Greenhouse Sprayer Calibration and Spray Calculation Worksheet

Retain the following information for your records: Date _____

Business _____ Operator_____ Phone _____

Address _____ Town _____ State_____ Zip code _____

Sprayer Identification Sprayer _____

Pressure _____

Tip _____

Location Information Greenhouse_____

Growth stage_____

Hangers Present? _____

How much do you spray with this sprayer in this house at this stage of growth?

To know how much chemical to mix, you need to know how much spray volume you will need for the area to be treated. By calibrating yourself to your sprayer to the crop at this stage of growth, you can start off with the correct amount of spray.

Step 1: Find the square footage of a portion of your greenhouse to test.

Perhaps this is a few benches or a given section of floor, but the crop in it should represent the crop throughout the section to be sprayed. Calculate the "test area" by multiplying the length of the test section times the width of the test section (not including aisles).

_____*square feet* ("test area")

Step 2: Figure out how much liquid it takes to spray the test area.

In your sprayer, put more water than you think will be needed to spray the "test area". Do not add any pesticide for this step; you are simply determining how much you spray with that sprayer in a given area. The amount you start with is the "initial volume". Spray the "test area", giving the same coverage you would during a real spray. When you finish the "test area", measure how much water is still in the tank. This is the "remaining volume".

Calculate the volume used for this test ("test volume")

"Initial volume" minus "Remaining volume" equals "Test volume"

_____*gallons* - _____*gallons* = _____*gallons* ("test volume")

Step 3: Measure the total square footage to be sprayed with chemical.

This may be the entire greenhouse or just a portion. Call this the "spray area". The "spray area" is the length times the width (not including the aisles).

___*square feet* ("spray area")

Step 4: Calculate how much spray you need for the "spray area".

This is the total amount of liquid (water plus chemical) you will need in your tank. Call this the "spray volume".

"Test volume" times "Spray area" divided by "Test area" equals "Spray volume"

____*gallons ("test volume") X* ____*square feet ("spray area")* ÷___*square feet* ("test area") =

_____*gallons ("spray volume")*

Step 5: Calculate how much chemical to use.

This will be the amount of chemical you mix into the "spray volume" to treat your crop. Call this the "spray chemical". The label may give this to you in "ounces, fluid ounces, lbs, etc **per gallon**". If so, simply multiply that number times the "spray volume" to find "spray chemical".

More likely, the label will tell you how much chemical to use (in ounces, fluid ounces, lbs, etc.) **per 100 gallons**. If so, calculate "spray chemical" as follows:

"Chemical per 100 gallon" times "Spray volume" divided by 100 equals "Spray chemical"

____*oz, floz, lbs ("chemical per 100 gallon") X* ____*gallon ("spray volume")* ÷ 100 =

_____*oz, floz, lbs ("spray chemical")*

Step 6: Mix your tank

Put approximately ½ of the "spray volume" in the tank. Add "spray chemical". Continue filling the tank to the "spray volume". Always follow mixing directions on the label.

Jonathan Ebba, Extension Field Specialist & George Hamilton, Extension Field Specialist December 20, 2019

Backpack Sprayer Calibration Worksheet
1/128 Method

1/128 Method Calibration

The concept of the 128th method is based on the time it takes to spray 128th of an acre with a single nozzle on a backpack sprayer and hand pumped sprayer. That time requirement is then used to collect fluid ounces from a single nozzle. Since there are 128 fluid ounces in a gallon, the simple conversion or result is in gallons per acre (GPA).

Retain the following information for your records: Date _____

Ag Firm _____ Operator _____ Phone _____

Address _____ Town _____ State ____ Zip code _____

Backpack Sprayer Identification: _____

Backpack Sprayer Brand _____ Tank Size _____

Sprayer Tip Type _____ Sprayer Tip Size _____

Control Flow Value Regulator Type and Pressure Rating _____

Step 1: Determine application pressure and timing.

Mark off an area that is 340 square feet (18.5 feet by 18.5 feet). Mark out established boundaries. Measure the time in seconds it takes to uniformly spray the 340 square feet. Walk at a comfortable, steady speed and maintain consistent pressure while spraying. Operate the backpack sprayer with half tank of water at the desired pressure.

