Sprayer Selection & Management

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

Michael L. White

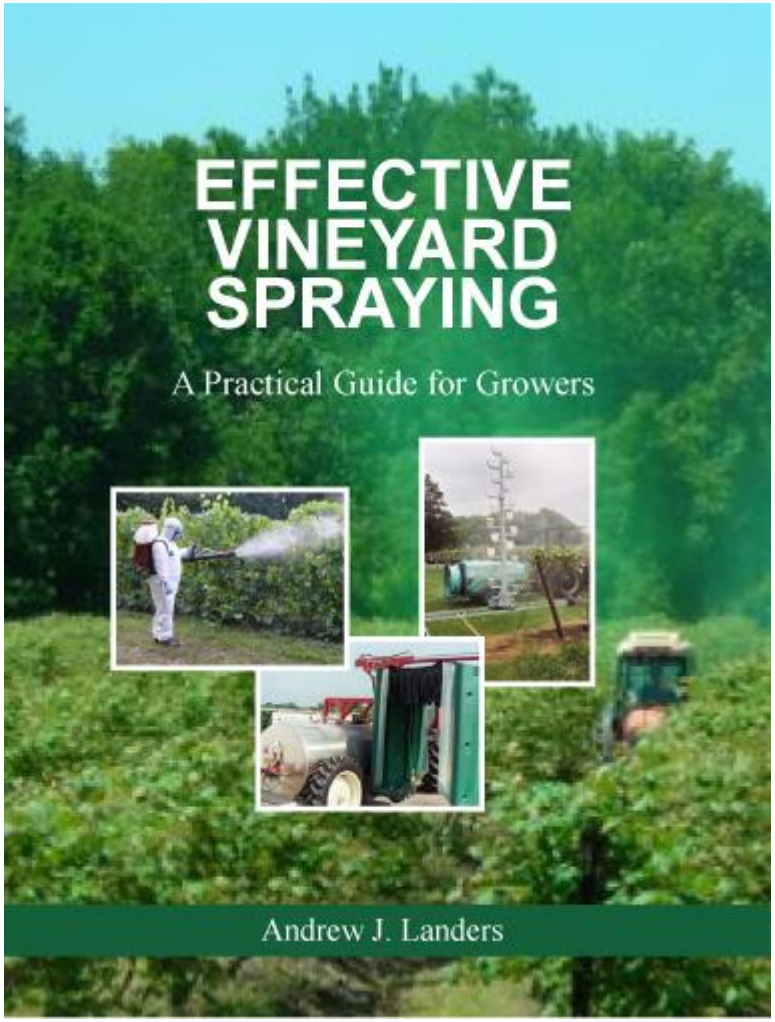
ISU Viticulture Specialist

909 E. 2nd Ave. Suite E

Indianola, IA 50125

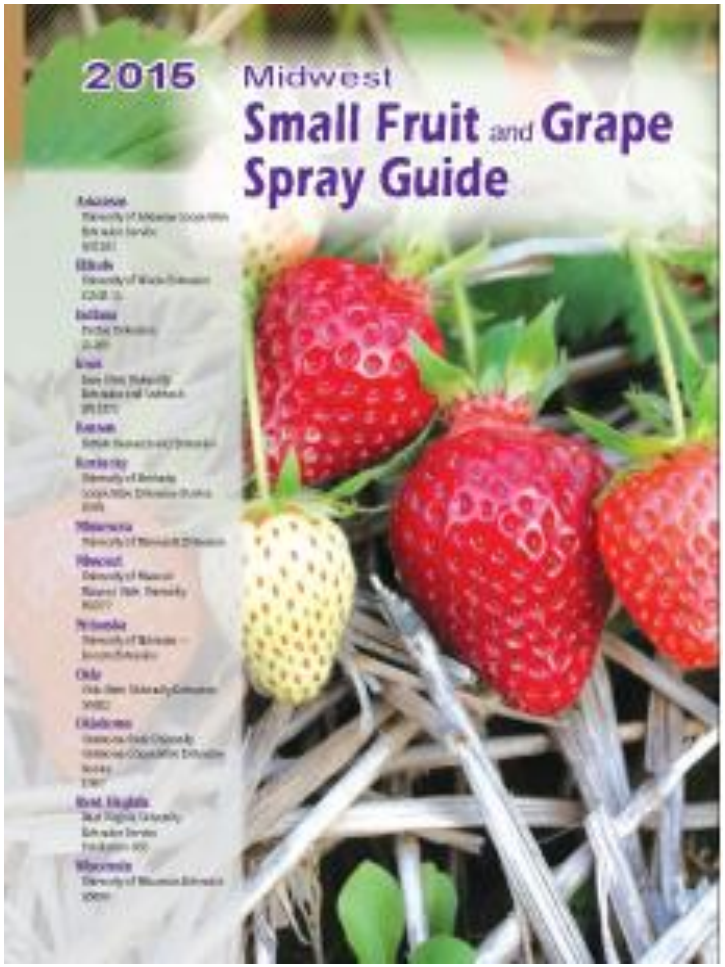
Cell: 515-681-7286

E-mail: mlwhite@iastate.edu



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

Dr. Andrew Landers
Cornell University



- 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.

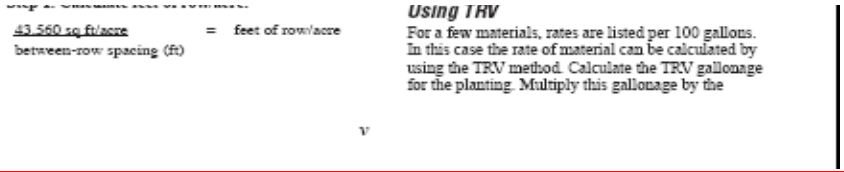
Tree Row Volume (TRV)

Dilute Rate Based on Canopy

1. 43,560 sq. ft./ ac. = 4,356 row ft.
   10' row spacing acre

2. 4,356 x 6' vine Ht. x 3' vine width
= 91,476 cu. ft. of TRV/ac.

3. 91,476 x density factor = gallons/ac.
