Setting Up A Spray Program

2- 2:50 p.m., Friday January 16th, 2015
Kansas Grape Growers & Winemakers Association

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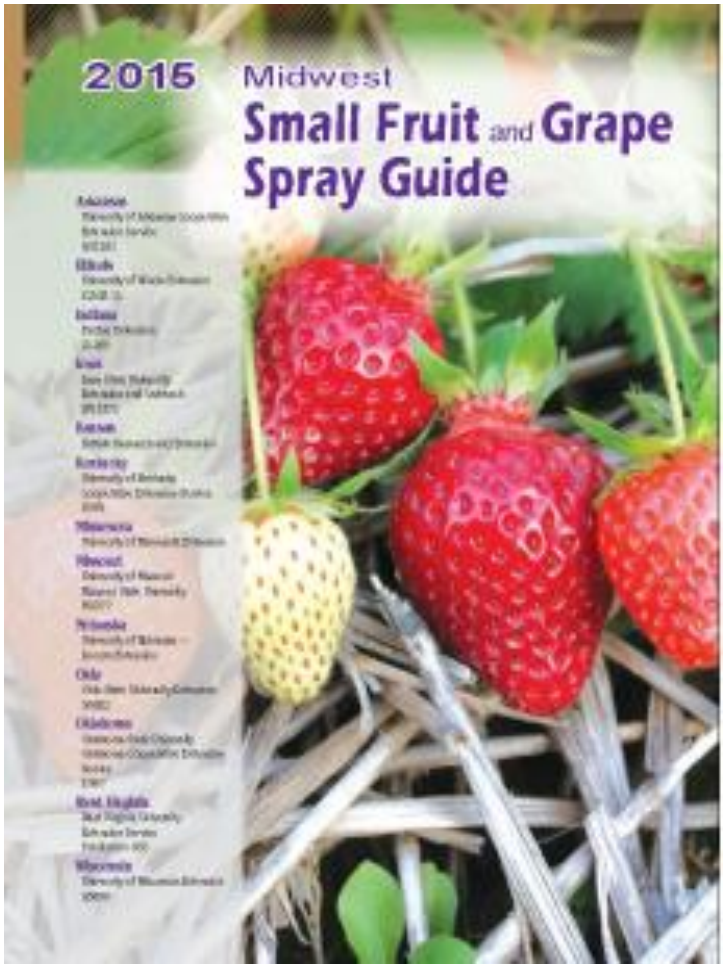
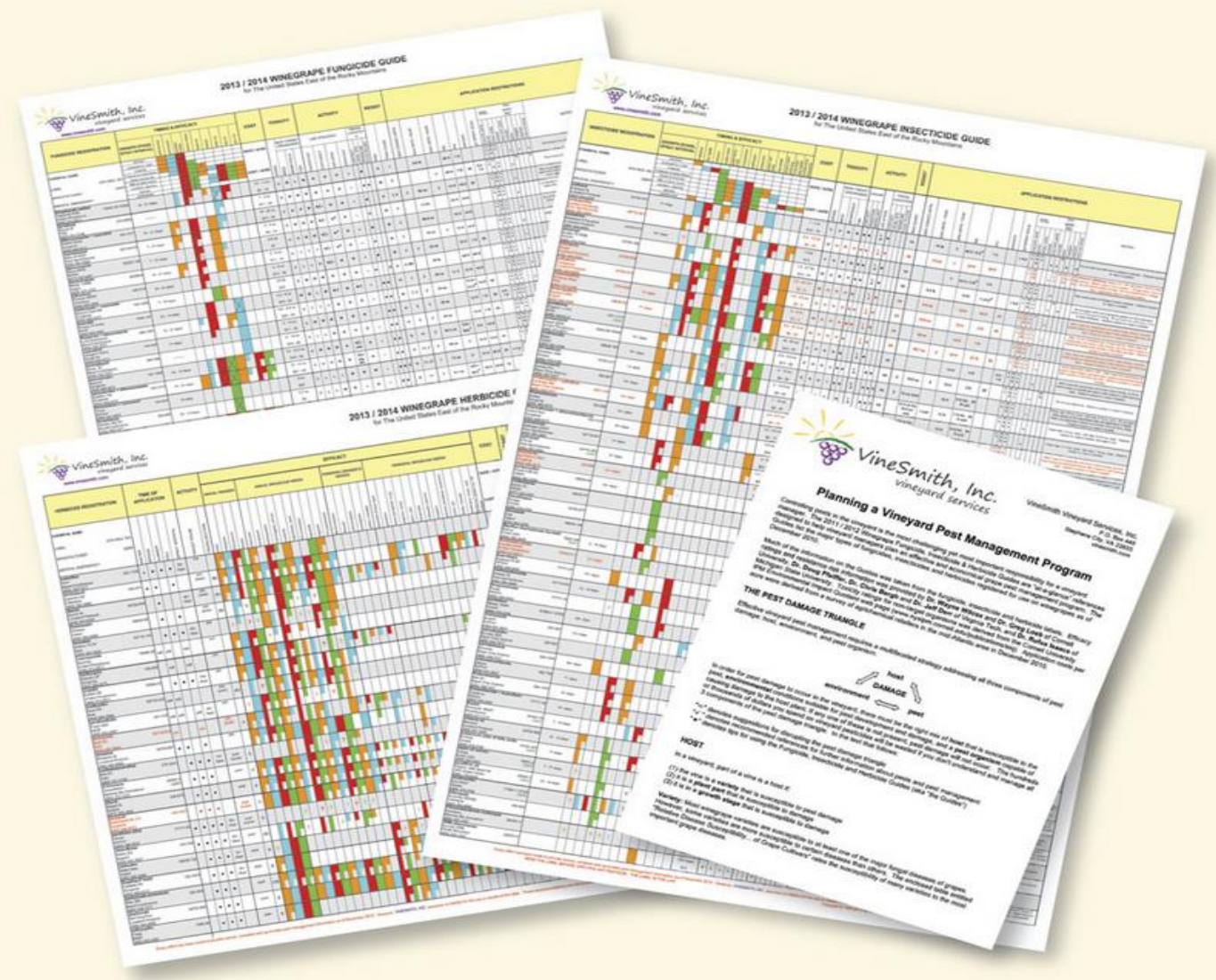


