Backpack Sprayer Basics & Calibration Methods
A Look at the Tools…

• Variety of types
Backpack Sprayer Pumps
Piston vs. Diaphragm pump
Images: amazon.com
Backpack Sprayer Wands

- Plastic versus Low Volume Basal Wand
- Gunjet 30
Backpack Sprayer Wands

There’s even booms...
Backpack Sprayer Screens

• Screen versus check valves
Backpack Sprayer Tips

• Adjustable conejet
• Off Center (OC)
• Flat fan
• Even flat fan
• Thinvert
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www.amazon.com
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Figure 16: The Thinvert® has enhanced herbicide uptake and is applied at low gallons per acre.

agriculture.purdue.edu
Backpack Sprayer Pressure valve

- Maintains constant pressure
- Regulates in a variety of pressures
- Color coded
Backpack Sprayer Harness

- Aftermarket harnesses available for greater comfort
Backpack Sprayer Flexibility

- Low Volume Foliar
  - Cut Stump Treatments
  - Basal Bark Treatments
  - Soil Treatments
Backpack Sprayer Flexibility

- Low Volume Foliar Treatments
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Backpack Sprayer Flexibility

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Easy Steps to Backpack Sprayer Calibrations
Learning Objectives

• Identify and understand the steps to calibrate a backpack sprayer
• Identify tools needed
• Understand sprayer components
• Recognize correct selection of nozzles
Easy Steps to Calibration

• Time required: Approximately 30 minutes
• Equipment required:

Wear proper PPE to clean the sprayer—inside and out—to remove pesticide residue.
Backpack Sprayers

How to use the backpack sprayer

1. Held steady in front of you
2. Back and forth in front of you
How to use the backpack sprayer
Backpack Sprayer Calibration

Two methods to calibrate backpack sprayers

1. Application based per 1000 sq. ft.
2. Application rate in gallons per acre (GPA)
Backpack Sprayer Calibration: Application Based per 1000 sq.ft.

Step 1: Stake out a plot of 1000 sq. ft.

50 ft. x 20 ft.
Backpack Sprayer Calibration: Application Based per 1000 sq.ft.

Step 2: Fill the tank half way with water
Backpack Sprayer Calibration: Application Based per 1000 sq.ft.

Step 3: Record the amount of time it takes to accomplish a uniform coverage of the plot.

- Do three times and calculate the average time
Backpack Sprayer Calibration:
Application Based per 1000 sq.ft.

Step 4: Spray directly into a measuring container for the same amount of time recorded in step 3.
Backpack Sprayer Calibration: Application Based per 1000 sq.ft.

Step 5: Use math formula to determine needed material

Let’s do a sample problem.
Sample Problem

Here is what we know:
1. Lawn is 40 ft. by 65 ft. = 2600 SQ. ft.
2. Label rate of 2 oz. per 1000 sq. ft.
3. Test plot time 80 seconds to do 1000 sq. ft.
4. Amount of material applied 57 oz.
1. From calibration, we applied 57 oz. of material on each 1,000 sq. ft.
Sample Problem

2. Lawn is 40 ft. by 65 ft.
   $40 \text{ ft.} \times 65 \text{ ft.} = 2,600 \text{ sq. ft.}$
Sample Problem

Set up formula and cross multiply to determine water needed

\[
\frac{57 \text{ oz.}}{1,000 \text{ sq. ft.}}
\]
Sample Problem

Set up formula and cross multiply

\[
\frac{57 \text{ oz.}}{1,000 \text{ sq. ft.}} = \frac{Y \text{ oz.}}{2,600 \text{ sq. ft.}}
\]
Sample Problem

Set up formula and cross multiply

\[
\frac{57 \text{ oz.}}{1,000 \text{ sq. ft.}} \times \frac{2,600 \text{ sq. ft.}}{Y \text{ oz.}} = \frac{1,000 \text{ sq. ft.}}{X \text{ oz.}}
\]
Sample Problem

Set up formula and cross multiply

\[
\begin{align*}
57 \text{ oz.} \times 2600 \text{ sq. ft.} &= 1000 \text{ sq. ft.} \times \text{Y oz.} \\
\frac{148,200 \text{ sq. ft.}}{1000 \text{ sq. ft.}} &= \frac{1000 \text{ sq. ft.} \times \text{Y oz.}}{1000 \text{ sq. ft.}} \\
148.2 \text{ oz.} &= \text{Y oz.} \hspace{1em} \text{(amount of water)}
\end{align*}
\]
Sample Problem

3. Label rate of 2 oz. per 1000 sq. ft.
Sample Problem

Then determine amount of product needed

2 oz. \times \frac{1,000 \text{ sq. ft.}}{2,600 \text{ sq. ft.}} = \frac{Z \text{ oz.}}{}