   1000 x 0.7 = 64 gallons / acre
   x 0.8 = 73 gallons / acre
   x 0.9 = 82 gallons / acre
   x 1.0 = 92 gallons / acre


43,560 sq ft/acre = feet of row/acre
between-row spacing (ft)

Using THV

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. Calculate the TRV 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

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

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

CF ValveTM (Constant Flow) Model 9866

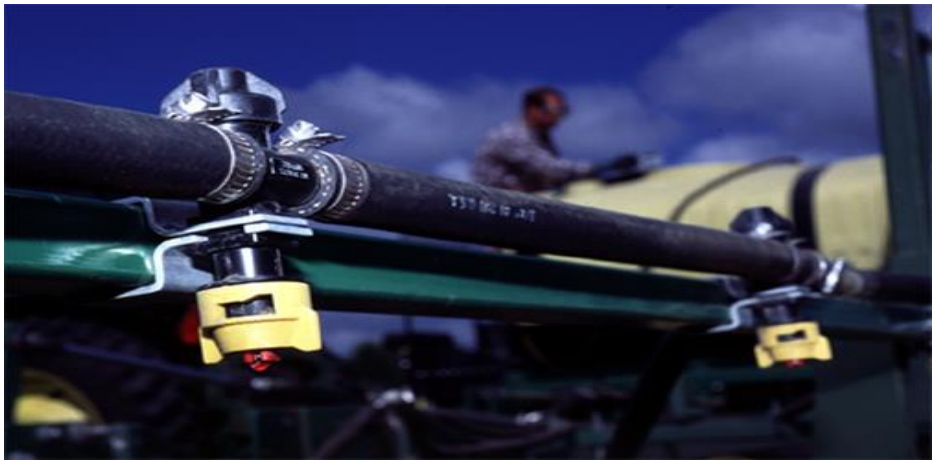
98661V Yellow; 14.5 psi - 11/16" Thread Viton® Seals
98662V Red; 21.0 psi - 11/16" Thread Viton® Seals
98663 Blue; 29.0 psi - 11/16"Thread
98664 Green; 43.5 psi - 11/16" Thread

