Sprayer Selection & Management

11-11:50 a.m. Saturday January 17th, 2015
Kansas Grape Growers & Winemakers Assn.

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Aug. 2010 – 260 pages
Approx. $61.50 with shipping

Dr. Andrew Landers
Cornell University

http://www.effectivespraying.com/
Sprayer Calibration
Spray Schedule
Fungicides
Insecticides
Cultivar Disease Susceptibility
Herbicides
Record Keeping Info & Form
Conversion Factors
Dilute vs Low Volume Spraying

**Dilute Spray Volume**

Uniform rate to cover plants to the point of run off.

Standard 1X rate of 100 gal./ac. for 5-7’ tall vines, 3-5’ wide and in rows 9-10’ apart.

**Low Spray Volume**

AKA: “Concentrate Spray Volume” is a lower volume rate applied in proportion to 1X rate. Example 50 gal./acre would be a 2X rate.

Common to see same pest control at 25% less rate.

**Tree Row Volume (TRV)**

**Dilute Rate Based on Canopy**

1. \[\frac{43,560 \text{ sq. ft.}}{\text{ac.}} = 4,356 \text{ row ft. per acre}\]
   \[10' \text{ row spacing} \]

2. \[4,356 \times 6' \text{ vine Ht.} \times 3' \text{ vine width} \]
   \[= 91,476 \text{ cu. ft. of TRV/ac.}\]

3. \[91,476 \times \text{density factor} = \text{gallons/ac.}\]
   \[1000 \times 0.7 = 64 \text{ gallons / acre}\]
   \[\times 0.8 = 73 \text{ gallons / acre}\]
   \[\times 0.9 = 82 \text{ gallons / acre}\]
   \[\times 1.0 = 92 \text{ gallons / acre}\]

**Using TRV**

For a few materials, rates are listed per 100 gallons. In this case the rate of material can be calculated by using the TRV method. Multiply the gallonage for the planting. Multiply this gallonage by the...
Vineyard Sprayers

Air Blast/Mist Sprayer Selection Criteria

Tank Size: How many acres and how many gallons/acre?

- 30-50 gallon/acre (low volume)
- 50-100 gallon/acre (dilute volume)

Tank Material:
- Stainless Steel – Best
- Plastic/Fiberglass – Good (UVL protection important)

Single or dual row spray application.

Directional spray cannon vs. volute
### Selection Criteria

<table>
<thead>
<tr>
<th>Pump Type</th>
<th>Pressure Range</th>
<th>RPM Speed</th>
<th>Gal/Min</th>
</tr>
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<tr>
<td>Roller</td>
<td>50 – 300 psi</td>
<td>300 – 1000</td>
<td>1-35</td>
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<tr>
<td>Centrifugal</td>
<td>5 – 75</td>
<td>540 – 4500</td>
<td>0-120</td>
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<tr>
<td>Piston</td>
<td>400 – 1000</td>
<td>540 – 1800</td>
<td>5 - 60</td>
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<tr>
<td>Diaphram</td>
<td>50 – 850</td>
<td>200 – 1200</td>
<td>1 – 60</td>
</tr>
</tbody>
</table>

- **Pull Type vs. 3 pt - PTO vs. Self Powered slide in units**
- **Air Blast vs. Spray Nozzle Boom**
- **Air Speed (50-300 mph)**
- **Air Volume (3,000 to 25,000 CFM)**
Selection Criteria

Hand booms are recommended for spot spraying.
Mix tanks work well for premixing.
Fresh water tank for cleaning up.
Tank agitation system Important to keep tank mixes in solution.
Translucent tank or easy-to-read tank site gauge needed.
Accessories – cab controls, speed sensors, automated output, lights, GPS Unit, floatation tires, electric on/off
In-line filters vs. nozzle filters
Rinse Tank for cleaning out mix and spray tank.
Example Back Pack Pump Sprayers

