 ft = 100 ft²</p>	

(continued)

Calibration Steps	Sample Problem	Calculations
4. Spray plain water into a bucket for 15 seconds, then measure the amount of water collected.	64 oz (0.5 gal) of water was collected	
5a. Compute the amount of water required to treat the area by first dividing its total area by the square footage in Step 3.	250 ft ² ÷ 100 ft ² = 2.5	
5b. Determine the total amount of water required by multiplying the number from Step 5a times the amount of water collected in Step 4.	2.5 x 0.5 gal = 1.25 gal of water required	
6a. Compute the amount of product needed to treat the area by first dividing the area to be treated by 1000 square feet (from rate on the label).	250 ft ² ÷ 1000 ft ² = 0.25	
6b. Then multiply the amount of product required per 1,000 square feet times the number in 6a.	5 oz / 1000 ft ² x 0.25 = 1.25 oz to treat 250 ft ²	

Spraying Turf with a Compressed Air Sprayer

- Pour half of the water required (Step 5b) into your sprayer. Add 1.25 ounces of the product (Step 6b) and stir. Then add the remainder of the water to bring the level up the 1.25 gallons. Replace the plunger and pump the sprayer to capacity.
- Agitate the mixture regularly, while spraying, and check the level in the tank when half the job is completed; adjust your walking speed accordingly.
- Triple rinse, dry, and store your sprayer properly.

If some of the mixed product is left in the sprayer after you have finished the job, immediately use it to spot treat the same kind of weeds in another area of the lawn, or respray the area just treated.

Bucket Sprayers

Bucket sprayers are devices that use a bucket for mixing and supplying the pesticide product. There are two major types: *siphoning* and *trombone*.

Siphoning Bucket Sprayers



A. Blessing

With siphoning bucket sprayers, a bucket is placed next to the water faucet and a siphoning device is positioned between the faucet and a garden hose. One end of the siphon is screwed directly onto the faucet, and the other is attached to the hose. A small rubber tube is attached to one side of the siphoning device and its free end placed in a bucket containing the pesticide mixed with a little water.

As water flows through the siphoning device, it creates suction that pulls the product out of the bucket, through the tube,

and injects it into the stream of water moving through the garden hose. An adjustable nozzle that can turn the water on and off is attached to the opposite end of the hose, allowing the applicator to alter the spray pattern. The operation is similar to that of a hose-end sprayer.

The siphoning device proportions the product in a ratio of 16:1. That is, for every 16 gallons of water flowing through the siphon and into the hose, one gallon of product is pulled from the bucket into the water flow and mixed uniformly. This ratio must be considered when mixing the pesticide concentrate with water in the bucket. The concentration of the bucket mixture must be computed so that, when it is being mixed with water flowing through the hose, the correct concentration exits the nozzle at the opposite end of the hose.

Always use a siphon equipped with a valve to prevent backflow of the pesticide into your water system.

Good News About Siphoning Bucket Sprayers



- **Bucket sprayers are inexpensive.** They cost around \$15.
- **The fatigue factor is minimal.** The bucket containing the product does not have to be carried; it remains stationary during the application.
- **Various spray patterns can be selected.** Interchangeable nozzles for the garden hose allow the user to change the spray pattern as desired.
- **They're versatile.** The siphoning equipment can be used to treat many sizes and shapes of plants, ranging from small shrubs to medium-sized trees. Buckets of various sizes can be used, depending on the size of the job.
- **Bucket sprayers are easy keepers.** They require very little maintenance, are relatively easy to clean, and don't require much storage space.

Bad News About Siphoning Bucket Sprayers



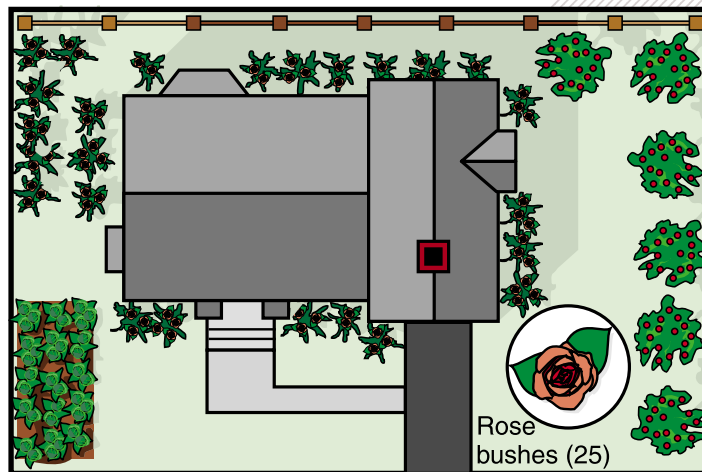
- **Contamination of the garden hose can be a problem.** Small amounts of pesticide may be left inside the hose, and the outside of the hose may become contaminated as it is dragged across the lawn during application. Never drink water from a hose that is used to apply pesticides.

