



## **Sprayer Calibration Using the 1/128th Method for Motorized Backpack Mist Sprayer Systems**

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The motorized backpack mist sprayer, also known as the mist blower, is becoming increasingly more popular among small-acreage producers here in Hawai'i. The backpack unit holds a small engine that powers a fan. The fan is connected to a flexible tube that directs air towards the intended target. Located near the end of the flexible tube is a discharge orifice that regulates the flow rate of the spray solution from the hopper. The force of the air causes the spray solution to be atomized into a fine mist. The fine mist in combination with the forced air can help the spray solutions penetrate the crop canopy and improve coverage.

Calibrating spray equipment is an important step in applying crop-protection chemicals to a targeted crop/pest. Proper calibration of the sprayer can help to ensure accurate spray coverage. Calibrating a motorized backpack mist sprayer can be difficult; therefore, we have produced a simple, step-by-step guide to address some important variables affecting calibration. We have adapted the 1/128th method of sprayer calibration to the backpack sprayer calibration procedure to simplify the process.

The 1/128th calibration method is a fast, easy way to compute the gallons-per-acre rate (GPA). Under-application of crop-protection chemicals can result in poor pest control and contribute to pesticide resistance. Over-application of crop-protection chemicals can lead to human, legal, and environmental issues, as well as possible crop injury, i.e., phytotoxicity. It is important to know the calibrated spray volume in gallons per acre (GPA) and the amount of pesticide to be mixed with



that calibrated spray volume to accurately apply crop-protection chemicals. Always read the pesticide label and follow the instructions.

### **Simplified 1/128<sup>th</sup> Calibration Conversions**

**128 fluid ounces = 1 gallon**

**1 fluid ounce = 1/128th of a gallon**

**340 sq ft = 1/128th of an acre**

Based on the 1/128th calibration method, each ounce of water discharged to the 340-sq-ft area during calibration corresponds to 1 gallon of spray mix per acre.

**1 fluid ounce collected → 1 gallon per acre (GPA)**

This 1/128th calibration method requires almost no calculations. The number of fluid ounces of spray mix you apply to a 340 sq ft area corresponds to the estimated number of gallons of spray mix per acre.

The accuracy of spray delivery is only as good as the consistency of application in the test area.

### Key Variables to Consider for Motorized Backpack Mist Sprayer Application

- Properly maintained spray equipment
- Discharge orifice size
- Motor speed
- Target pest
- Pest incidence
- Spray volume in tank
- Crop height/orifice discharge height
- Crop density
- Wind speed, direction
- Field terrain: e.g., slope, roughness of terrain, etc.
- Sprayer's speed: e.g., energy level, arm motion, walking speed, etc.

### Calibrating Your Motorized Backpack Mist Sprayer Using the 1/128th Calibration Method

**Step 1:** Select a representative calibration site in the field to be sprayed (with representative terrain, crop density, height, etc., and measure out 1/128th of an acre (340 sq ft) (Fig. 1a, b). Example: It may be 18.5 ft by 18.5 ft or 10 ft by 34 ft (Fig. 1c, d).

Note that you do not need to use the exact dimensions provided in the example. Just establish a 340 sq ft area, or 1/128th of an acre.

For best results, measuring the area in the field to be sprayed is ideal, as crops vary in height and density (Fig. 1c). Selecting a good representative crop area for calibration purposes will help ensure that the correct amount of chemical is applied to the actual target area.

**Step 2:** Fill motorized backpack sprayer hopper (tank) with  $\frac{3}{4}$  to  $\frac{2}{3}$  volume of water (e.g., 320 fl oz) (Fig. 2). Make sure you know how much water you've put in the hopper. Always calibrate with a known orifice opening



Fig. 1a.



Fig. 1b.

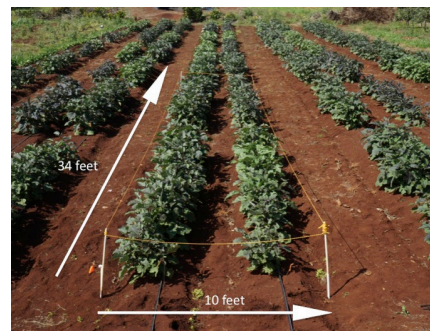


Fig. 1c.

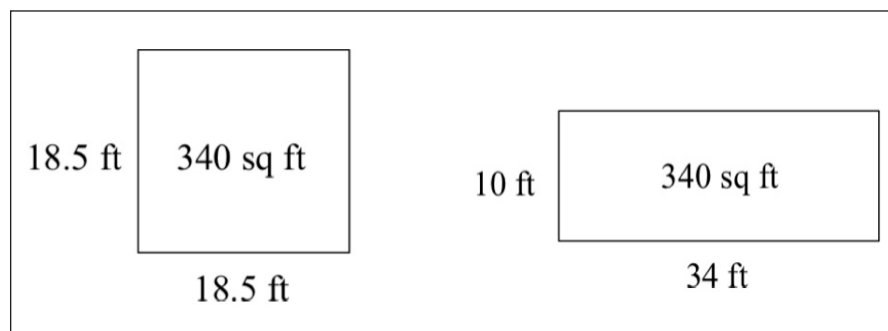


Fig. 1d.



Fig. 2.

and motor speed. Consider marking your throttle lever setting if it helps maintain motor speed.

**Step 3:** Spray water on the plants in a comfortable, consistent motion to get the best spray coverage of the targeted 340 sq ft area (Fig. 3a). Keep in mind that you need consistent, uniform spraying motion and walking speed.

