

Weed Control in New & Established Vineyards

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Reasons for Controlling Weeds

Primary Reasons:

- Conserve soil moisture.
- Reduce competition for nutrients.

Secondary Reasons:

- Reduce cover for mice & other rodents.
- Improve air circulation to reduce the incidence of disease.
- Improve harvest labor efficiency / satisfaction.
- Reduce competition for sunlight.

(Only applies for very young vines)

Root Distribution Under Bare Ground & Sod



Although grapevines have an extensive root system, sod between the rows and any weeds down the rows can be very competitive.

Methods of Weed Control can be divided into two categories

Cultural:

- Mechanical
- Mulching
- Burning
- Biological

Chemical:

- Fumigation
- Herbicides

Cultural Methods of Weed Control

Mechanical:

2. Mowing

a. Between rows:

- The ground cover controls erosion.
- Allows getting back into the field sooner after a rain.
- Takes up excess moisture and N.
- Allowing the grass to grow in the fall helps harden off the vines.

b. Under the vines:

- Requires special equipment.
- Requires frequent mowing to minimize competition.
- Suitable for well established, vigorous vines on fertile soils.
- Risk of injuring the trunks.



Cultural Methods of Weed Control

Mulching:

Controls weeds & conserves soil moisture.

1. Organic material:

- Finding a source of mulch material (straw, wood chips).
- Can introduce new weeds.
- Not recommended for wet, poorly drained sites.

2. Synthetic material:

- Can harbor mice under the material.



Cultural Methods of Weed Control

Burning:

1. Requires special equipment.
2. Trunk guards are needed for young vines, or the bark needs to be mature.
3. Effective when weeds are just emerging.
4. Only controls weeds that have emerged.
5. Timing is important.
6. Rate of travel is critical:
 - Too fast: poor weed control.
 - Too slow: wastes fuel; & could injure the vines.



Red Dragon
Agricultural Flamer

Cultural Methods of Weed Control

Biological:

1. **Crop rotation** (Does not apply for grapes.)
2. **Smother crops** (Does not apply for grapes.)
3. **Cover crop residue** (Organic mulch)
4. **Alleopathic crops** (Cereal rye)
5. **Living mulches** (Frequent mowing, moss)
6. **Grazing** (Weeder geese, mammals: may feed on the vines & berries; sanitation is an issue.)

Chemical Methods of Weed Control

Fumigation:

1. Only suitable for pre-plant weed control.
Fumigants that control weeds are toxic to grape vines.
2. Require special equipment to apply.
Some require tarps to trap the material in the soil.
3. Very expensive unless the treatment targets other pests:
Nematodes
Soil-borne diseases

Would not be considered a viable weed control strategy in Iowa.

Chemical Methods of Weed Control

Herbicides:

1. Pre-emergence

Non-selective

2. Post-emergence

a. Selective

b. Non-selective

3. Organic (natural)

Corn Gluten Meal (10% N) A potential for grapes, but not yet registered for use. Can be considered as a source of nitrogen.

Weed Control with Herbicides

Pre-emergence Herbicide

Post-emergence Herbicide



Applied in late fall or spring
before weed seeds germinate.

Applied in spring or summer after
weed seeds have germinated.

Vineyard Herbicide Sprayers

are designed to apply herbicides and other chemicals directed at the ground. They should never be used to apply pesticides directed at the grape foliage.



PBM Supply & Mfg., Inc.



Slimline
Manufacturing, Ltd

3-point sprayer w/ rear-mounted boom

Side-mounted spray boom

Characteristics of Pre-emergence Herbicides

Control weeds as they germinate.

- Most must be applied before the weeds emerge, or be “tank mixed” with a post-emergence herbicide.
- Require rain / irrigation (1/2 to 1”), or incorporation into the soil to “activate” (must be in the seed germination zone).
- Most have residual activity that provides season-long control, with some carrying over to the following year.
- Not effective in controlling established perennial weeds.

Most are broad-spectrum (non-selective).

- Generally a given herbicide will provide better control of one type of weed than the other (Broadleaf vs. Grasses).
- Avoid using the same pre-emergence herbicide each year.

Characteristics of Post-emergence Herbicides

Control weeds after they emerge.

