

## Calibrate Your Sprayer to Determine Your True Application Rate

By: Dr. Erdal Ozkan  
Pesticide Application Technology Specialist  
Extension Agricultural Engineer  
Ohio State University



*Picture source: Syngenta*

Have you calibrated your sprayer this year before the spraying season started? If yes, great! If not, there is still time to do that. You may ask: Why do I need to calibrate my sprayer? The answer is simple: you must know exactly how much chemical is applied. Without a calibration, you are simply guessing.

Applying pesticides at the proper rate is essential to achieving satisfactory weed, disease, and insect control. The directions on the container label tell what application rates give the best results. However, proper application rates will be attained only if sprayers work well and are calibrated correctly.

Calibrating a vineyard sprayer is not as difficult as it sounds. Usually the first thing you want to know is the application rate in gallons per acre. There are many methods to choose from to determine this, but one method that is the easiest and the most practical is as follows:

- 1) Find a level ground and, fill up the sprayer tank completely up to the lid; or up to a certain marking on the tank water site gauge, if your sprayer has one.
- 2) Measure an area in the vineyard equal to one acre and spray this area at your normal spraying settings
- 3) Return to where you had measured the initial water level in the tank
- 4) Refill the sprayer tank with water up to the same marking you placed when you filled the tank,
- 5) The amount of water that was needed to refill the tank back to the same level is equal to gallons per acre application rate.

- 6) Make changes in pressure or travel speed if the difference between the measured (actual) application rate and the intended rate is greater than 5% of the intended rate.

This method is quick and simple, and you find out what your application rate is. However, if you follow this method, you will never know if any one of the nozzles is plugged, or worn out. With this method, you may have one nozzle clogged and spraying only 50% of what it is rated for, and the next nozzle may be worn out, or not the right size, and spraying at a rate 50% more than its rated output. These inaccuracies will cancel each other out and the final gallons applied per acre may be exactly what you intended to apply. However, the results will be less than desirable. Therefore, relying on the quick and easy calibration method mentioned above is not a good idea. Here is another method that tells you more about the conditions of your sprayer.

- 1) **Determine the Row Spacing** (distance between two rows in feet) in the vineyard
- 2) **Determine travel speed in Miles per Hour (MPH)**

Travel speeds change depending on the ground conditions, and the topography. To determine the actual travel speed in miles per hour, follow this procedure:

- a) Measure a distance (in ft)
- b) Drive the distance and record the time elapsed in seconds,
- c) Divide distance by time and multiply the resulting number by 0.68

### 3) **Determine Gallons per Acre (GPA) application rate**

- a) Attach hoses to each nozzle on the sprayer and run the sprayer at the pressure recommended for your application
- b) Measure nozzle output in ounces per minute for each nozzle. Convert ounces per minute to gallons per minute (GPM) by dividing ounces by 128 (there are 128 ounces in one gallon)
- c) Replace any nozzle when the measured output deviates by more than 10 percent of the rated output of that nozzle when it was new (check nozzle catalogs for rated outputs)
- d) When satisfied with the nozzles on the sprayer, calculate the Total GPM from all nozzles by adding individual nozzle output.
- d) Use the formula below to determine the GPA application rate:

$$\text{GPA} = \frac{\text{Total GPM} \times 495}{\text{MPH} \times \text{Row spacing (ft)}}$$

### 4) **Make adjustments**

Compare the actual application rate above resulting from the calibration process with the intended application rate. If the difference between the calculated actual rate and the intended rate is more than 5% of the desired rate, you need to make adjustments to bring the error below 5%. You can start by changing the pressure. Lowering the spray pressure will reduce the spray delivered; higher pressure means more spray delivered. Do not

exceed the pressure rate recommended for the nozzles when adjusting the pressure rate. Remember that changes in pressure will result in changes in droplet size. So, don't go to extreme pressure settings just to reach the desired output from nozzles. You can also correct the application error by changing the travel speed. Slower speeds mean more spray delivered, faster speeds mean less spray delivered. If changes in either pressure or travel speed, or both do not bring the application rate to the desired rate, then you may have to select a new set of nozzles with smaller or larger orifices.

#### **5) Recalibrate the sprayer**

Calibrating a sprayer once a year is not enough. It should be calibrated several times throughout the season to compensate for wear in pumps, nozzles, and metering system; and when spraying in a different orchard or vineyard than the one where the previous calibration was made. Changes in the soil surface characteristics and topography cause changes in travel speed which will directly affect the application rate.

**6) Safety is extremely important.** Use water instead of chemical mixtures when calibrating your sprayer, and wear gloves and protective clothing.

In summary, properly maintained spraying equipment is critical to pest control and user safety. A properly calibrated sprayer saves you thousands of dollars in chemical cost; improves yield; reduces the chance of damage to grapes as a result of over application and potential risk of contamination of the environment with pesticides.