

# Calibrating Boom Sprayers

A Users Guide

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## Why calibrate?

Calibrating insures proper application rates of pesticides. When equipment is not properly calibrated, it is easy to apply too little or too much pesticide. The result can be a lack of pest control, damage to crops, excess cost, and harm to the operator and environment. Besides, it is the law.



Calibration is the process of measuring application rates of your sprayer based on speed, pressure, nozzle size/type, or a combination of the three. All sprayers, including hand held, back pack, and boom sprayers should be calibrated several times during the growing season or whenever you change chemicals.

## Before you calibrate, be sure the sprayer is clean and in good working order.

Follow the manufacturer's instructions for checking and maintaining the equipment. Follow recommendations for rate of travel, types of nozzles, pump pressure, and suggested settings to achieve a specific delivery rate. Check for leaks, plugged filters, kinked lines, fittings, and pump seals. Make sure that all nozzles have the same flow rate and pattern.

**Note:** If there is a significant difference in the output from one or more nozzles you should check to make sure they are the same nozzle type. Look for damage, excessive wear, or blockage. Consistent nozzle output will ensure a uniform and accurate application rate, which will result in the most economical and efficient use of pesticides.

Once the equipment is inspected and determined to be in good working order you are ready to begin calibration.

## Pre-Operation Check List

- ✓ Clean the tanks to remove any sand or other abrasive material that could clog screens and cause wear on the pump and nozzles.
- ✓ Fill the tank with clean water.
- ✓ Clean the suction and line strainers.
- ✓ Remove nozzle tips, strainers, and boom end caps.
- ✓ Clean and inspect the nozzle tips and strainers.
- ✓ Make sure all of the nozzles are the same size and type.
- ✓ Run the sprayer and flush the boom and all hoses with clean water.  
(Never operate the pump without liquid in the tank)
- ✓ Reinstall nozzles and strainers and replace any worn or damaged parts.
- ✓ Replace boom end caps.
- ✓ Run the sprayer again and check connections for leaks.
- ✓ Adjust the pressure regulator to the desired operating pressure and run the sprayer again.
- ✓ Collect the spray from each nozzle for a given amount of time to see if nozzle output is uniform.
- ✓ Calibrate the sprayer using one of the methods described on page 2.
- ✓ Add water and chemical to the tank in the correct proportions for the desired application rate.

## Two methods for calibrating a boom sprayer

### I—The tank refill method:

Set two stakes 660 feet apart in a field that is similar to the area to be sprayed.

Partially fill and operate the sprayer to see that all parts are working properly.

Select an operating speed and pressure based on nozzle recommendations. Note the tachometer reading or mark the throttle setting. (When spraying be sure to use the same speed and pressure that was used for calibrating.) Shut off the sprayer.

Fill sprayer tank completely.

Begin 25 feet from the first stake to get up to operating speed with the spray off.

When the boom passes the stake, switch the sprayer on. Turn the sprayer off when the boom passes the second stake.

After spraying, refill the tank. Measure the amount of water (to nearest quart) that is needed to refill the tank.

Use this formula to determine the application rate of the sprayer:

$$\text{Gallons per acre (GPA)} = \text{Gallons to refill} \times 66 / \text{spray width (feet)}$$

#### Example:

It took 5.5 gallons to refill the tank and the spray width was 10 feet:

$$\text{GPA} = 5.5 \times 66 / 10 = 363 / 10 \text{ or } 36 \text{ gallon/acre}$$

Add the recommended amount of chemical (from the pesticide label) to the tank as determined by the application rate (GPA) and volume of water in the tank. For example, if you want to apply 2 pounds of pesticide per acre and you are applying 36 gallons of water per acre, add 2 pounds of chemical for every 36 gallons of water in the tank.