- Can be selective or non-selective.
- Stage of weed development can be critical.

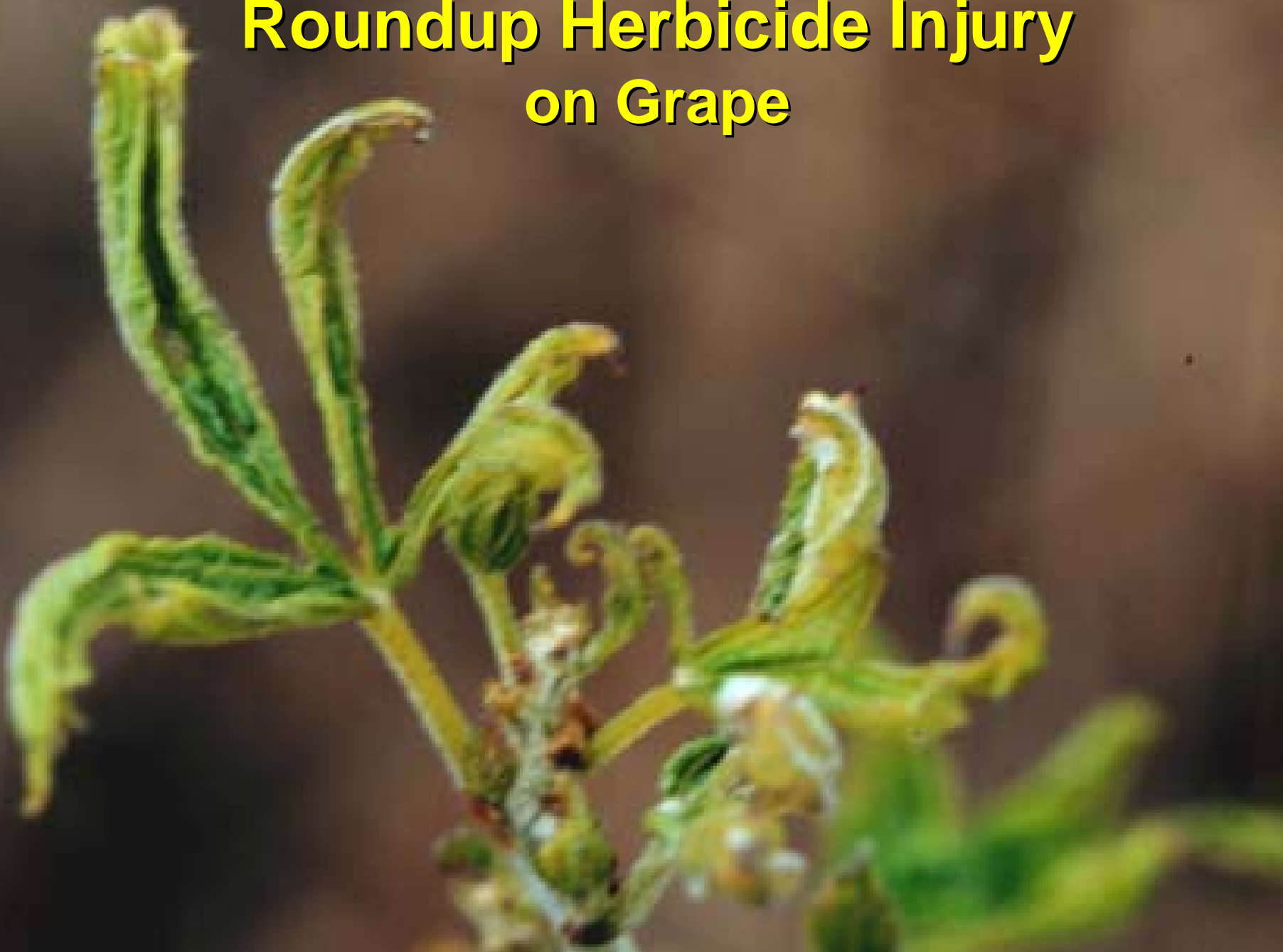
Kill either a) on contact, b) must be absorbed, or c) be absorbed and translocated to the roots.

- May require a surfactant or other additive to be most effective.
- They exhibit no residual activity, and must be re-applied as needed.