Seconds to spray the 18.5 feet by 18.5 feet area:

First Trial:_____ Second Trial:_____ Third Trial:_____

Total time (sum of the 3 trials): _____Seconds

Average time needed to spray 340 square feet area (18.5 feet by 18.5 feet) =

_____fluid ounces divided by 3 trials = _____ average number of seconds to given spray area

Step 2: Measure nozzle output.

Using a stopwatch and measuring cup marked in fluid ounces, collect water from the nozzle for the time (in seconds) it took to spray the predetermined area.

Collect water output for _____ seconds (Calculated in Step1)

Amount collected:

1) _____ fluid ounces 2) _____ fluid ounces 3) _____ fluid ounces

Total output from the nozzle (sum of the 3 collections): _____fluid ounces

Fluid ounces for average nozzle output =

_____fluid ounces divided by 3 collections = _____fluid ounces for average nozzle output

Average nozzle output: _____ fluid ounces is equal to _____Gallon per Acre (GPA)

The sprayer is calibrated to deliver _____ gallons per acre.

To convert to gallons per 1000 square feet

Gallons per 1000 square feet = _____GPA divided by 43.46 *(number of 1000 sq. ft. in acre)*

Gallons per 1000 square feet = _____

To convert to fluid ounce per 1000 square feet

Fluid Ounce per 1000 square feet = _____ Gallons per 1000 square feet times 128 fl. oz. per gallon

Fluid Ounce per 1000 square feet = _____

George Hamilton, Extension Field Specialist **February 8, 2016**

University of New Hampshire Cooperative Extension

Backpack Sprayer Calibration Worksheet
Actual Area Sprayed Method

Retain the following information for your records: Date _____

Ag Firm _____ Operator_____ Phone _____

Address _____ Town _____ State ____ Zip code _____

Sprayer Identification Backpack Sprayer _____

Spray Nozzle _____ Tip Size _____

Control Flow Valve Type and/or Pressure _____

Actual Area Sprayed Method Calibration

The concept of the actual area sprayed method is based on the time it takes to spray given area with the backpack sprayer. That time requirement the given area is then used to collect spray from the backpack sprayer.

Step 1: Determine application pressure and timing.

Mark off an area along with marking out established boundaries and record measurements of the area. Measure the time in seconds it takes to uniformly spray the given area. Walk at a comfortable, steady speed and maintain consistent pressure while spraying. Operate the backpack sprayer with half tank of water at the desired pressure.

Total:_____ seconds to spray the_____ feet by _____ feet area.

Step 2: Measure nozzle output.

Using a stopwatch and measuring cup marked in fluid ounces, collect water from the nozzle for the time (in seconds) it took to spray the given area.

Collect water output for _____ seconds.

Amount collected:

1) _____ fluid ounces 2) _____ fluid ounces 3) _____ fluid ounces

Total output from the nozzle (sum of the 3 collections): _____fluid ounces

Fluid ounces for average nozzle output =

_____fluid ounces divided by 3 collections = _____fluid ounces for average nozzle output

Average nozzle output: _____ fluid ounces

Gallons for average nozzle output = _____ fluid ounces divided by 128 fluid ounces = _____ gallons

Step 3: Calculate number of square feet in given area.

Given Area:_____feet by_____feet area.

Calculate number of square feet:_____feet times _____ feet = _____ square feet in given area.

Step 4: Rate per Acre.

Gallon per Acre = (_____) Gallons (given area) = ____(X) Gallons per Acre__
(_____) Square Feet (given area) 43,560 Square Feet per Acre

Gallon per Acre = (_____) Gallons (given area) times 43,560 Square Feet per Acre
(_____) Square Feet (given area)

Gallon per Acre = _____ = _____ Gallon per Acre

Step 4: Rate per 1,000 Square Feet in Gallons.

Gallon per 1,000 square feet = (_____) Gallons (given area) = (X) Gallons per 1,000 Square Feet
(_____) Square Feet (given area) 1,000 Square Feet

Gallon per 1,000 Square Feet = (_____) Gallons (given area) times 1,000 Square Feet per Acre
(_____) Square Feet (given area)

Gallon per 1,000 Square Feet = (_____) = _____ Gallons 1,000 Square Feet
(_____)

Step 4: Rate per 1,000 Square Feet in Fluid Ounces.