- **Application distance from water faucet is limited.** It is generally recommended that no more than 50 feet of garden hose be used with bucket sprayers; this, of course, limits their usefulness to a radius of 50 feet from the water faucet.
- **Bucket sprayers are difficult to monitor.** The bucket containing the product often is left unattended and out-of-sight while the user is spraying. This poses a threat to small children and pets playing nearby and limits the applicator's ability to keep an eye on the level of product in the bucket.
- **Garden hoses can be difficult to maneuver around plants.** Use a quality hose that maintains its flexibility when temperatures are cool.

Calibrating a Siphoning Bucket Sprayer for Spraying Plants

Calculating Gallons of Water and Ounces of Product Needed

You plan to spray 25 shrub rose bushes with a fungicide to control black spot disease. The label of the product says to use 1.5 fluid ounces per gallon of water.



Calibrating a Siphoning Sprayer for Spraying Plants

Calibration Steps	Sample Problem	Calculations
<p>1. Attach the siphon device to the faucet and the garden hose. Attach the nozzle to the opposite end of the hose and make sure the valve is turned off.</p> <p><i>Do not add pesticide at this time.</i> Put plain water in the bucket and drop the siphon tube into the water. Turn on the water at the faucet, then at the end of the hose. Spray the rose bushes with the water and record the amount of time required to treat all of the plants.</p>	<p>5 minutes to treat 25 rose bushes</p>	
<p>2. Determine how much water was used in one minute. Spray water into a second bucket and measure the amount collected in one minute.</p>	<p>2 gallons of water collected in 1 minute</p>	
<p>3. Determine how much water is required for the entire job.</p>	<p>$2 \text{ gal / min} \times 5 \text{ min} = 10 \text{ gal}$</p>	
<p>4. Compute the amount of pesticide product required for the job.</p>	<p>$1.5 \text{ fl oz / gal} \times 10 \text{ gal} = 15 \text{ fl oz}$</p>	

(continued)

Calibration Steps

Sample Problem

Calculations

5. Compute the amount of water and pesticide to add to the bucket when the delivery ratio for the siphoning device is 16:1.

Since only 10 gallons of water will be required for the job, you'll need a 10/16 mix in the bucket.

6. Mix 15 fl oz of pesticide product with 65 fl oz of water in the bucket.

16 gal water passing through hose will withdraw 1 gal of liquid from bucket

$$10 \div 16 = 0.625 \text{ gal}$$
$$.625 \text{ gal} \times 128 \text{ oz / gal} = 80 \text{ oz}$$

Since 15 fl oz of the product (Step 4) is required for the job, the actual amount of water needed is

$$80 \text{ fl oz} - 15 \text{ fl oz} = 65 \text{ fl oz}$$

First, put the 15 fl oz of pesticide into the bucket. Then add 65 fl oz of water to bring the level up to 80 fl oz. Stir to mix.

Spraying Plants with a Siphoning Bucket Sprayer

- Place the siphoning tube into the bucket containing the 80-ounce mixture of pesticide and water, and turn the water on at the faucet. At the opposite end of the hose, direct the nozzle toward the rose bushes and squeeze the trigger. Spray the rose bushes until the mixture in the bucket is used.
- Working from the nozzle end of the hose, partially fill the bucket with plain water, rinsing the sides as you go. Spray this solution onto the same plants *after the first application has dried*. Repeat twice so that the equipment is triple rinsed.
- Remove the siphon and attach the garden hose directly to the faucet; allow water to flow through the hose and nozzle to make sure all of the product is rinsed out. Remove the nozzle.
- Rinse, dry, and store the nozzle and the siphoning device according to the manufacturers' instructions.