Can cause injury to the crop.

- Avoid contact with the foliage, canes, and fruit.

Roundup Herbicide Injury on Grape



Grape Herbicides*

Pre - emergence		Post - emergence
Casoron / Norosac (4wk AP)	Kerb (6 mo AP, R)	Fusilade (NB only)
Devrinol	Princep (3 yrs AP)	Gramoxone Extra (R)
Gallery (NB only)	Prowl (NB only)	Poast
Goal	Snapshot (NB only)	Rely
Karmex (3 yrs AP)	Solicam (2 yrs AP)	Roundup Ultra
	Surflan	Select (Prism) (NB only)
	Treflan	Touchdown

Some have restrictions regarding when & by whom they can be used:
 AP = after planting; NB = non-bearing; R = restricted use pesticide

* Refer to **PM-1375** *Midwest Commercial Small Fruit & Grape Spray Guide*
 (an annual publication)

Weeds Controlled by Pre-emergence Herbicides

Product	Broadleaf		Grasses	
	Annual	Perennial	Annual	Perennial
Casoron / Norosac	Most	Some	Most	Some
Devrinol	Some		Most	
Gallery	Most		Some	
Goal ^Y	Most			
Karmex	Most		Most	
Kerb ^{Z, Y}	Some		Most	

^Z Restricted use pesticide.

^Y Has pre- & post-emergence properties.

Weeds Controlled by Pre-emergence Herbicides

	Broadleaf		Grasses	
Product	Annual	Perennial	Annual	Perennial
Princep	Most		Some	
Prowl	Some		Most	
Snapshot	Most		Some	
Solicam	Some		Most	
Surflan	Some		Most	
Treflan	Many		Most	

Weeds Controlled by Post-emergence Herbicides

	Broadleaf		Grasses	
Product	Annual	Perennial	Annual	Perennial
Fusilade			Most	Most
Gramoxone Extra ^Z	Most	Suppress	Most	Suppress
Poast			Most	Most
Rely	Most	Some		
Roundup Ultra	Most	Some	Most	Many
Select (Prism)			Most	Most
Touchdown	Most	Most	Most	Most

^Z Restricted use pesticide.

“Herbicide Resistance”

1. Herbicide products are not effective in controlling all weeds.
2. Therefore, the continued use of a product will favor weeds tolerant to that herbicide and leads to a change in species making up population (“herbicide resistance”).
3. To avoid, **DO NOT USE:**
 - a) The same herbicide from year to year.
 - b) Herbicides that are of the same chemical group.
 - c) Herbicides that have the same mode-of-action.

This is particularly true for pre-emergence herbicides.

Classification of Grape Herbicides by Chemical Group

Pre-emergence:

- Dinitroaniline

Prowl, Surflan, Treflan

Post-emergence:

- Cyclohexendione

Poast, Select

- Glyphosate & analogs

Roundup Ultra, Touchdown

Classification of Grape Herbicides by Mode-of-Action

Pre-emergence:

- Inhibits cell wall biosynthesis:
Casoron / Norosac, Gallery
- Inhibits cell division in the shoots & roots:
Kerb, Prowl, Snapshot, Surflan, Treflan
- Inhibits root growth of seedlings: **Devrinol**
- Inhibits photosynthesis: **Karmex, Princep**
- Inhibits carotene synthesis: **Solicam**
- Rapidly disrupts cell membranes in light: **Goal**

Classification of Grape Herbicides by Mode-of-Action

Post-emergence:

- Inhibits lipid biosynthesis:
Fusilade, Poast, Select
- Inhibits amino acid synthesis:
Roundup Ultra, Touchdown
- Rapidly disrupts cell membranes in light:
Gramoxone Extra, Rely

Effective Weed Management with Herbicides

1. Control problem perennial weeds before planting.
2. Learn to identify problem weeds.

NCR 281 Weeds of the North Central States

3. Select herbicides that meet your needs.

PM 1375 Midwest Commercial Small Fruit and Grape Spray Guide

READ THE HERBICIDE LABEL

Pesticide label web site:

<http://www.cdms.net/manuf/manuf.asp>

Information on the Herbicide Label

- Crops product is registered for use on.
- Weeds controlled by the product.
- Method of application:
 - **Broadcast, band, directed spray, wick / wiper**
- Rate of application:
 - **Affected by: Soil texture & organic matter content.**
- Time of application.
- Tank mixing options (**mixing & applying more than one herbicide at a time**).
- Proper safety equipment to mix & apply, and first aid treatment.
- Environmental hazards.
- Other restrictions and precautions.
- Storage and disposal directions.