Fluid Ounce per 1,000 Square Feet = _____ Gallons per 1,000 Sq. Ft. times 128 Fluid Ounces per Gallon

Fluid Ounce per 1,000 Square Feet = _____Fluid Ounces

George Hamilton, Extension Field Specialist **January, 2019**

Boom Sprayer Calibration Worksheet
One Minute Method

Retain the following information for your records: Date _____

Farm _____ Operator _____ Phone _____

Address _____ Town _____ State_____ Zip code _____

Sprayer and Tractor Identification Sprayer _____ Tractor _____

Calibration

1. Measure the distance between nozzles in inches.

   Distance between nozzles_____

2. Drive the tractor over a given distance and note the exact time in seconds it takes to pass the end points. Make a return pass and check the time again. If the time differs by no more than 2 seconds, average the two times. Repeat if the time differs by 2 seconds or more. Note the engine RPM and gear that were used to make the passes.

   Tractor RPM_____ Gear_____ Travel Distance_____

   Time in seconds – down_____ time in seconds – back_____ Average Time in seconds_____

   Miles per Hour = Distance in Feet x 60 / Time in Seconds x 88 = (____ Feet) x 60 / (____ Seconds) x 88 = _____ = _____ MPH (carry to back of the page)

3. With the tractor in a stationary position set the same engine RPM used in Step 2. Also, set the application pressure that you normally use and spray water through the broom. Collect spray at the nozzles when all the nozzles appear to have a uniform delivery at the desired psi. The container(s) should be quickly placed under the nozzle(s) for the 60 seconds.

   Pressure _____PSI

   Number of Nozzles on Boom_____

   Type of Nozzle _____

   Size of Tip _____

   Height of Boom from Target _____

   New Nozzle Tip's Output _____

Nozzle Output			Nozzle Output		
Nozzle #		Output in Fluid Gallons	Nozzle #		Output in Fluid Gallons
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		
	Output			Output	
				Total Output	

(Looking at the sprayer from behind, #1 nozzle is on left side)

All Nozzles Output = (_____) GPM (carry to back of the page)

Average output = Total Output in gallons / Total number of nozzles = _____ gallons / nozzles = _____gallons (Average Output)

Minimum Output = 0.90 X _____ Average Output = _____ Gallons

Maximum Output = 1.10 X _____ Average Output = _____ Gallons

Replace nozzles if output is greater than 10% variation between nozzles.

Replace all nozzles if average output is 15% more than a new nozzle's output (from manufacturer's chart or discharge test).

Page Two Boom Sprayer Calibration Worksheet – One Minute Method

Crop:_____

Block (#_____) Spray Swath Width _____ft

Linear Feet of Row per Acre = $\frac{43{,}560}{\text{Row Width}}$ = $\frac{43{,}560}{(\quad)}$ = (_____) Feet per Acre
Or Spray Swath Width

Speed in Feet per Minute = MPH **X** 88 = (_____) MPH **X** 88 = (_____) Feet per Minute

Minutes/Acre = $\frac{\text{Linear Feet Row per Acre}}{\text{Feet per Minute}}$ = $\frac{(\_\_\_\_\_)}{(\quad)}$ = (_____) Minutes/Acre

GPM = Gallons per Minutes *GPA = Gallons per Acre* *MPA = Minutes per Acre or Minutes/Acre*

GPA = GPM **X** MPA = (_____) GPM **X** (_____) MPA = (_____) GPA

George Hamilton, Extension Field Specialist *revised January 2019*

Boom Sprayer Calibration Worksheet
1/128 Method

Retain the following information for your records: Date _____

Farm _____ Operator_____ Phone_____

Address_____ Town_____ State_____ Zip code_____

Sprayer and Tractor Identification Sprayer _____ Tractor_____

1. Measure the distance between nozzles in inches. Check A Quick and Easy Method to Accurately Calibrate a Low Pressure Boom Sprayer:128th Method of Calibration document for corresponding distance to travel for timing.

   Distance between nozzles_____ Travel Distance_____

2. Drive the tractor the correct distance shown above and note the exact time in seconds it takes to pass the end points. Make a return pass and check the time again. If the time differs by no more than 2 seconds, average the two times. Repeat if the time differs by 3 seconds or more. Note the engine RPM and gear that were used to make the passes.