Adjustable Pressure Gauge

- **Constant Flow**
- **Uniform Pressure**
- **Less Pumping**
- **Less Drift**

http://www.nukeaweed.com

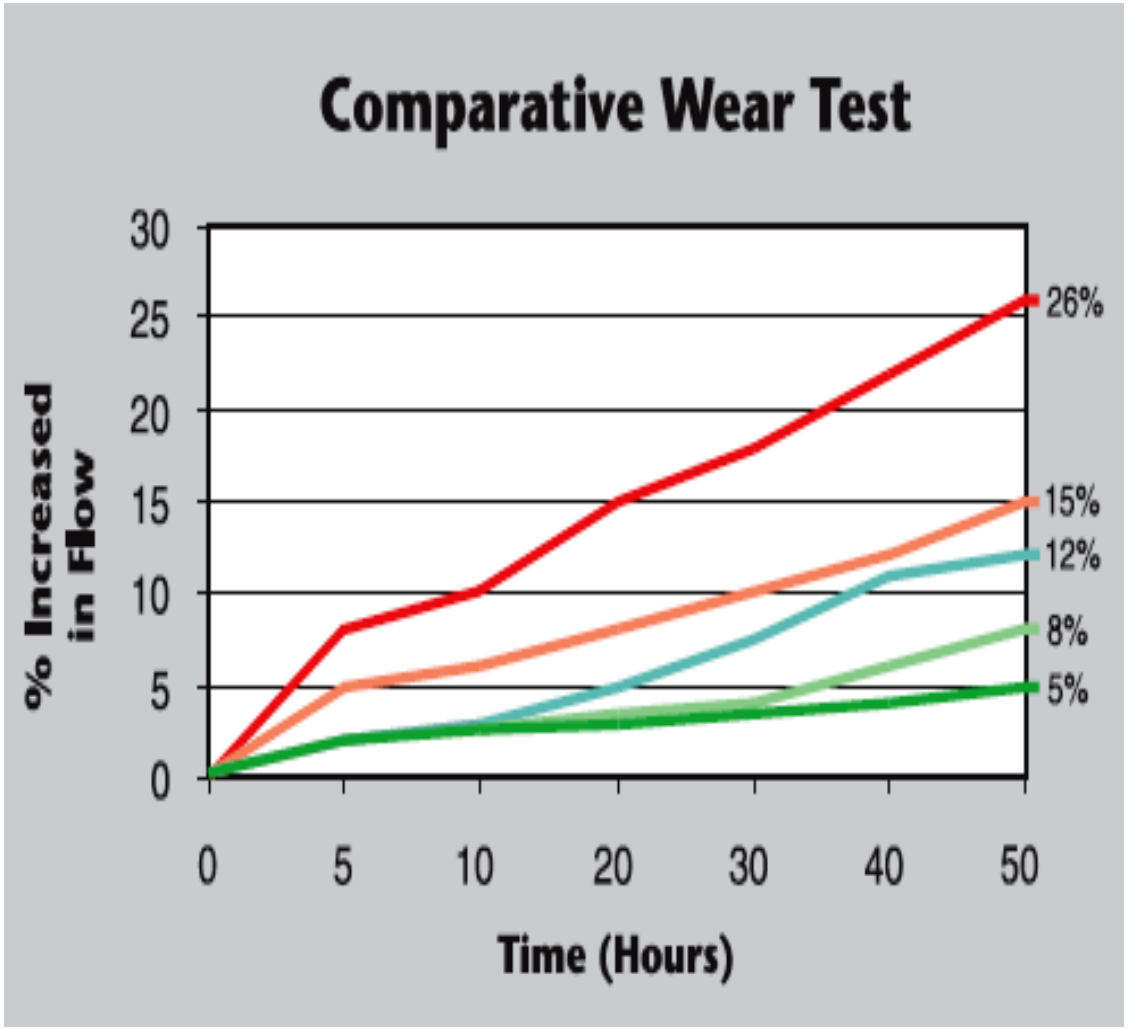
Ground Boom Sprayers



Nozzle Selection is Important!