To Optimize Your Weed Control Program with Herbicides

1. Calibrate your application equipment each year.
B 861 Midwest Small Fruit Pest Management Handbook
2. Apply herbicides at the proper rate and time.
3. Alternate pre-emergence herbicides from year to year avoiding herbicides from the same **chemical group** or **mode-of-action**.

Calibrating a Herbicide Sprayer

Sprayer set up:

1. Operate at a low pressure (< 30 psi) to minimize drift.
2. Use flat spray or flooding tip nozzle. Spray patterns should overlap under the vines for uniform coverage when spraying from both sides of the row.
3. Travel at 2 to 3 mph. Select a gear and rpm's to provide sufficient power.



$$\text{MPH} = \frac{\text{Vine spacing (ft)} \times \# \text{ vines passed / min.}}{88 \text{ ft / min.}}$$

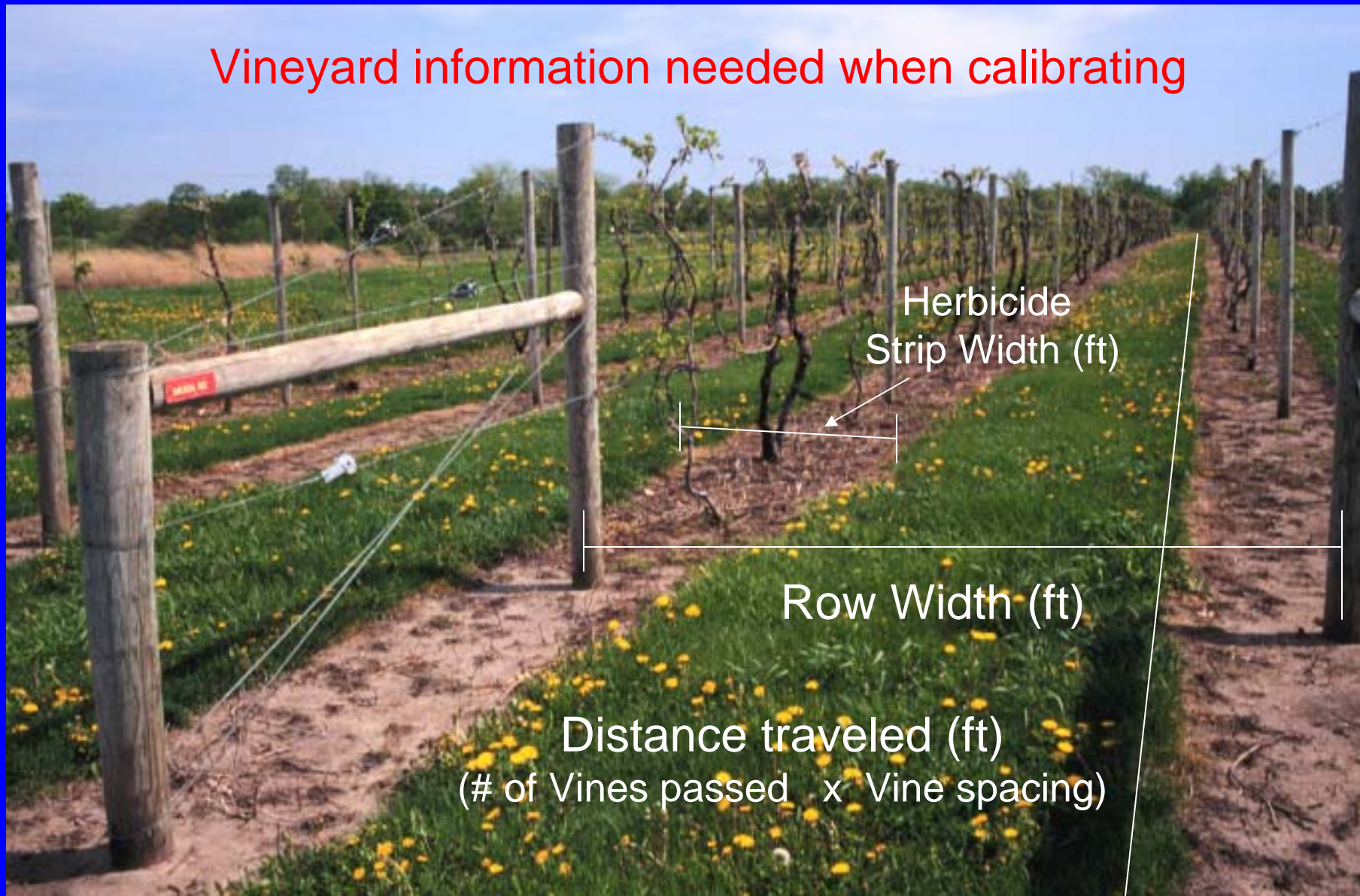
Calibrating a Herbicide Sprayer