Solo 425 DLX
90 psi max, pressure regulator
sprayer wt. = 11 lbs.
Approx. $110

Birchmeier Iris 15L
4 gal. external pump
Approx. $250.00

Hudson SP0 Triple Function Piston/Diaphragm Pump
4-Gallon, 150 PSI
Approx. $160
Back Pack Power Sprayers

**STIHL 420 Blower/Sprayer**
- 2 cycle gas engine
- 3.7 gal., 24 lbs empty,
- Approx. $750

**Solo 416 Sprayer**
- 12 Volt Rechargeable Sprayer
- 5 gal tank
- Approx. $370
Control Flow (CF) Valves “Highly” recommended for hand sprayers

Adjustable Pressure Gauge

- Constant Flow
- Uniform Pressure
- Less Pumping
- Less Drift
Nozzle Selection is Important!

Droplet Size Matters!
Nozzle material

Comparative Wear Test

Brass
Stainless Steel
Polyvinylidene Flouride
PolyAcetyl
Ceramic
2.5% Kaolin Clay solution
40 psi
Droplet size

Large droplets have less potential to drift because they:
- Fall more quickly
- Evaporate more slowly
- Are less affected by wind

Small droplets often result from:
- High spray pressure
- Small nozzle tips
- Wind shear across the nozzles
## Spray Droplet Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Symbol</th>
<th>Color</th>
<th>Approx VMD</th>
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<tr>
<td>Very fine</td>
<td>VF</td>
<td>Red</td>
<td>&lt;100</td>
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<tr>
<td>Fine</td>
<td>F</td>
<td>Orange</td>
<td>100-175</td>
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<tr>
<td>Medium</td>
<td>M</td>
<td>Yellow</td>
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<td>Coarse</td>
<td>C</td>
<td>Blue</td>
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<td>Extremely coarse</td>
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Source: ASAE Standard S-572
## Broadcast Nozzle Selection Guide

<table>
<thead>
<tr>
<th>Herbicides</th>
<th>Fungicides</th>
<th>Insecticides</th>
<th>Drift Management</th>
<th>PWM Nozzle Control</th>
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<td>SYSTEMIC</td>
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<td>XRC 80°, XRC 110°</td>
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GPM = \frac{GPA \times MPH \times W}{5,940}

GPA = \frac{5,940 \times GMP}{MPH \times W}

Where: GMP = Gallons/Minute/Nozzle
GPA = Gallons/Acre
MPH = Miles/Hour
W = Nozzle Spacing in Inches
= Row Spacing Inches/ # Nozzles per Row

MPH = \frac{\text{Feet Traveled}}{\text{Seconds}} \times \frac{60}{88} \quad \text{or} \quad \frac{\text{Seconds}}{88} \times 60 \quad \text{Seconds to travel 88’}

64 oz. Calibration Jug $35
SpotOn $150
Red Ball Tip Tester $70
Spray Tip Testers
Nozzle Selection

Select nozzle size based on Gallons Per Minute (GPM)

Hollow Cone Type Spray Tips

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<td>0.080</td>
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<td>0.122</td>
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<td>0.66</td>
<td>0.83</td>
<td>1.04</td>
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</tbody>
</table>

*Use CP20229-NY gasket when 4514-NY Nylon slotted strainer is not used.

http://www.teejet.com
Nozzle Nomenclature

Nozzle Type: XR TEEJET
Brand Name: VisiFlo®
Material: 11004VS

110° Spray Angle
0.4 Gallon Per Minute nozzle capacity rated at 40 PSI

http://www.teejet.com
30-50% Overlap for Even Distribution

Ideal height, spacing and angle varies by nozzle type.