- Sprayer Calibration
- Spray Schedule
- Fungicides
- Insecticides
- Cultivar Disease Susceptibility
- Herbicides
- Record Keeping Info & Form
- Conversion Factors

44 Fungicides
44 Insecticides
23 Herbicides
Pre-harvest Interval
Re-Entry Interval
Toxicity
Mode of Action
Resistance Mgt.
Respray Interval
Tank Mixing
Brand Name
Chemical Name
Manufacturer
EPA Number
$ / Acre
Rates / Acre
Efficacy / Pest
Min. Gallons / Acre
Personal Protective
Equipment (PPE)



2013/14 Guide is $39, New Guides are $59

Vineyard
Restricted Use Pesticides

Fungicides: None

Herbicides: Kerb, Gramoxone (paraquat)

Insecticides: Agri-mek, Baythroid, Brigade, Danitol, Lorsban EC, Mustang Max, Vendex

General Use Pesticides

Everything Else

Worker Protection Standard (WPS)

Worker Pesticide Safety Training

Central Pesticide Information, Application and Safety Posted Area

Decontamination Sites within ¼ mile of the site
(water, soap and towels)

Pesticide Personal Protective Equipment (PPE)
(Label - Agriculture Use Requirements)

Ability to Provide Timely Emergency Assistance

Pesticide Application Signs posted 24 hours Prior to Application and up Until 3 Days After the Restricted Entry Interval (REI) at Field Entry Areas

Vineyard Owners and Their Immediate Families are Exempt from Most of these rules.

Worker Protection Standard (WPS) for Vineyard Workers
What you need to know.

The Worker Protection Standard for Agricultural Pesticides (WPS) is a regulation issued by the U.S. Environmental Protection Agency (EPA). The final rules were fully implemented in 1995 to protect people from pesticides used on farms, forests, nurseries, and greenhouses. The WPS covers both workers in areas treated with pesticides and employees who handle pesticides (handlers).

ISU / EPA Vineyard Worker Self Training Guide - 37 pages

http://www.extension.iastate.edu/psep/WorkerProtect.html

Worker Protection Standard (WPS) Additional Resources

1. **Worker Protection Standard for Agricultural Pesticides, U.S. Environmental Protection Agency:** ***http://www.epa.gov/agriculture/twor.html***

2. **Worker Safety Training under the Worker Protection Standard, U.S. Environmental Protection Agency:** ***http://www.epa.gov/opp00001/health/worker.htm***

3. **EPS WPS publications: http://www.epa.gov/agriculture/awor.html#farmworkers**

4. **ISU Worker Protection Standard Complete Resource Guide http://www.extension.iastate.edu/psep/WorkerProtect.html**

Pesticide Signal Words

Signal Word	Toxicity	Oral Lethal Dose (150 lb person)
Danger	High	Few drops to a teaspoon
Warning	Moderate	teaspoon to a tablespoon
Caution	Low	1 oz. to a pint

Categories of Oral Toxicity

Toxicity	Signal Word	LD-50* mg/kg oral	dermal
High	"Danger"	0-50	0-200
Moderate	"Warning"	51-500	201-2,000
Slight	"Caution"	501-5,000	2,001 –20m
Non-toxic	none	> 5,000	> 20,000
Table Salt	none	3,320	
Aspirin	none	1,200	

*Dose required to produce death in 50% of exposed test animals.

Pesticide Resistance Management

a. Avoiding repetitive use or sole use of one chemical.
b. Tank mix with different modes of action. (Example FRAC mode of action #'s)
c. Alternate applications with products of different modes of action.
d. Limit the number of treatments – apply only when necessary.
e. Integrate with non-chemical fungicide methods.
f. Apply labeled rates.

Pesticide Resistance Action Groups:
http://www.clemson.edu/extension/pest_ed/issues/resistan.html

Know Your Weeds

Summer Annual – germinate in spring and produce seed before fall.

Winter Annual – germinate in late summer or fall and produce seed the next spring or early summer.

Biennial – germinates in fall or spring, vegetative stage first years and reproductive stage 2nd year.

Simple Perennial – Survives several years and reproduces primarily from seed.

Creeping Perennial – Survives several years and reproduces by underground roots or stems and by seed.

