Viticulture and Enology Program
WASHINGTON STATE UNIVERSITY

Calibration of a Weed Sprayer for Band Application with the 1/128th Method

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By using the 1/128th method, there is almost no math required to calibrate a weed sprayer. It is a simple method that can be done in a relatively short time. The preliminary step to all calibrations is to ensure that all parts of the sprayer (i.e. pumps, pressure gauges, etc.) are working properly

1. Check Speed

Speedometers on tractors, especially old ones, are notorious for being inaccurate. Knowing the actual speed you are driving is used in the subsequent calibration steps and will also help with achieving good coverage. Once desired speeds is achieved, record the RPM of engine and gear.

Manually:	Use a Tool:
In the vineyard, mark a 100 foot path with two poles. With a stopwatch, record the time it takes to for the front tire of the tractor to pass from one pole to the next. Use this formula to check the speed. $$MPH = \frac{feet\ traveled\ x\ 60}{\sec travled\ x\ 88}$$	In the vineyard, start the gps or app. Accelerate and drive down a row until you get to the desired speed (ex. 3.0 mph). Drive that speed for 15 seconds and then look at the device to determine accurate speed  Map My Ride iPhone App  GPS by TeeJet  eTrex hiking GPS

2. Measure the Band Width to be sprayed (Table 1)

Measure the band width to be sprayed and find the corresponding width and calibration in the table below.

Table 1

Area to be Sprayed (Under Vine; inches)	Calibration Distance (feet)
36	113.4
32	127.6
30	136.1
24	170.2
20	204.2
19	214.9
18	226.9
14	291.7
12	340.3
To determine distance for spacing or band width not listed, divide the spacing or band width expressed in feet into 340.3. *Example:* For a 13" band, the calibration distance would be 340 divided by 13/12 = 314.1.	

3. Time to Travel

In the field with your crop, mark out the calibration distance with a flag or cone for the start and stop of the run.

With all attachments in operation (harrows, planters, etc.) and traveling at the desired operating speed, determine the number of seconds it takes to travel calibration distance. Be sure machinery is traveling at full operating speed the full length of the calibration distance. Record the time it takes for the front tire of the tractor to hit the first flag to when it crosses the second flag.

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Steps to Weed Sprayer Calibration

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4. Measure Nozzle Output

As the tractor is parked and sitting still, operate the same throttle settings as recorded in **Step 3**. Turn on the spray with clean water (no pesticide). Collect the spray from ALL the nozzles for the same time it took to drive in **Step 3**. Measure the output in ounces in a measuring cup that is refined enough to have individual lines for each ounce. This ensures better accuracy.

Compare the output of the nozzle with the expected manufacturer output. The expected output can be found in a nozzle catalog and you will need to know the pressure and nozzle type/number you are using. If the output is more than 10% off the manufacturer's expected output, then change the nozzle. After putting in a new nozzle, repeat **step 4** to ensure that everything is operating correctly.

5. Convert to Gallons per Acre (GPA)

No math required! Because the area sprayed is 1/128th of an acre and there are 128 ounces in a gallon, the volume directly translates to GPA. For example, if 20 ounces was collected in the time to spray, than the spray is being applied at a rate of 20 gallons per acre.

Note: If the measured gallons per acre is not what you desired, then either change nozzles (i.e., different output), change nozzle number, or change driving speed to adjust sprayer output. For example, nozzles have different outputs (e.g., 0.1 gallons per minute or 0.2 gallons per minute), increasing the number of nozzles **increases** the total gallons per acre, and increasing tractor speed **decreases** total gallons per acre.

6. Calculate Area Treated

There is a difference between a ***planted*** acre of grapes and a ***treated*** band under the vine row. Therefore, the number of gallons/acre determined in **Step 5** is more than what will actually be applied to that planted acre. To determine what percentage of a ***planted*** acre is going to be ***treated,*** compare the treated band width in a row to the total row spacing.

Example: A 10-foot row spacing with a 3-foot band of herbicide sprayed under the vines (1½-feet on each side of the vine) would be three-tenths of an acre to be treated or 30% of one acre of vineyard (3÷10=0.30 or 30%). Multiply this by the number of grape acres. For example if this farm had 30 acres of grapes with 10-foot row spacing and 3-foot under-vine spacing, then 30% x 30 = 9 acres of treated land.

To determine how many tanks you will need, take the total number of treated acres, multiplied by the number of gallons per acre, and then divide by the capacity of the tank. Let's assume, the herbicide sprayer is a small tow behind 15 gallon tank.

$$Total\ Tanks\ Needed = 9\ acres\ x\ 20\ \frac{gal}{acre}\ \div 15\ \frac{gal}{tank} = 12\ tanks$$

To determine the number of ***treated acres per tank***, divide the treated acres by the number of tanks.

$$Total\ Treated\ Acres\ Covered = 9\ acres \div 12\ tanks = 0.75\ treated\ acres\ per\ tank$$

Steps to Weed Sprayer Calibration

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7. Calculate Amount of Chemical Needed for Treatment

The amount of water and chemical mixed should be for the amount of treated land combined with the volume of spray being delivered.

Example: In **Step 6**, there were 9 acres of treated land. Chemicals are usually listed as rates per acre. The amount of total chemical will be 9 times the recommended label rate to treat this 30-acre vineyard.

To determine the amount of **product needed per tank**, multiple the chemical rate on the label by the number of treated acres per tank. For example, if a product is labeled at 14 ounces per acre, then:

$$Product\ per\ tank = 14\ ounces\ per\ acre\ \ x\ \ 0.75\ treated\ acres\ per\ tank = 10.5\ ounces\ per\ tank$$

Manually:	Use a Tool:
Do **Steps 6 & 7** as described above	There are several smart phone apps on the market that will do the math. The user only needs to input the product rate, spray volume/acre, and tank size. These are some options, but there are others in the app stores.  Mix My Sprayer  Tank Mix