Some nozzles can be angled to get boom lower to the ground for less drift potential.

http://www.teejet.com
Strainers

Nozzle Strainers

Can be used with or without nozzle strainers. Easier to use and much less nozzle plugging problems.
Grease Pencils work great for putting mix notes on sprayer!
Spray Distribution Paper

Regular note pad paper can also work with pesticide mixes with colorants
Controlled Droplet Sprayers (CDA’s)

Enviromist Sprayers

Numerous U.S. Dealers

CDA’s (AKA Micron) Sprayers use straight product with no water.
Hand Held Controlled Droplet Applicators (CDA’s)

Multiple Brands & Dealers
Backpack Cifarelli sprayer with Cima volute nozzle
Approx. $3,000

http://www.bdimachinery.net/
Double Volute
Spray Innovations
http://www.sprayinnovations.com/

Double Low Volume Atomizer nozzles

Cima Sprayer (Italian 80-100 mph, low volume sprayer

http://bdimachinery.net
A1 Mist Sprayers
Columbus, NE
877-924-2474
http://www.mistsprayers.com

Engine mounted slide-ins or pull types

Cannon attachment available

Double or single volute
Spray Innovations Inc.
Columbus, NE
800-204-3535
http://www.sprayinnovations.com

Centrifugal pump
Hand Boom Attachment
Motorized Unit

Swihart Sales
Quinter, KS 67752
800-864-4595
http://www.swihart-sales.com

Double Volute Sprayer

55-110 gal. poly tanks available
3 nozzle single or double volute
Centrifugal pumps

Slide in Unit
Minnetonka, MN    800-704-4292

Superb Horticulture
Pymouth, IN
Ph: 800-567-8264
http://www.superbhorticulture.com/

3 pt PTO
60 GMP centrifugal pump
55 & 100 gal tanks
22 hp tractor min.
Squirrel Cage Fan

100 – 150 gal dual cannon and mist blower heads
45 hp tractor min.
200 gal. PTO model
150 gpm centrifugal pump
Squirrel Cage Fan
LectroBlast Sprayers
Progressive Ag Inc.
Modesto, CA
209-567-3232 or 800-351-8101
http://www.proaginc.com/

Places a negative charge on the spray solution to enhance attachment to plant. Reduces the volume of water needed.
3 pt Cannon
Variable tank size
Centrifical Pump

Made in France

3 pt  Piston or Diaphram Pump 50, 80, 105 & 160 gal.

3pt
240 – 484 gal.
Piston Pump

Numerous Dealers
3 PT Cannon Sprayer
Centrífugul Pump 160 – 200 gal. tank

Made in Brazil
3pt Piston Pump
50 gal. tank

Orchard Sprayer
500 gal. Piston Pump

http://www.montana.ind.br/

110 – 160 gal. tank
Hardi - Danish Co. with Davenport, IA plant
http://www.hardi-us.com/

150 gal. Cannon sprayer
Diaphragm pump

50 gal. tank
Diaphragm pump
22 radial fan

270 gal. tank

100-150 gal
Diaphragm pump

2 row sprayer

Air hoses

Diaphragm pump

Carried by Many Ag Equipment Dealers
Durand Wayland
50-100 gal. 3 pt.
300-600 pull types

John Bean Cannon
orchard sprayer
3 pt 35 – 60 hp models
110 to 170 gallon tank

3pt 18 to 50 hp models
50-100 gal. fiberglass tank
Diaphram pump

http://www.durand-wayland.com/

Durant Wayland now owns John Bean Sprayers
LaGrange, GA  800 241-2308
Brazilian company with manufacturing plant in Oregon

http://www.jacto.com/sprayers/

Pull Type cannon or volute models available

265, 400, 600 and 1000 gallon models

3 pt hitch

70-110 gal.

25, 28 & 33 inch fans available
Tassel Ridge Winery – Leighton, IA
5 row sprayer

Greentech Australia
with Sardi Fan Technology
http://greentechspraysystem.com/
Rears Manufacturing
Sprayers:
http://www.rearsmfg.com

Dealer:
Midwest Grower Supply:
http://mwgsupply.com/
Rotary Atomizer Sprayers

Thomas Bros. Equipment
41764 Red Arrow Hwy
Paw Paw, MI 49079
ph: 269-657-3735

Sprayer is constructed by Thomas Bros. u
Spray heads can be purchased here: $2,300 ea.