What needs to be determined

1. Gallons of spray applied per acre (GPA)
 - a. A function of spray delivery rate (gallons per minute, (gpm), spray band width, and rate of travel (mph).
 - b. Spray delivery rate is determined by the nozzle size and operating pressure.
2. Area to be treated (acres).
3. Amount of herbicide needed to treat the vineyard.
4. Amount of spray needed to deliver the herbicide.
5. Amount of herbicide to put in the spray tank.

Calibrating a Herbicide Sprayer

Vineyard information needed when calibrating



Calibrating a Herbicide Sprayer

Calibration Procedure:

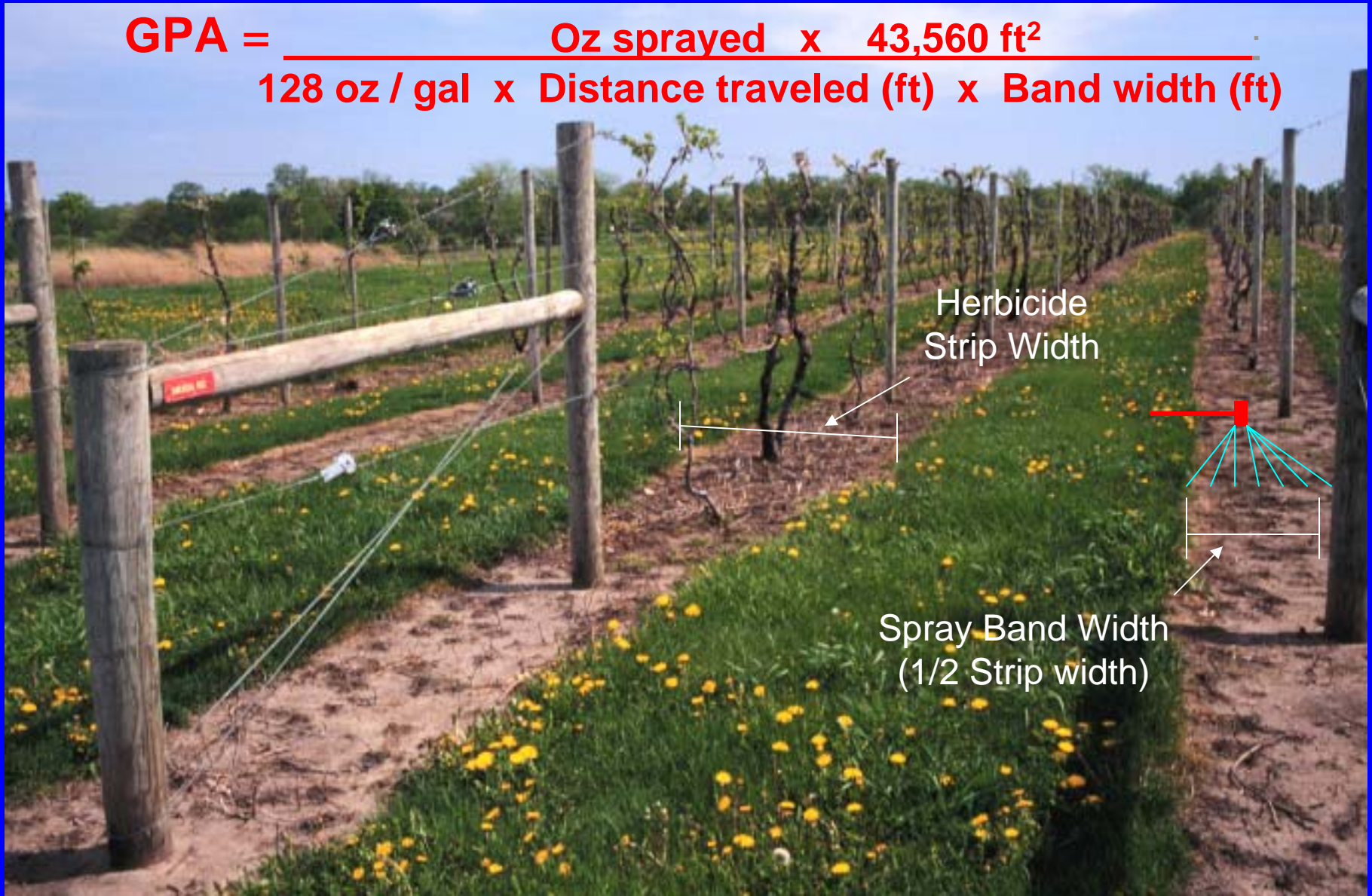
1. Fill the spray tank about 1/2 full with water only.
2. Operate the sprayer in the vineyard as if applying an herbicide (same gear, rpm's, mph).
3. Spray a known distance, collecting the spray discharge from the nozzle(s).