Know Your Insects

Grape Berry Moth

Source: http://news.cahnrs.wsu.edu/

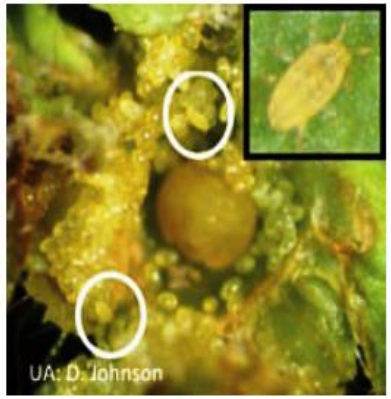
Climbing Cutworm

Grape Flea Beetle

Japanese Beetles

Multicolored Asian Lady Beetles

Phylloxera



Know Your Diseases

Anthracnose

Downy Mildew

Black Rot

Powdery Mildew

Phomopsis

Integrated Pest Management

Integrated practices involving the entire crop management system utilized to keep pest damage below the economic threshold level and keep adverse impacts to humans, wildlife, and the environment to a minimum.

Examples are:

-biological control **-proper crop scouting**

-spot applications vs broadcast applications

-sanitary vineyard practices

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.

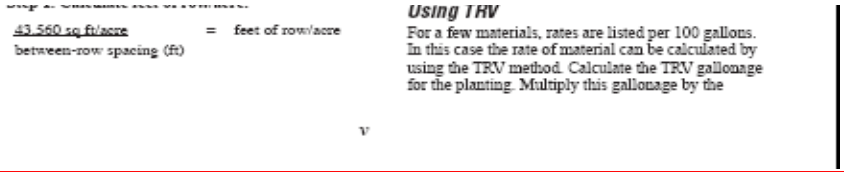
Tree Row Volume (TRV)

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

Know Your Spray Adjuvants

Spreader/Sticker, ie…. Non-ionic surfactant.

Spreader/Sticker/Penetrant, ie Crop oil concentrate or methylated seed oil.

Fertilizer Spray Enhancer, ie… liquid 28% nitrogen or dry ammonium sulfate crystals. Softens the water.

Drift Inhibitors: ie…acrylic or silcone polymer that reduces spray drift by increasing viscosity and droplet size.

Compatibility Agents, ie…"Unite", "Dawn dishwashing detergent" helps incompatible products mix together.

Anti-Foaming Agent – eliminates foam buildup in the tank

Compendium of Herbicide Adjuvants, Southern IL Univ.:
http://www.herbicide-adjuvants.com/

Pesticide Mixing Order

Follow this mixing order if not listed on label.

Fill tank ¼ with water and begin agitation.

Add compatibility agent if needed then follow this order:

1st	WDG	Wettable Dry Granules and/or packets
2nd	DF	Dry Flowable
3rd	WP	Wettable Powder
4th	AS	Aqueous Suspension
5th	F	Flowable
6th	EC or E	Emulsifiable Concentrate
7th	SP	Soluble Powder
8th	S	Solutions
10th	Surfactants	

Keep agitated and do not let stand overnight.

Know Your Herbicides

Table 12. Herbicides Registered for Weed Control in Small Fruit

Trade Name	Common Name	Crop Use	Risk of Resistance	Signal Word	REI	HRAC[1]
Preemergence control of grasses and/or broadleaf weeds						
Alion	indaziflam	grape	medium	caution	12 hr	L/-29
Callisto	mesotrione	blueberry	medium	caution	12 hr	F2/27
Casoron, Norosac	dichlobenil	blueberry, brambles, grape	medium	caution	12 hr	L/20
Chateau	flumioxazin	grape, strawberry	medium	caution	12 hr	E/14
Dachtal	DCPA	strawberry	low	caution	12 hr	K1/3

Table 13. Relative Effectiveness of Herbicides for Small Fruit Crops

	Grasses					Annual Broadleaves																Perennial Weeds			
Herbicide	Barnyardgrass	Crabgrass	Foxtails	Goosegrass	Panicum, Fall	Chickweed	Cocklebur	Galinsoga	Groundsel, Common	Hembit	Jimsonweed	Lambsquarters	Marestail	Morningglory, Annual	Mustards	Nightshades	Pigweed	Purslane	Ragweed	Shepherdspurse	Smartweeds	Velvetleaf	Violet, Field	Dandelion	Nutsedge, Yellow	Thistle, Canada	Woodsorrel, Yellow
Preemergence																											
Alion	G	G	G	G	G	G	N	N	G	F	N	F	G	F	G	N	G	G	F	G	G	G	N	G	N	N	F
Callisto	N	N	N	N	N	G	G	G	N	N	G	G	F	F	N	G	G	N	G	N	G	G	N	N	F	N	N
Casoron	N	G	G	G	G	G	F	N	G	G	N	G	F	N	G	N	G	G	G	G	G	G	N	G	N	G	G
Chateau	N	N	N	N	N	F	F	N	N	N	G	G	G	F	N	G	G	G	F	G	F	F	N	N	N	N	N
Dacthal	G	G	G	G	G	F	N	N	N	N	N	F	N	N	N	N	F	F	N	N	N	N	G	N	N	N	N