Droplet Size Matters!

Nozzle material



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

Classification	Symbol	Color	Approx VMD
Very fine	VF	Red	<100
Fine	F	Orange	100-175
Medium	M	Yellow	175-250
Coarse	C	Blue	250-375
Very Coarse	VC	Green	375-450
Extremely coarse	EC	White	>450

Source: ASAE Standard S-572

TeeJet® Broadcast Nozzle Selection Guide

	HERBICIDES			FUNGICIDES		INSECTICIDES			
	SOIL APPLIED	POST-EMERGENCE		CONTACT	SYSTEMIC	CONTACT	SYSTEMIC	DRIFT MANAGE-MENT	PWM NOZZLE CONTROL
		CONTACT	SYSTEMIC						
 *Turbo TeeJet®* Reference page 7		VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	VERY GOOD	EXCELLENT
 *Turbo TeeJet®* at pressures below 30 PSI (2.0 bar) Reference page 7	GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	VERY GOOD	EXCELLENT
 *Turbo TwinJet®* Reference page 16	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	VERY GOOD	EXCELLENT
 *Turbo TwinJet®* at pressures below 30 PSI (2.0 bar) Reference page 16	VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	EXCELLENT	EXCELLENT
 *Turbo TeeJet® Induction* Reference page 11	EXCELLENT		EXCELLENT		EXCELLENT		EXCELLENT	EXCELLENT	
 *Air Induction Turbo TwinJet®* Reference page 17	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	
 *AI3070®* Reference page 18		VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	
 *XR, XRC TeeJet®* Reference pages 12–13		EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	GOOD	EXCELLENT

INSECTICIDES		DRIFT MANAGEMENT	SPRAY ANGLE	TIP CAPACITIES	VISIFLO® POLYMER VP	VISIFLO CERAMIC VK	VISIFLO STAINLESS STEEL VS	STAINLESS STEEL SS
CONTACT	SYSTEMIC							
VERY GOOD	VERY GOOD	VERY GOOD	110°	01–08	•			
GOOD	EXCELLENT	VERY GOOD						
EXCELLENT	EXCELLENT	VERY GOOD	110°	02–06	•			
VERY GOOD	EXCELLENT	EXCELLENT						
	EXCELLENT	EXCELLENT	110°	015–06	•			
EXCELLENT	GOOD	GOOD	XR 80°, XR 110°	01–15	110°	•	•	•
GOOD	VERY GOOD	VERY GOOD	XRC 80°, XRC 110°	015–08	110°	•	•	

Calibration

SpotOn $150

64 oz. Calibration Jug $35

Red Ball Tip Tester $70

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

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

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

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

Nozzle Selection

Select nozzle size based on Gallons Per Minute (GPM)