**Take into account the height and fullness of the developing crop during calibration** (Fig. 3a, b, c). As the plant density increases, it may require more spray volume, a longer time, or both to spray a given area. It is

also important to remember with backpack mist sprayer systems that the higher you raise the discharge orifice, the slower the spray solution will discharge. Therefore, you will have to calibrate the system individually for high and low crop heights.

**Example:** Spray solution will discharge faster when spraying tea (a shorter crop) (Fig. 3a) compared to spraying banana (a taller crop) (Fig. 3b), assuming all other variables are the same.

**Note:** Variability in solution output (caused by changes in the discharge orifice's vertical angle, as mentioned above) can be mitigated by the use of pressure pump



Fig. 3a



Fig. 3b

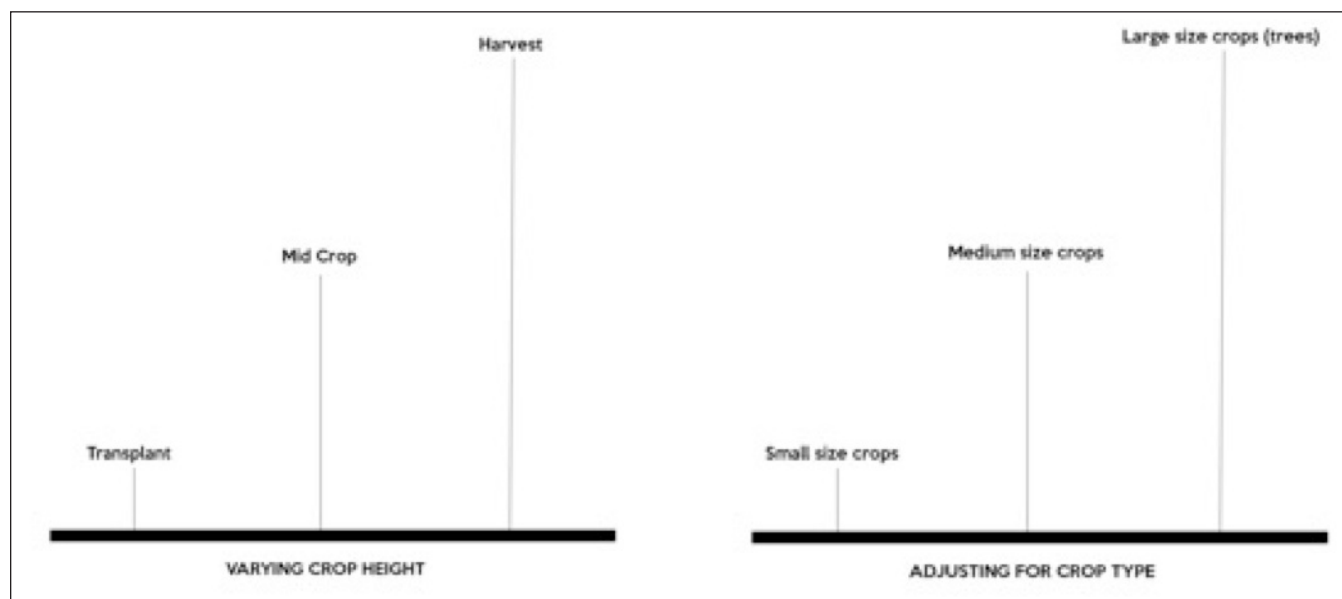


Fig. 3c



kits (Fig. 4). Pressure pump kits can help maintain a consistent output rate when the discharge orifice is held at varying angles.

**Step 4:** Measure the time it takes you to spray the targeted area (Fig. 5). It is important for the sprayer to be consistent in covering the 340 sq ft area. Changes in application speed will affect the accuracy of calibration.

**Step 5:** Turn engine off and empty and measure the remaining water from the hopper to calculate how much water was discharged (original volume minus amount remaining equals the amount discharged) (Fig. 6).

**Step 6:** Utilizing the 1/128<sup>th</sup> method of calibration, the number of ounces discharged to spray the 340 sq feet

area equals the number of gallons per acre (GPA) of spray solution (Fig. 7)

Repeat steps 2–6 two more times and average the three results.

**Example:** If you started with 320 fl oz of water in the tank, and you collected 192 fl oz after spraying the 340 sq ft area, then 128 fl oz (= 320-192) of water was discharged.

Therefore, based on your calibration, the sprayer output is 128 gallons per acre, or 128 GPA.

### Summary

Pesticide applicators are required to know how much product is applied to a targeted crop. Proper sprayer calibration is a necessary step for all applicators of crop-protection chemicals. A change in one variable of



Fig. 4



Fig. 5



Fig. 6



Fig. 7

pesticide application (e.g., spray pressure, nozzle type, walking speed, etc.) can dramatically influence the end result. Spray equipment should be recalibrated at the beginning of each application, as conditions often change; for instance, a change in the spray applicator can drastically affect the volume output. It is also important to note that spray equipment technology is constantly changing. New sprayer equipment and accessories are becoming available on the commercial market that can help improve the efficacy and consistency of sprayer calibration and application.

Always read and follow the label of the pesticide you are applying. For more information, contact the Hawai'i Department of Agriculture Pesticide Branch or the UH CTAHR Cooperative Extension Service.

### Disclaimer

Mention of a trademark or proprietary name does not constitute an endorsement, guarantee, or warranty by the University of Hawai'i Cooperative Extension Service or its employees and does not imply a recommendation to the exclusion of other suitable products. Pesticide use is governed by state and federal regulations. Read the pesticide label to be sure that the intended crop site is included on it, and follow all label directions.

### Note on Measurements

\*\*We use fluid ounces, gallons, ounces, pounds, etc. because these units of measurement correspond with different pesticide labels.

### References

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