Types of Herbicides

Soil Applied – root and or shoot uptake

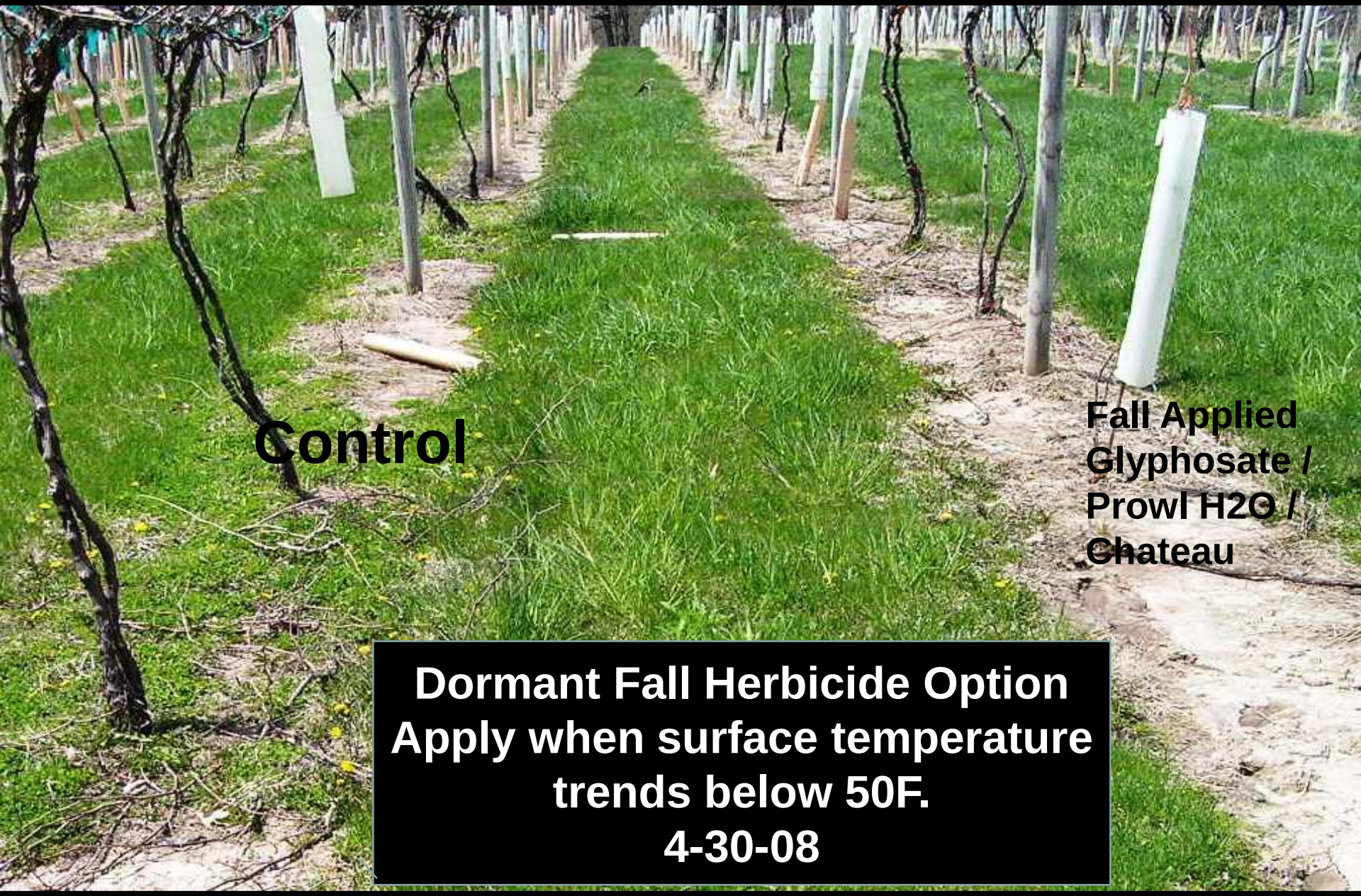
Pre-emergence – apply before seeds germinate