Ledebuhr Industries, Inc.
101 Innovation Parkway
Williamston, MI 48895
Ph: 866-641-4671
http://www.ledebuhr.net

Nozzle in center of fan
HOMEMADE SPRAYERS

Larry Engbers     Pella, IA
Front mounted post pounder used above
2 squirrel cage fans used below

Fred Ver Schuure  Oskaloosa, IA
Old FMC boom sprayer used at ISU Armstrong Research Farm Vineyard at Lewis Farm  6-18-05

Bohemian Sprayer – John Ernest Kopsa  squirrel cage
John Ernest Winery, Tama, IA homemade sprayer  6-4-05
Fixed nozzle boom sprayer with gas leaf blower. Upright and horizontal booms. 6-27-11 MSU Viticulture Field Day

Home made Fixed Nozzle
Rod Wilson, Milo, IA
Lemon Creek Winery
Berrien, MI
Vineyard row herbicide sprayer

Whispering Hills Vineyard
Carson, IA
Homemade Air blast Sprayer
Two Saints Vineyard & Winery
St. Charles, IA
http://www.twosaintswinery.com/

Double row under the wire herbicide sprayer
Homemade Mower/Weed Sprayer
Schade Vineyard & Winery
Waukee, IA
http://www.schadecreek.com/

Vertical Boom
Vineyard Sprayer
Josh Franzen, Calmer, IA
Herbicide & Fungicide Sprayer
Winterhaven Vineyard & Nursery, Janesville, MN
http://www.winterhavengrapevines.com/

Mud Flap Deflector for Roundup Spraying
John Broadbent
Norwalk, Iowa
Herbicide & Fungicide Sprayer

Gary Harman
Indianola, IA
Herbicide & Fungicide Sprayer
2009 Northern NY Ag Development Project – Boom Plans: http://www.nnyagdev.org/_horticulturecrops.htm

North River Vineyard
Carlisle, IA
Sunset Ridge Winery
Dubuque, IA

Under Wire Herbicide Sprayer
Arrowhead Vineyards
Baroda, MI
Multipurpose Air Assisted Hydraulic Sprayer  
Flushing Quail Vineyard - Tracy, IA
Spraying PAM or light coating of Mineral Oil prior to spraying will save a lot of clean up time!
Tank Cleaning Procedures

1. Clean inside and outside of sprayer so not to contaminate waterways, bodies of water or sensitive areas.
2. Rinsing and spraying off into the field is often the best option.
3. Many labels provide instructions on tank cleaning.
4. A typical tank cleaning procedure would be:
   - Fill tank 1/3 to 1/2 full of water with cleaner added and re-circulate for 10-15 minutes and flush through boom. Clean screens and nozzles separately.
   B. Repeat and let solution set overnight before flushing through the boom.
Typical Tank Cleaning Solutions

- Commercial Tank Cleaner
- Household Ammonia
- Detergent
Sprayer Winterization

1. Rinse and flush the tank and boom.
2. Wash exterior of sprayer.
3. Check for signs of wear & tear and replace worn parts.
4. Apply grease to all grease zerks.
5. Read manufacturers recommendations for winter pump storage.
6. Fill pump with oil or anti-freeze if no specific directions are given and/or just pull the drain plug on the pump.
7. Store inside if possible.
Highly Recommend Enclosed Cabs

John Bean Sprayer at ISU Ames Horticulture Research Farm
http://www.hort.iastate.edu/facilities/hortfarm

Hardi Air Blast Spayer
Two Saints Vineyard & Winery
St. Charles, IA
http://www.twosaintswinery.com/
Wine Grower News 2015

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Thank You