Typical Assembly with Ceramic Disc and Core

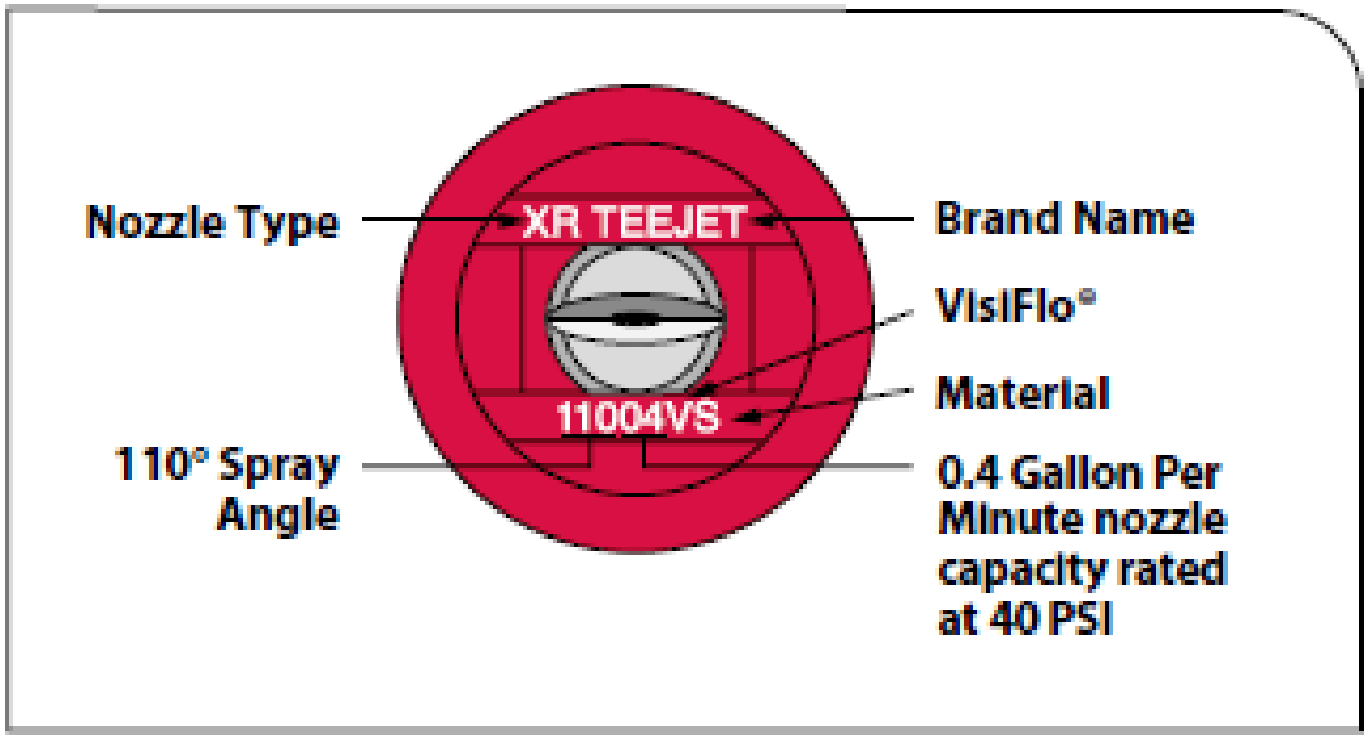
TeeJet Nozzle Body | 4514-NY Slotted Strainer* | Core | Disc | CP20230 TeeJet Cap