Pre-plant Incorporated (PPI) – soil incorporated

Post Emergence – foliage sprays

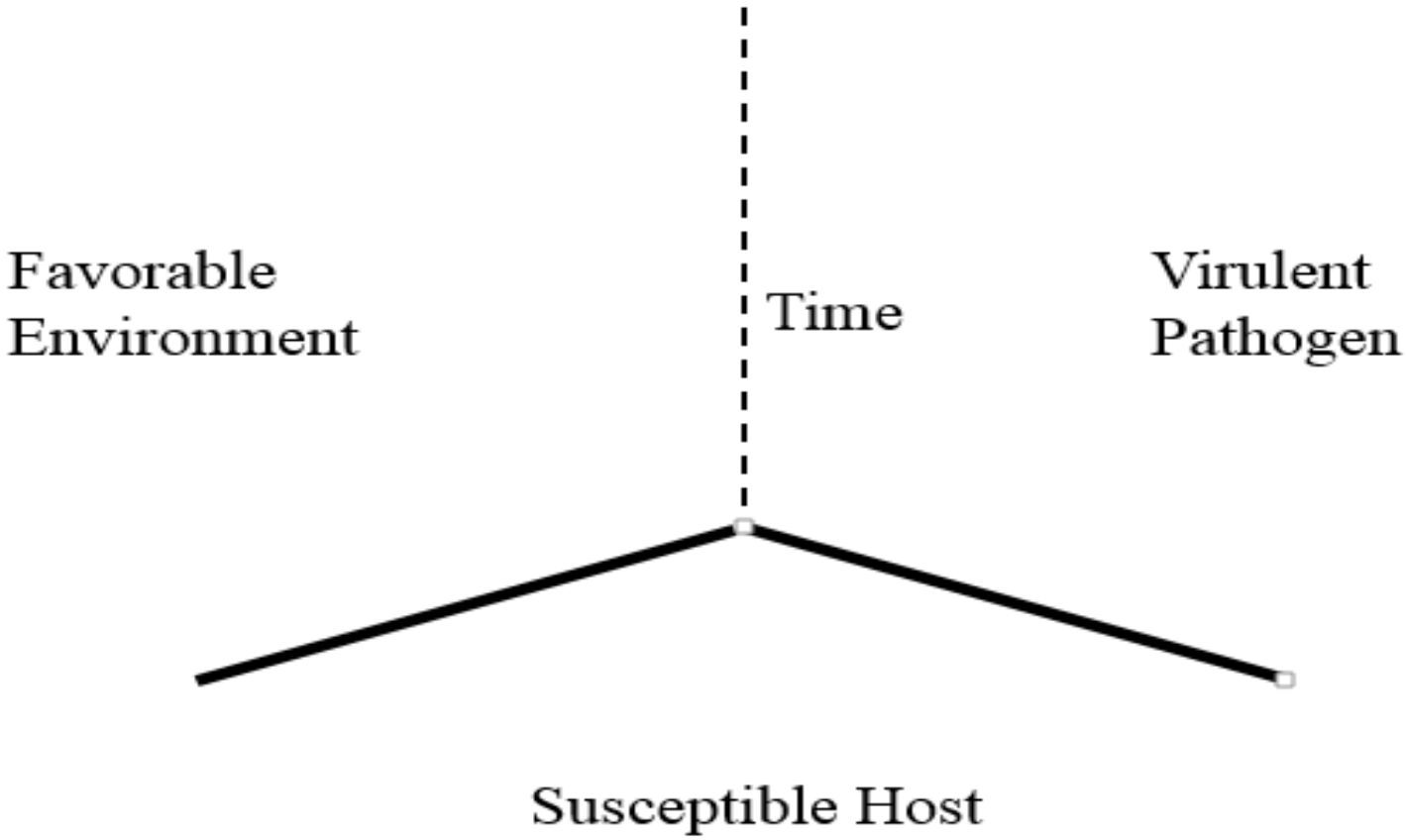
Contact – need good coverage over leaf surface

Systemic – translocation within plant. Can be soil or post applied to foliage



Dormant Fall Herbicide Option
Apply when surface temperature trends below 50F.
4-30-08