   Tractor RPM_____ Gear_____

   Time in seconds – down_____ time in seconds – back_____ Average Time in seconds_____

   Miles per Hour = $\frac{\text{Distance in Feet x 60}}{\text{Time in Seconds x 88}}$ = $\frac{(\quad\text{Feet}) \text{ x } 60}{(\quad\text{Seconds}) \text{ X } 88}$ = _____ = _____ MPH

3. With the tractor in a stationary position, set the same engine RPM used in Step 2. Also, set the application pressure (30-40 psi) that you normally use and spray water through the boom. Collect spray at the nozzles when all the nozzles appear to have a uniform delivery at the desired psi. The container(s) should be quickly placed under the nozzle(s) for the exact number of seconds noted in #2 above.

   Pressure_____PSI

   Number of Nozzles on Boom_____

   Type of Nozzle_____

   Size of Tip_____

   Height of Boom from Target _____

   New Nozzle Tip's Output_____

Nozzle Output			Nozzle Output		
Nozzle #	Tip Size	Output in Fluid Ounces	Nozzle #	Tip Size	Output in Fluid Ounces
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		
	Output			Output	
				Total Output	

(***Looking at the sprayer from behind, #1 nozzle is on left side***)

Average output = $\frac{\text{Total Output in fluid ounce}}{\text{Total number of nozzles}}$ = _____fluid ounce / _____nozzles = _____fluid ounce = Average Output

Minimum Output = 0.90 X _____ Average Output = _____ Fluid ounces

Maximum Output = 1.10 X _____ Average Output = _____ Fluid ounces

Replace nozzles if output is greater than 10% variation between nozzles

Replace all nozzles if average output is 15% more than a new nozzle's output (from manufacturer's chart or discharge test).

The ounces collected per nozzle for the exact number of seconds equal the rate of spray per acre in gallons.
_____GPA

(Example: If 18 ounces are collected in the time noted in #2 above, you are spraying 18 gallons per acre from that nozzle).

George Hamilton, Extension Field Specialist *revised January 2019*

A Quick and Easy Method to Accurately Calibrate a Low Pressure Boom Sprayer – 1/128 Method

Steps use for Calibrating a Low Pressure Boom Sprayer using the 1/128 Method

1. Measure the distance between nozzles in inches. For a boom sprayer that has nozzles placed 20" apart, measure off a distance of 204 feet on a field similar to that which you will spray (e.g., turf, sod, disked, etc.). The correct distance of travel for other nozzle spacings is as follows:

Nozzle Space	***Travel Distance****
16 inches	256 feet
17 inches	239 feet
18 inches	227 feet
19 inches	215 feet
20 inches	204 feet
21 inches	194 feet
22 inches	185 feet
23 inches	177 feet
24 inches	170 feet
25 inches	163 feet

* 340 feet/nozzle space in feet = distance

2. Drive the tractor the correct distance shown above and note the exact time in seconds it takes to pass the end points. Make a return pass and check the time again. If the time differs by no more than 2 seconds, average the two times. Repeat if the time differs by 3 seconds or more. Note the engine RPM and gear that were used to make the passes.

3. With the tractor in a stationary position set the same engine RPM used in Step 2. Also set the application pressure (30-40 psi) that you normally use and spray water through the broom. Do the spray patterns from all the nozzles look uniform? If not, the tips should be removed and check for wear or blockage. Collect spray at the nozzles when all the nozzles appear to have a uniform delivery at the desired psi. The container(s) should be quickly placed under the nozzle(s) for the exact number of seconds noted in #2 above.

4. The ounces collected per nozzle for the exact number of seconds equal the rate of spray per acre in gallons. (Example: If 18 ounces are collected in the time noted in #2 above, you are spraying 18 gallons per acre from that nozzle). Collect from other nozzles and replace any tips that vary by more than 10% (or 2 ounces with the example stated).

Additional information relating to calibration is available in a Cooperative Extension fact sheet entitled, "*Low Pressure Boom Sprayer-Calibration and Care.*"

George Hamilton, Extension Field Specialist - Revised March 2020
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