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

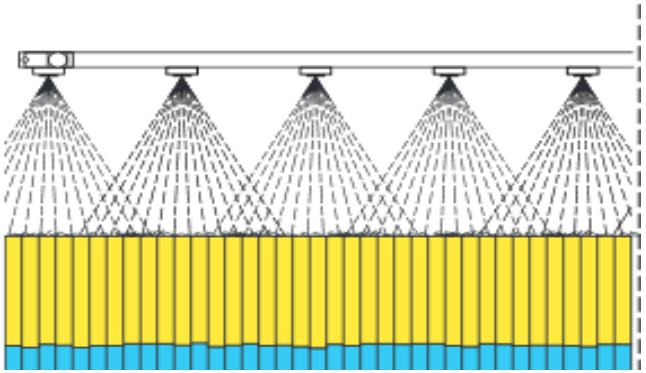
Hollow Cone Type Spray Tips

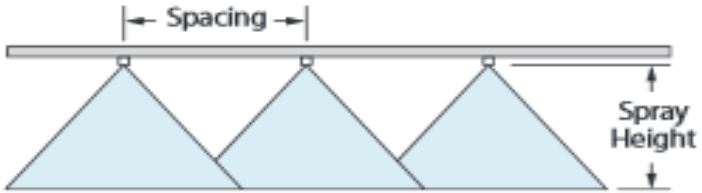
			GPM												
			10 PSI	20 PSI	30 PSI	40 PSI	60 PSI	80 PSI	100 PSI	150 PSI	200 PSI	300 PSI	20 PSI	40 PSI	80 PSI
D1	DC13	.031"	—	—	.059	.066	.078	.088	.097	.115	.128	.152	—	51°	62°
D1.5	DC13	.036"	—	.057	.067	.075	.088	.098	.110	.127	.142	.167	38°	55°	66°
D2	DC13	.041"	—	.064	.075	.08	.10	.11	.12	.14	.16	.18	49°	67°	72°
D3	DC13	.047"	—	.071	.08	.09	.11	.12	.13	.16	.18	.20	53°	70°	75°
D4	DC13	.063"	.070	.09	.11	.12	.14	.16	.17	.20	.23	.27	69°	79°	83°
D1	DC23	.031"	—	—	.064	.072	.080	.096	.107	.124	.139	.164	—	47°	58°
D1.5	DC23	.036"	—	.064	.076	.086	.103	.117	.130	.155	.175	.210	34°	51°	62°
D2	DC23	.041"	—	.078	.092	.10	.13	.14	.16	.19	.21	.25	51°	63°	70°
D3	DC23	.047"	.065	.087	.10	.12	.14	.16	.18	.21	.24	.28	58°	69°	75°
D4	DC23	.063"	.082	.113	.14	.15	.19	.21	.23	.28	.32	.38	68°	82°	87°
D5	DC23	.078"	.095	.13	.16	.18	.22	.25	.28	.34	.38	.46	79°	89°	94°
D6	DC23	.094"	.112	.15	.19	.21	.26	.29	.32	.39	.45	.54	84°	93°	98°
D1	DC25	.031"	—	—	.088	.101	.122	.138	.156	.185	.210	.255	—	27°	43°
D1.5	DC25	.036"	—	—	.118	.135	.162	.185	.205	.245	.280	.33	—	38°	49°
D2	DC25	.041"	—	.12	.14	.16	.19	.22	.25	.29	.34	.41	39°	51°	58°
D3	DC25	.047"	.10	.14	.17	.19	.23	.26	.29	.35	.40	.48	52°	61°	67°
D4	DC25	.063"	.15	.21	.25	.29	.35	.40	.45	.54	.62	.75	67°	74°	80°
D5	DC25	.078"	.18	.25	.30	.35	.42	.48	.54	.65	.75	.90	73°	79°	84°
D6	DC25	.094"	.23	.32	.39	.44	.54	.62	.70	.85	.97	1.19	79°	85°	89°
D7	DC25	.109"	.26	.37	.45	.52	.63	.73	.81	.98	1.18	1.37	85°	91°	93°
D8	DC25	.125"	.31	.43	.53	.61	.75	.89	.97	1.19	1.36	1.68	91°	96°	97°

Nozzle Nomenclature

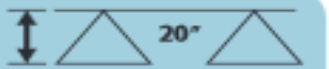


30-50% Overlap for Even Distribution

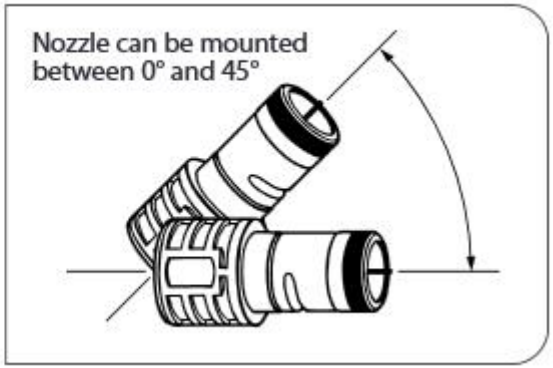




Optimum Spray Height

	 20"
80°	30"
110°	20"

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.

Strainers

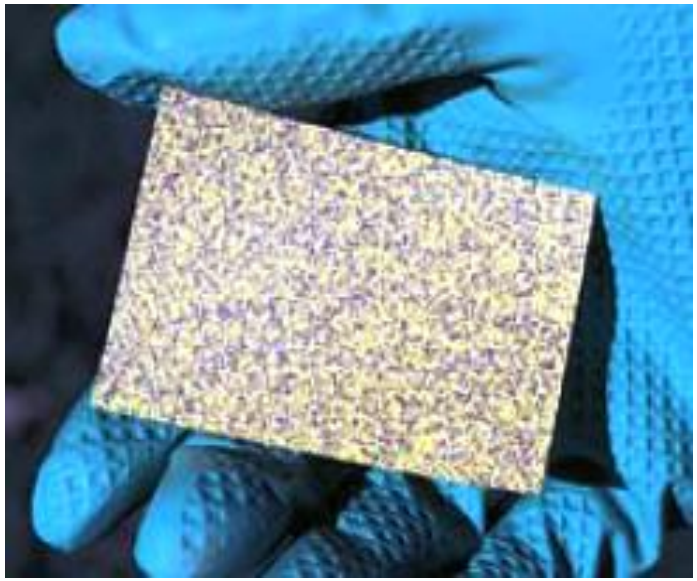
Nozzle Strainers

In-Line Boom 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
http://www.rbmc.com.au/mist.htm