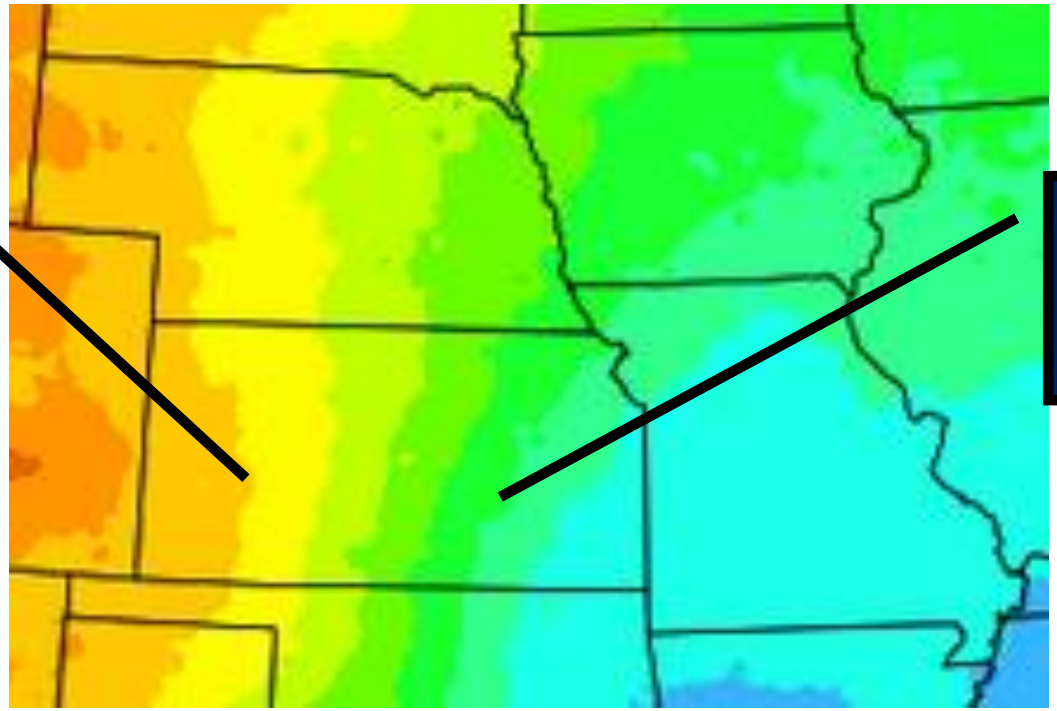
The Disease Triangle



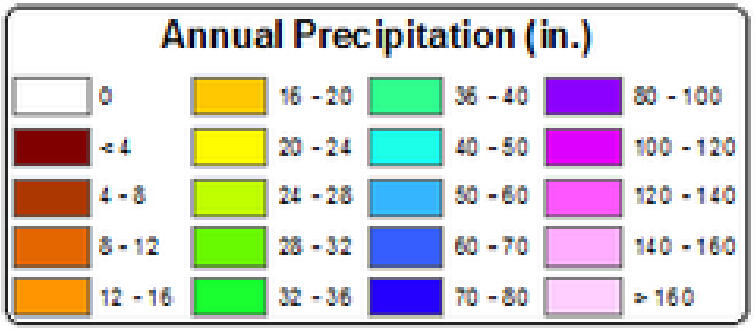
Common Sense – Very Important!

1981 to 2010 Average Annual Rainfall Map

Low Disease Pressure



High Disease Pressure



Fungicide Effectiveness

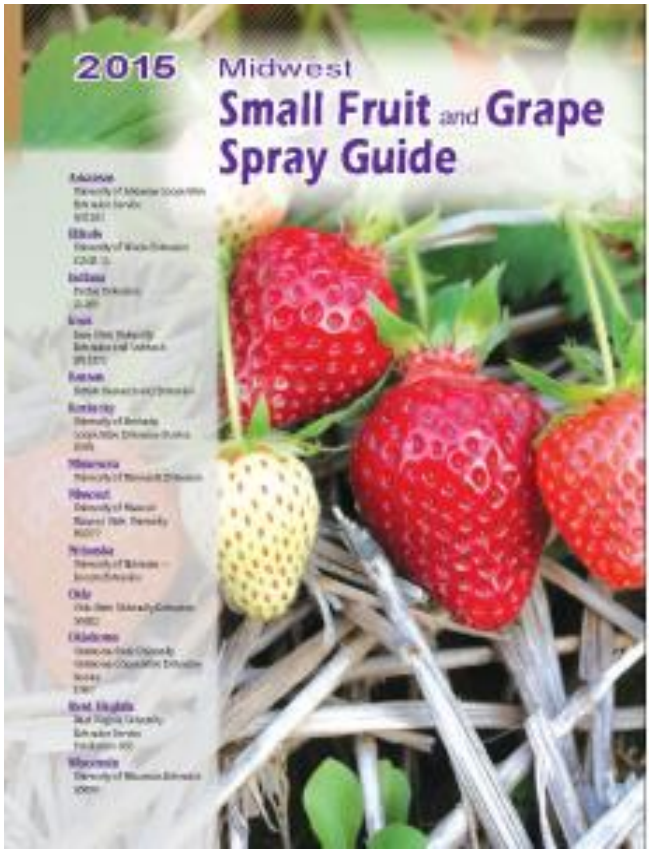


Table 1. Effectiveness of Fungicides for the Control of Grape Diseases

Fungicide	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis rot	Bitter rot	Anthracnose
Abound[1,2]	+	+++	+++ (FRP)	+++ (FRP)	++	7	+++
Bayleton[1]	0	+++	0	+++ (FRP)	0	7	7
Captan	+++	+	+++	0	+	++	++
Elevate	0	0	0	0	+++	0	7
Endura	0	0	0	+++	++	0	+++
Ferbam	+	+++	+	0	0	++	7
Fixed copper and lime	+	+	+++	++	+	+	7
Flint[1,2]	+	+++	+ (FRP)	+++ (FRP)	++	7	+++
Forum	0	0	+++	0	0	0	0
Inspire Super	0	+++	0	+++	+++	7	+++
Luna Privilege	?	+	0	+++	++	?	?
JMS Stylet Oil	0	0	0	+++	0	0	7
Mancozeb	+++	+++	+++	0	0	++	+++
Mettle	0	+++	0	+++ (FRP)	0	7	+++
Potassium salts	0	0	0	++	0	0	7
Phosphorous acid	0	0	+++	0	0	0	7
Presidio	0	0	+++	0	0	0	0
Pristine[2]	++	+++	+++ (FRP)	+++	++	7	+++
Procure[1]	0	++	0	+++ (FRP)	0	7	7
Quadris Top	+	+++	+++	+++	++	7	+++
Quintec	0	0	0	+++	0	0	0
Rally[1]	0	+++	0	+++ (FRP)	0	7	+++
Ranman	0	0	+++	0	0	0	0
Reason	7	7	++	7	7	7	7
Revus	0	0	+++	0	0	0	0
Revus Top	0	+++	+++	+++	7	7	+++
Ridomil Gold MZ	+	++	+++	0	0	++	++
Ridomil Gold Copper	+	+	+++	++	+	+	0
Rovral	0	0	0	0	+++	0	7
Scala	0	0	0	0	+++	0	7
Sovran[1,2]	+	+++	++ (FRP)	+++ (FRP)	++	7	+++
Sulfur	+	0	0	+++	0	0	7
Switch	0	0	0	0	++	7	0
Tavano	7	7	7	+++	++	7	7
Tebuzol[1]	0	+++	0	+++ (FRP)	0	7	+++
Topsin M[2]	++	+	0	+++	++	++	+++
Torino	0	0	0	+++	0	0	0
Vangard	0	0	0	0	+++	0	7
Vintage	0	+++	0	+++ (FRP)	0	7	+++
Vivando	0	0	0	+++	0	0	0
Zampro	0	0	+++	0	0	0	0
Ziram	++	+++	++	0	0	7	++