A. Blessing

When spraying trees or tall shrubs, always direct the spray from the center of the plant, outward, to avoid exposing yourself to parts of the plant already treated; i.e., don't put yourself in a situation where you have to reach past wet, treated foliage to reach untreated parts of the plant. When spraying overhead, make sure your gloves are outside your sleeves.

Trombone Bucket Sprayers

Trombone bucket sprayers have a sprayer wand made up of two pieces. The front piece slides back and forth on the other, much like the slide on a trombone. This movement creates a suction that pulls the mixture out of the bucket through a small hose clipped to the side. The opposite end of the hose is attached to the sprayer.

Trombone sprayers are useful in treating tall trees that cannot be covered by small compressed air sprayers and hose-end equipment. They are particularly useful for spraying fruit trees.

Like the siphoning device, the trombone sprayer requires a bucket; but there are some major differences. The bucket is not stationary and is carried to the job. There is no attachment to a faucet, nor is a garden hose used to deliver the product.

When using a trombone sprayer, you mix the pesticide product at the label rate, in the bucket; a ratio of 1:1 is used rather than the 16:1 ratio used for the siphoning device.



Good News About Trombone Sprayers

- **Trombone sprayers can be used to treat tall trees.** Fully primed, a trombone sprayer can reach trees as tall as 20 feet.
- **Their range of treatment is unlimited.** The sprayer is not tethered to a garden hose and does not have to be used in proximity to a water faucet.
- **Contamination possibilities are minimal.** A garden hose is not used to deliver the product.
- **Trombone sprayers are easy to operate.** Equipment is self-contained, portable, and relatively easy to maintain; and it requires minimal storage space.
- **They are easy to monitor.** The level of the bucket mixture is observable while spraying.



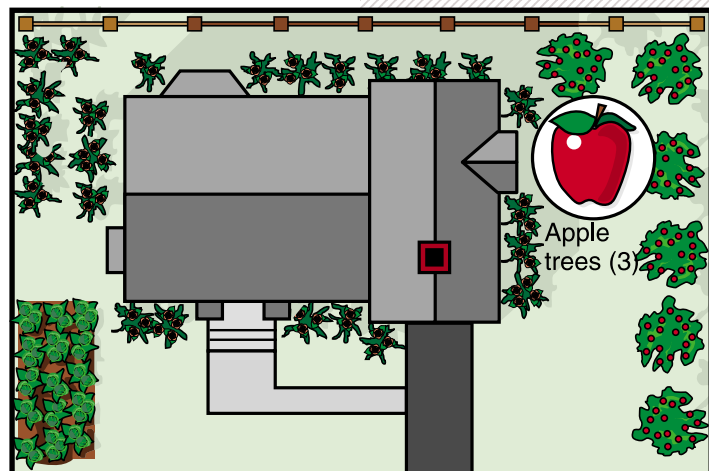
Bad News About Trombone Sprayers

- **Trombone sprayers are expensive.** A quality trombone sprayer costs \$40–\$60.
- **They are somewhat inconvenient.** Larger jobs require the user to stop and refill the bucket several times.
- **They are awkward.** The pesticide applicator has to lift and carry the bucket as the job progresses, and it is very heavy when full.
- **Drift can be a factor.** Movement of the spray off-target, due to a breeze or wind, can be a problem when spraying tall trees at high pressures.

Calibrating a Trombone Sprayer for Spraying Plants

Calculating Gallons of Water and Ounces of Product Needed

You plan to spray three fruit trees with a multipurpose pesticide product containing a fungicide and two insecticides. The label on the product says to use 5 tablespoons (5 Tsp) per gallon of water.