Numerous U.S. Dealers

CDA's (AKA Micron) Sprayers use straight product with no water

Hand Held Controlled Droplel Applicators (CDA's)

Multiple Brands & Dealers

Backpack Cifarelli sprayer with Cima volute nozzle
Approx. $3,000

http://www.bdimachinery.net/

Double Low Volume Atomizer nozzles

Cima Sprayer (Italian

80-100 mph, low volume sprayer

http://bdimachinery.net

Double Volute

Spray Innovations

http://www.sprayinnovations.com/

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

Double Volute Sprayer

55-110 gal. poly tanks available

3 nozzle single or double volute

Centrifugal pumps

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

Centrifugal pump

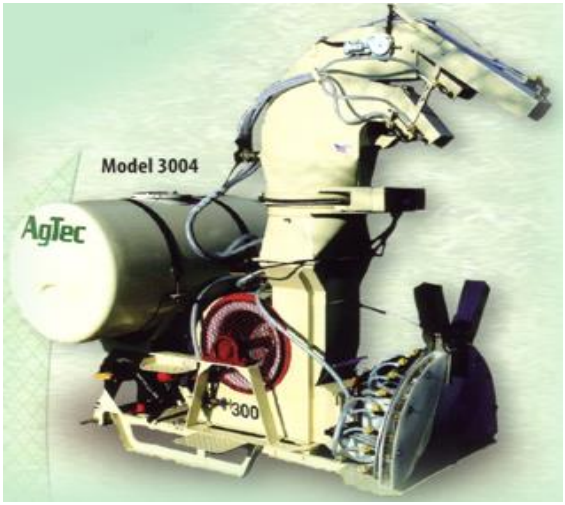
Hand Boom Attachment

Motorized Unit

Slide in Unit

Minnetonka, [illegible] 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

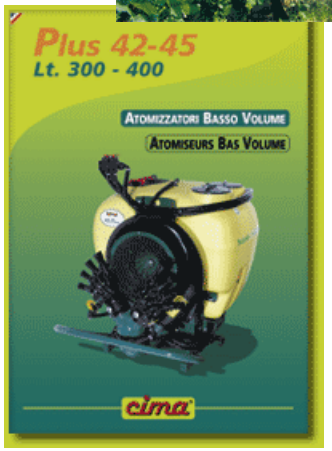
Squirrel Cage Fan

PTO

2 row Cannon

Cima Sprayers

Italy



PTO

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.

BERTHOUD

Made in France

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

3 pt Cannon

Variable tank size

Centrifical Pump

3pt

240 – 484 gal.