Cultivar Disease Sensitivity

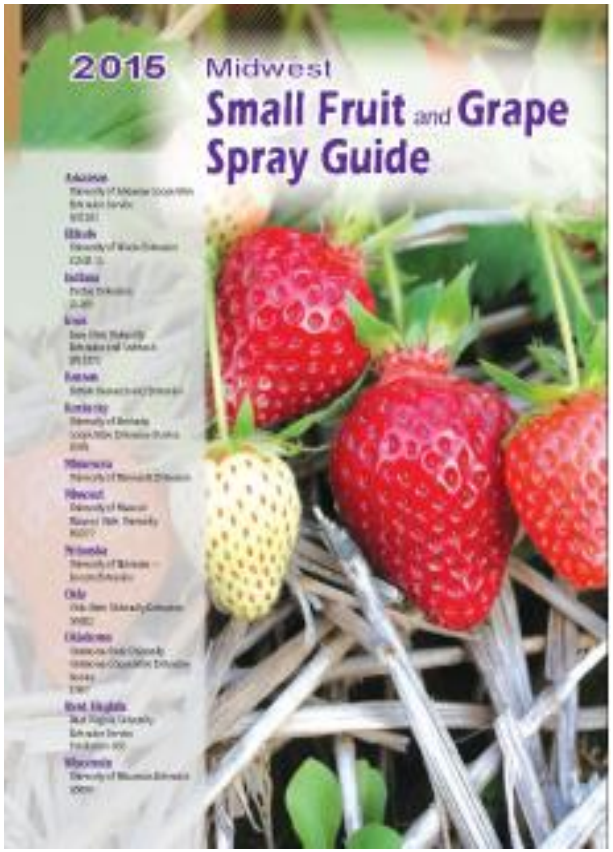
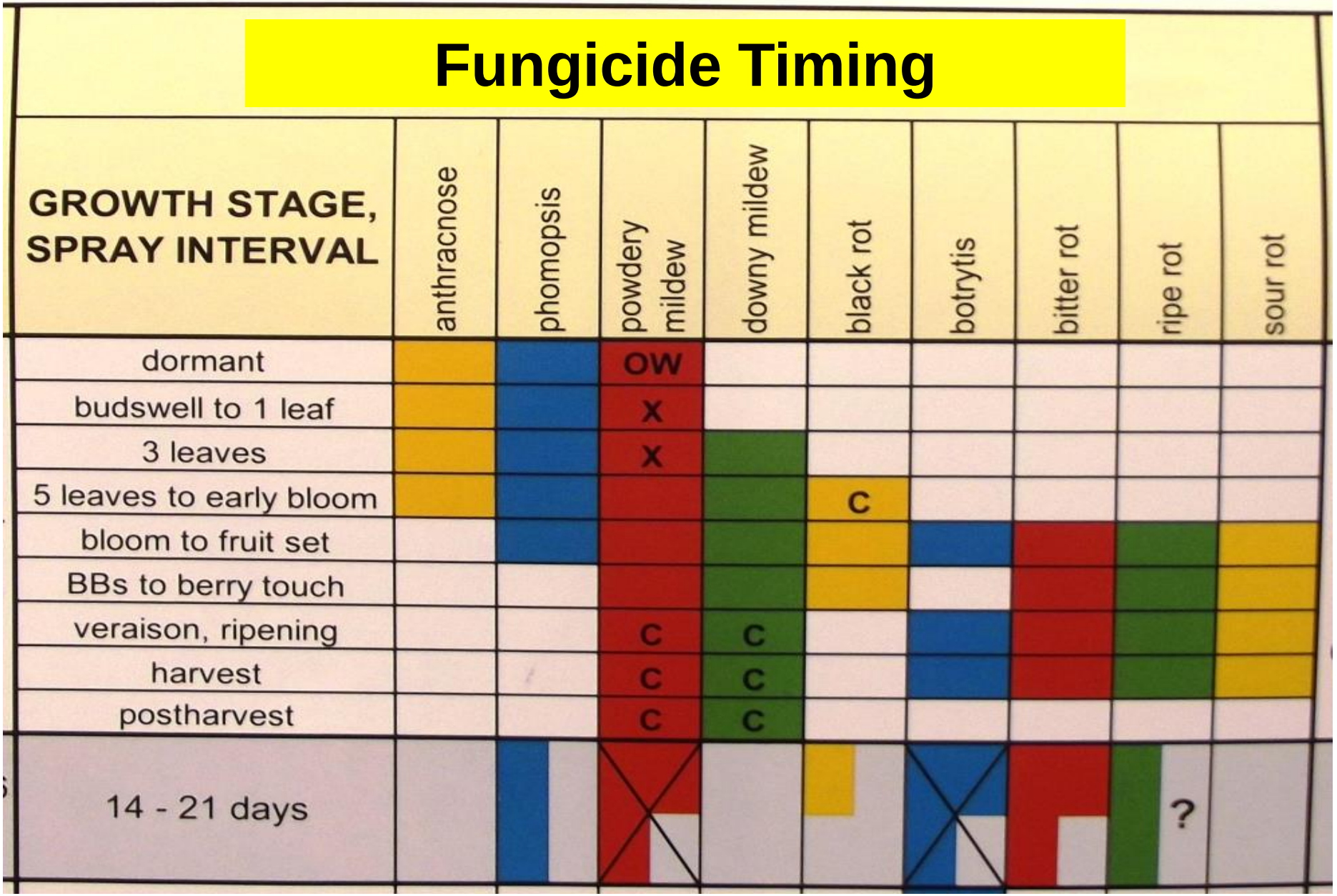