Calibrating a Trombone Sprayer for Spraying Plants

Calibration Steps	Sample Problem	Calculations
<p>1. Select a tree to spray.</p> <p>Fill a 5-gallon bucket with plain water and carry it to the tree. <i>Do not add pesticide at this time.</i></p> <p>Clip the trombone sprayer hose to your bucket and adjust the nozzle for the desired spray pattern.</p> <p>Spray the entire tree, making sure to completely cover all of the branches and leaves (both sides) and the trunk. Spray to the point that the liquid is just about ready to run or drip off the tree.</p> <p>Note how much liquid remains in the bucket, and subtract it from the 5-gallon capacity to determine how much was used.</p> <p>Repeat this process for the remaining two trees.</p>	<p style="text-align: center;">4.75 gal remain $5 \text{ gal} - 4.75 \text{ gal} = 0.25 \text{ gal}$ $0.25 \text{ gal} = 1 \text{ qt}$</p> <p style="text-align: center;">Tree number 1 = 1 qt Tree number 2 = 3 qt Tree number 3 = 8 qt (2 gal)</p>	
<p>2. Compute the amount of water required for the job.</p>	<p style="text-align: center;">$1 \text{ qt} + 3 \text{ qt} + 8 \text{ qt} = 12 \text{ qt}$ $12 \text{ qt} = 3 \text{ gallons}$</p>	
<p>3. Compute the amount of pesticide product required for the job.</p>	<p style="text-align: center;">$5 \text{ Tsp / gal} \times 3 \text{ gal} = 15 \text{ Tsp}$</p>	

Application Procedures

- Pour into the bucket *half* the water necessary for the entire job. Add *all* of the pesticide required for the job. Stir until the product is distributed uniformly in the water, then add the rest of the water.

Sample Problem: In a 5-gallon bucket, mix 15 tablespoons of product with 3 gallons of water.

- Spray all of the mixed product onto the three trees. After the original application has dried, fill the bucket with *plain water* and spray it on the trees. Repeat this two times so that the equipment has been triple rinsed.
- Allow the equipment to dry, and store it properly.
- Note: The size of some jobs may require mixing and applying several bucketfuls of mixed product, in which case you will put off triple rinsing until the entire application is completed.

CONCLUSION

Homeowners take great pride in beautiful and productive landscapes that complement their homes and increase their property's value. A lush green lawn, large shade trees, healthy shrubs, bountiful fruit trees and vegetable gardens, and beautiful flowers blend to create the perfect picture.

But landscape plants must be maintained properly to protect the homeowner's investment, and those who assume the task themselves must become knowledgeable of the needs of landscape plants and the cultural practices required to keep them healthy.

Homeowners must constantly nurture their green thumb! Some have an inherent desire to interact directly with their landscape plants and do so with an on-going, intensive study of horticultural practices. They derive great pleasure and satisfaction from gardening and the challenges it presents. They exert an effort to learn about landscape maintenance and actually take charge, performing whatever activities are required, themselves.

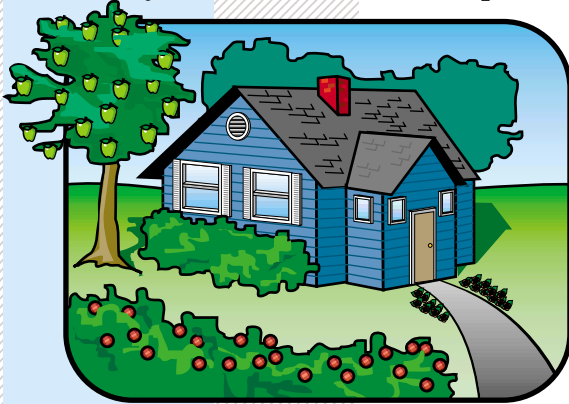
Other homeowners are less interested in gardening but share gardening enthusiasts' love of a beautiful landscape and appreciation for the value it adds to their property. Their choice is to contract with a professional lawn care services to maintain their lawn and plantings.

Although an ounce of prevention is worth a pound of cure—and despite our using good cultural practices—sometimes pests get the upper hand. And sometimes pesticide applications are necessary. If you decide to apply pesticides, yourself, remember these steps:

1. Make sure the pest is positively identified.
2. Be careful to select the correct product to control the pest.

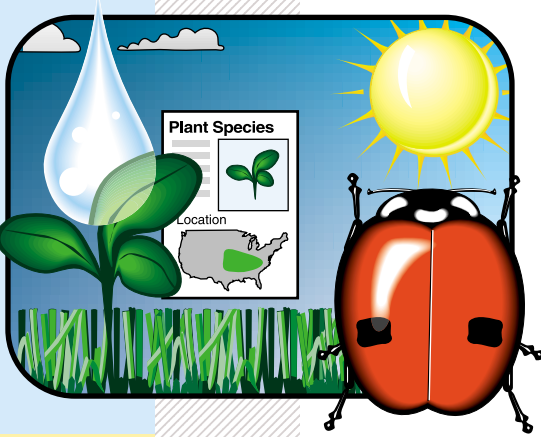
GOAL

A healthy and attractive landscape



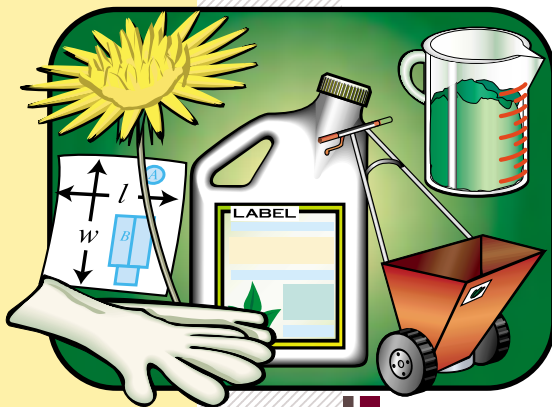
FIRST

Always follow good cultural practices



THEN

If needed, apply pesticides accurately



3. Buy only the amount you'll need to avoid having to store leftover product.
4. Read the label carefully and understand how to mix and use the product safely and effectively.
5. Obtain and use the required safety clothing.
6. Select the proper application equipment for the job, and calibrate it accurately.
7. Mix just enough to complete the job—or to complete each increment if the job requires making a series of applications.
8. Know and practice all safety measures referenced on the product label.
9. Clean, store, and maintain the application equipment according to the manufacturer's instructions.

These steps may appear complicated to a first-time user of pesticides and pesticide application equipment, but they are very straightforward and can be mastered with study and experience.

Calibration is an important step in pesticide application. Other publications in this series address various aspects of homeowner pest control (see page 38). Obtain, study, understand, and practice the requirements for each step. Pesticides (and fertilizers) must be applied safely to minimize risk to the user, the environment, and the landscape plants. Visit the following websites for additional information:

www.btny.purdue.edu/PPP/

www.agry.purdue.edu/agronomy/turf/turf.htm

Homeowners' responsibility to calibrate equipment accurately is an integral component of safe pesticide application, and the result is worth the time and effort: a healthy, beautiful landscape that adds value to your home.

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Pesticides and Personal Protective Equipment, PPP-38

Pesticide Safety and Calibration Math for the Homeowner, PPP-39

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CONVERSIONS			ABBREVIATIONS		
1 gallon	=	16 cups	1 gal	=	16 C
	=	8 pints		=	8 pt
	=	4 quarts		=	4 qt
	=	128 fluid ounces		=	128 fl oz
1 quart	=	4 cups	1 qt	=	4 C
	=	2 pints		=	2 pt
	=	32 fluid ounces		=	32 fl oz
1 pint	=	2 cups	1 pt	=	2 C
	=	16 fluid ounces		=	16 fl oz
1 cup	=	8 fluid ounces	1C	=	8 fl oz
1 tablespoon	=	3 teaspoons	1 Tsp	=	3 tsp
	=	1/2 fluid ounce		=	1/2 fl oz
4 tablespoons	=	2 fluid ounces	4 Tsp	=	2 fl oz
	=	1/4 cup		=	1/4 C
8 tablespoons	=	4 fluid ounces	8 Tsp	=	4 fl oz
	=	1/2 cup		=	1/2 C
	=	1/4 pint		=	1/4 pt
1 square yard	=	9 square feet	1 sq yd	=	9 sq ft
			1 sq yd	=	9 ft ²
1 acre	=	43,560 square feet	1 A	=	43,560 ft ²

To quickly and easily measure an application site, determine the length of your normal stride while walking. First, walk across an area and count the number of steps you take. Then measure the length of the area covered and divide it by the number of steps to determine the length of your stride.

Example: You take 25 steps and cover 75 feet.

$$75 \text{ ft} \div 25 \text{ steps} = 3 \text{ ft}$$

So the length of your normal stride is 3 feet.

Next, measure the length and width of a treatment area by walking across it in opposite directions and counting the number of steps. Multiply the number of steps by the length of your stride.

Example: Length = 37 steps Width = 22 steps

$$37 \text{ steps} \times 3 \text{ ft} = 111 \text{ ft}$$

$$22 \text{ steps} \times 3 \text{ ft} = 66 \text{ ft}$$

Finally, multiple the length times the width:

$$111 \text{ ft} \times 66 \text{ ft} = 7,326 \text{ ft}^2$$

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