Piston Pump

3pt Piston Pump

50 gal. tank

3 PT Cannon Sprayer

Centrifigul Pump 160 – 200 gal. tank

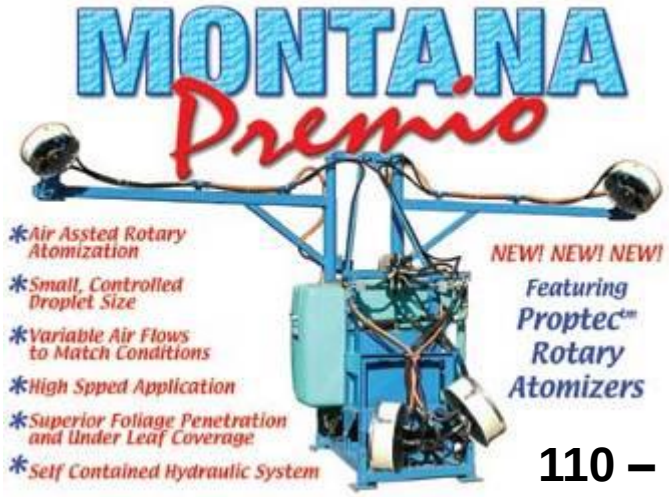
Made in Brazil

MONTANA

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

Orchard Sprayer

500 gal. Piston Pump



110 – 160 gal. tank

Hardi - Danish Co. with Davenport, IA plant
http://www.hardi-us.com/

150 gal. Cannon sprayer

Diaphram pump

50 gal. tank

Diaphram pump

22 radial fan

100-150 gal

Diaphram pump

Air hoses

270 gal. tank

2 row sprayer

Diaphram pump

DURAND WAYLAND
SPRAYING, PACKING & LABELING SYSTEMS

John BEAN SPRAYERS

Durant Wayland now owns John Bean Sprayers

LaGrange, GA 800 241-2308

Durand Wayland

50-100 gal. 3 pt.

300-600 pull types

3pt 18 to 50 hp models

50-100 gal. fiberglass tank

Diaphram pump

John Bean Cannon orchard sprayer

3 pt 35 – 60 hp models

110 to 170 gallon tank

jacto
No Sprayer Delivers More

Brazilian company with manufacturing plant in Oregon

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

3 pt hitch

70-110 gal.

25, 28 & 33 inch fans available

Pull Type cannon or volute models available

265, 400, 600 and 1000 gallon models

http://www.hagie.com/

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

Nozzle in center of fan

- **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

HOMEMADE SPRAYERS

Fred Ver Schuure Oskaloosa, IA

Larry Engbers Pella, IA

Front mounted post pounder used above

2 squirrel cage fans used below

Old FMC boom sprayer used at ISU Armstong 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

Double row weed sprayer

Summerset Winery, Indianola, IA

Homemade Airblast Sprayer Grundy Center, IA

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!

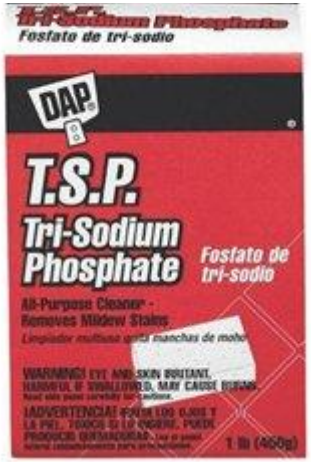
Tank Cleaning Procedures

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

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

John Bean Sprayer at ISU Ames Horticulture Research Farm

http://www.hort.iastate.edu/facilities/hortfarm

IOWA STATE UNIVERSITY
Extension and Outreach

Midwest Grape and Wine Industry Institute

Home | Events | Enology | Viticulture | Industry Info | Lab | Projects | Contacts

News
Wine Grower News
Institute Updates
Archive
2014
2013
2012
2011
2010
2009
2008
2007

Wine Grower News 2015

Current Issue

#291 - December 26, 2014

Issue Index

Fruit Spray Guide Evaluations
USDA Provides Greater Protection for Fruit, Vegetable & Other Specialty Crops
University of Wisconsin Enology Position
(NCSARE) Online Learning Center
2014 / 2015 Northern Grapes Project Upcoming Webinar Series
1-9, VESTA Regular Spring Registration Ends
Upcoming Beginning Distillation Workshops (Updated)
1-(23-24), Greater KC Cellarmasters – Amateur Wine Competition
Goals of the Midwest Grape & Wine Industry Institute
2-(5-7), Cold Climate Conference – Minneapolis, MN
2-(27-28), IWGA Annual Conference – Cedar Rapids, IA
3-(4-5), Fruit Brandy Distillation Workshop – Mountain Grove, MO
3-(24-26), Natl. Viticulture & Enology Extension Leadership Conference
Neeto Keeno
Show n Tell
Videos of Interest
Marketing Tidbits
Notable Quotables
Articles of Interest
Calendar of Events

Subscribe to Wine Grower News

Send an e-mail to mlwhite@iastate.edu with "Subscribe" in the subject line.

Thank You