### II—The 1/128<sup>th</sup> acre method

This method requires a stop watch, jars (either homemade or a commercial calibration jar) and a course measured out at a specific length depending on the nozzle spacing on the sprayer boom (see the chart at right). Make sure the area where you calibrate the sprayer is similar in terms of surface and terrain (sod, plowed, hilly, flat etc.) to the field to be sprayed.

Fill the sprayer tank at least half full with clean water.

Measure and mark off a course according to the table. You may want to set permanent stakes marking the length of the course to save time the next time you calibrate your spray equipment.

Select the tractor gear and record or mark the throttle setting or the speedometer reading that will be used during the spraying operation. Record the number of seconds it takes to drive your sprayer unit the length of the course. Remember to begin driving about 25 feet before the first stake so the tractor is traveling at operation speed for the entire length of the course. Start the timer as the sprayer crosses the first stake. Drive the course several times and calculate the average time it takes to complete the course.

Use the average seconds it took to run the course (arrived at in the previous step) to time the output from the spray nozzles.

Set the pressure and pump speed to the settings you plan to use in the field. With the sprayer standing still, catch the water from several nozzles in the collection jars. Run the sprayer for the number of seconds arrived at in the previous step.

Calculate the average output per nozzle in ounces. The ounces per nozzle will equal the gallons per acre applied by the sprayer when operated at that particular pressure and pump speed.

Nozzle Spacing (in)	Course length (ft)
12	340
16	255
20	204
24	170
28	146
32	127
36	113
40	102



**Example:**

A sprayer has 24 inch nozzle spacing. The course length would be 170 feet (see the table).

If it takes an average of 30 seconds to drive the course length at your selected spraying speed and the average amount of water collected from several nozzles running for 30 seconds is 12 ounces, the sprayer is applying 12 gallons per acre.

If the delivery rate is not within 5 percent of the desired rate adjust the sprayer by changing pressure or travel speed. If a large change is needed select a different set of nozzles.

**Calculate the tank mix**

Now that the sprayer is calibrated you are ready to calculate your tank mix. Using the recommended application rate from the pesticide label, the capacity of the sprayer tank, and the calibrated output of the sprayer, determine how much chemical to add to the tank.

Divide the tank capacity by the gallons applied per acre to determine how many acres can be treated per tankful.

Multiply the acres treated per tankful by the rate per acre to determine how much chemical to add to a full tank.

***Note:** If you are treating a small number of acres you may use less than a full tank. Adjust your calculations accordingly.*

If the label recommends an application rate of 1 pint per acre and your sprayer has a 200 gallon tank that delivers 10 gpa, first calculate the number of acres treated by a tankful: **200 gallon tank/10 GPA = 20 acres treated per tankful**

Then calculate the amount of pesticide to add to a full tank:

**20 acres per tank x 1 pint per acre = 20 pints of pesticide added to a full tank**

**Why does this work?**

The course length multiplied by the nozzle spacing (width) equals an area of 1/128th acre. Since there are 128 fluid ounces in a gallon the number of ounces delivered per nozzle in the time it takes to drive the course length is equal to the number of gallons per acre. It doesn't matter how many nozzles are on the boom, each one covers 1/128th of an acre for the designated distance in the table on page 2.

**Ounces per Nozzle = GPA**

If there are two or more nozzles per spacing you will need to multiply the measured ounces by the number of nozzles for the spacing to get the gallons applied per acre.

If you are banding the pesticide (applying in strips to just a portion of the row) remember to determine the travel distance by the band width rather than the nozzle spacing.

**CAUTION**

**ALWAYS** read and follow the label. It is a violation of federal and state law to use a pesticide inconsistent with its label.

As the applicator, **YOU** are legally responsible.

There are risks and benefits to using pesticides. To obtain maximum benefit and to minimize risk carefully calibrate equipment and follow all label instructions. Pay special attention to precautionary statements.

Contact your local Cooperative Extension office for pest management recommendations. Contact your local NRCS office for an evaluation of the environmental risks associated with individual pest control practices and for a mitigation plan to reduce risks involved with pesticide use.





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