Calibrating a Herbicide Sprayer

Calculating Gallons per Acre (GPA)

$$\text{GPA} = \frac{\text{Oz sprayed} \times 43,560 \text{ ft}^2}{128 \text{ oz / gal} \times \text{Distance traveled (ft)} \times \text{Band width (ft)}}$$



An Alternative Procedure for Calculating Gallons per Acre (GPA)

1. With sprayer 1/2 full with water only, select a gear & rpm's to maintain power, and determine the rate of travel (MPH) at which you plan to spray.
2. In a stationary position and operating at the rpm's used in determining MPH, collect the spray discharge from the nozzle(s) directed at the herbicide strip for a timed period and convert to gallons per minute (GPM).
3. Calculate GPA:

$$\text{GPA} = \frac{\text{GPM} \times 495}{\text{MPH} \times \text{band width (ft)}^*}$$

* Band width equals 1/2 of the herbicide strip width.

Calibrating a Herbicide Sprayer

Calculating Acres to be Treated

$$\text{Treated Acres} = \text{Field acres} \times \frac{\text{Herb. Strip Width}}{\text{Row Width}}$$



$$\text{Field Acres} = \frac{\# \text{ of vines} \times \text{row width (ft)} \times \text{vine spacing (ft)}}{43,560 \text{ ft}^2}$$

Calibrating a Herbicide Sprayer

Need to know Acres Treated to determine

How much Herbicide is needed to treat the vineyard:

$$\text{Herbicide units} = \text{Herb. rate} / \text{A} \times \text{Treated Acres}$$

How many Gallons of Spray is needed to treat the vineyard:

$$\text{Gallons} = (\text{GPA} \times \text{Treated acres}) \times 1.05 *$$

* Increase by 5% to assure that the job will be completed.

Calibrating a Herbicide Sprayer

How much herbicide to put in the tank:

- Recommended herbicide rate per acre (from label).
- Gallons of spray to be applied, or tank capacity.
- Gallons per Acre (GPA) application rate (determined).



$$\text{Units of Herbicide Per Tank} = \frac{\text{Gallons of Spray Material to be Mixed}}{\text{GPA}} \times \text{Rec. Herbicide Rate per Acre}$$

Successful Weed Control

The final step is to put the proper amount of water and herbicide in the spray tank, and spray the vineyard at your pre-determined speed (gear and rpm's).



Sometimes a combination of a pre-emergence herbicide in the spring followed by a post-emergence herbicide in the summer are needed to effectively control weeds.