PennState Extension
Sample Problem

Then determine amount of product needed

\[
2 \text{ oz.} \times 2,600 \text{ sq. ft.} = 1000 \text{ sq. ft.} \times Z \text{ oz.}
\]

\[
5,200 \text{ sq. ft.} = 1000 \text{ sq. ft.} \times Z \text{ oz.}
\]

\[
\frac{5,200 \text{ sq. ft.}}{1,000 \text{ sq. ft.}} = \frac{1000 \text{ sq. ft.} \times Z \text{ oz.}}{1,000 \text{ sq. ft.}}
\]

5.2 oz. = Z oz. (amount of product)
Sample Problem

Take into account the amount being added to the final mix

1. We will use a total of 148.2 oz. water to make the treatment

2. 5.2 oz of product added to water

$$148.2 - 5.2 = 143 \text{ oz. of water needed}$$
Backpack Sprayer Calibration: Application Rate in Gallons per Acre

Step 1: Stake out an area equal to 340 sq. ft. (1/128th of an acre)
• Examples: 18.5 ft. by 18.5 ft. or 20 ft. by 17 ft.
Backpack Sprayer Calibration: Application Rate in Gallons per Acre

Step 2: Fill the tank halfway with water
Backpack Sprayer Calibration: Application Rate in Gallons per Acre

Step 3: Record the time it takes to accomplish a uniform coverage of the plot

20 ft. X 17 ft.
Backpack Sprayer Calibration: Application Rate in Gallons per Acre

Step 4: Spray directly into a measuring container for the same period of time and pressure.
- Record the ounces captured.
- Ounces is equal to gallons per acre
Backpack Sprayer Calibration: Application Rate in Gallons per Acre

Step 5: Divide pesticide per acre amount by GPA to determine mix ratio

Ex: label rate is 2 pints per acre

\[
\frac{32 \text{ oz. (2 pints)}}{20 \text{ GPA}} = 1.6 \text{ oz. needed per gallon of mix}
\]
Backpack Sprayer Calibration: Application Rate in Gallons per Acre

Step 6: Multiply pesticide per gallon amount by tank capacity.

\[
\begin{align*}
1.6 \text{ oz. per gallon} & \times 3.5 \text{ gallon (tank capacity)} = 5.6 \text{ oz. of pesticide in a full sprayer that contains 3.5 gallons}
\end{align*}
\]
Backpack sprayer calibration video
Questions

Any questions or comments about backpack sprayer calibrations?
# Backpack Sprayer Calibration: 1,000 sq. ft. Method

## Calibration Worksheet
Place in pesticide application notebook for future reference.

**Date:** ______________  **Applicator:** ______________

**Your Calibration:**
- Area to treat: ____________ ft. x ____________ ft. = ____________ sq. ft.
- Label rate of pesticide: ____________ oz. per 1,000 sq. ft.
- Name of pesticide and formulation: ________________________________
- Amount of water collected in the time it took to spray the 1,000 sq. ft. test plot: ____________ oz.

### Determine the Amount of Water (Y):

<table>
<thead>
<tr>
<th># oz. to treat test plot</th>
<th>Y amt. of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 sq. ft.</td>
<td># sq. ft. to treat</td>
</tr>
</tbody>
</table>

### Determine the Amount of Pesticide (Z):

<table>
<thead>
<tr>
<th># oz. (rate) from label</th>
<th>Z amt. of pesticide</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 sq. ft.</td>
<td># sq. ft. to treat</td>
</tr>
</tbody>
</table>

### Fill in the Blanks:

\[
\frac{\text{Y amt. of water}}{1,000 \text{ sq. ft.}} = \frac{\text{Z amt. of pesticide}}{1,000 \text{ sq. ft.}}
\]

### Cross multiply:

\[
1,000 \text{ sq. ft.} \times Y = \_\_\_\_\_\_ \times \_\_\_\_\_\_ \text{ sq. ft.}
\]

\[
1,000 \text{ sq. ft.} \times Z = \_\_\_\_\_\_ \times \_\_\_\_\_\_ \text{ sq. ft.}
\]

### Multiply through and divide by 1,000 to solve for Y and Z:

\[
\frac{1,000 \times Y}{1,000} = \frac{Z}{1,000}
\]

Amount of water (Y) = ____________ oz.

\[
\frac{1,000 \times Z}{1,000} = \frac{Z}{1,000}
\]

Amount of pesticide (Z) = ____________ oz.

### Actual amount of water to add to pesticide in the sprayer:

\[
Y - Z = \text{Water to add}
\]

\[
\_\_\_\_\_\_ \text{ oz.} - \_\_\_\_\_\_ \text{ oz.} = \_\_\_\_\_\_ \text{ oz.}
\]

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Handout developed by Penn State Extension, Pesticide Education Program
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  - Pest Management and Pesticides in the Environment
- **Two 1-Credit SPANISH** courses that cost $20:
  - Pest Management and Pesticides in the Environment
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Credits

Presentation prepared by:
Bill Riden, Penn State Extension, Pesticide Education Program

Images: Garo Goodrow, Art Gover, amazon.com, Purdue University

Reference: Penn State Pesticide Education Program, Youtube video on backpack sprayer calibration
https://www.youtube.com/watch?v=XWQL6ppkDao

Video imaging provided by Chazzbo Media.

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