Table 4. Relative Disease Susceptibility and Chemical Sensitivity among Grape Cultivars.
The relative ratings in this chart apply to an average growing season under conditions usually favorable for disease development. Any given cultivar may be more or less severely affected depending on conditions.

Cultivar	Susceptible or Sensitive to											
	Black rot	Downy mildew	Powdery mildew	Botrytis	Phomopsis	Eutypa	Crown gall	Anthracnose	Sulfur[1]	Copper[1]	2,4-D[1]	dicamba[1]
Arandell	+	+	+	+	++	?	?	+	?	?	++	?
Aromella	+	+++	+	+	++	?	?	+	?	?	+++	+++
Aurore	+++	++	++	+++	+	+++	++	+	No	++	?	?
Baco Noir	+++	+	++	++	+	++	+++	+	No	?	?	?
Brianna	?	+	?	+	?	?	?	?	?	?	++	+
Cabernet Franc	+++	+++	+++	+	?	?	+++	++	No	?	+	+++
Cabernet Sauvignon	+++	+++	+++	+	+++	+++	+++	?	No	+	+	?
Catawba	+++	+++	++	+	+++	+	+	++	No	++	++	++
Cayuga White	+	++	+	+	++	+	++	+++	No	+	+	+++
Chambourcin	+++	+	+++	++	+	?	++	+	Yes	?	+++	++
Chancellor	+	+++	+++	+	+++	+	+++	++	Yes	+++	++	?
Chardonel	++	++	++	++	+++	++	++	+	No	?	++	+++
Chardonnay	++	+++	+++	+++	+++	++	+++	+++	No	+	++	+++
Concord	+++	+	++	+	+++	+++	+	+	Yes	+	+++	++
Corot noir	+	+++	+	+	++	+	+	+	No	?	++	+++
Cynthiana/Norton	+	++	+	+	+	?	+	+	Yes	?	+++	+++
DeChaunac	+	++	++	+	+++	+++	++	++	Yes	+	+	++
Delaware	++	+++[3]	++	+	+++	+	+	++	No	+	+++	?
Edelweiss	?	?	?	?	?	?	?	?	?	?	++	?
Foch	++	+	++	+	+	+++	+	++	Yes	Yes	+++	+++
Fredonia	++	+++	++	+	+++	?	+	+++	No	?	++	++
Frontenac	+++	+	++	++	+	?	?	+	No	?	+	+++
Frontenac Gris	++	+	++	++	+	?	?	+	No	?	+	+
Geneva Red	+	++	++	++	+	+	+	+	No	?	+	+++
Gewürztraminer	+++	+++	+++	+++	?	?	+++	+++	No	+	?	?
Jupiter	++	+++	+++	+	+	?	?	+	?	?	+	++
LaCrescent	++	+++	++	+	+++	+	+	+	?	?	+++	+++
LaCrosse	+++	++	++	+++	++	?	?	+	?	?	+++	+++
Lemberger	+++	+++	+++	+	?	+++	+++	?	No	?	++	?
Leon Millot	+	++	+++	+	+	+	?	+	Yes	?	+	?
Marquette	+++	+	+	+++	?	?	+	?	?	?	+++	+
Marquis	+	+++	+	+	+++	?	?	+++	?	?	+	?
Mars	+	+	+	+	+	?	+	+	?	?	+	+
Merlot	++	+++	+++	++	+	+++	+++	++	No	++	?	?
Moore's Diamond	+++	+	+++	++	?	++	?	?	No	?	?	?
Niagara	+++	+++	++	+	+++	+	++	++	No	+	+++	++
Noiret	++	++	++	+	+	?	++	+	No	?	++	+++
Pinot gris	+++	+++	+++	++	?	+++	+++	?	No	?	?	?
Pinot noir	+++	+++	+++	+++	?	?	+++	?	No	+	?	?
Reliance	+++	+++	++	+	++	?	?	+++	No	+	+	?
Riesling	+++	+++	+++	+++	++	++	+++	?	No	+	+	++
St. Croix	?	++	++	++	+++	?	?	+	?	?	++	?
Seyval	++	++	+++	+++	++	+	++	+	No	+	++	+++
Steuben	++	+	+	+	+	?	+	+	No	?	+	++
Sunbelt	+	++	++	+	+	?	?	+	?	?	+++	++
Traminette	+	++	+	+	+++	?	++	+	No	?	++	++
Valvin Muscat	++	+	++	+	+	?	+	?	No	?	+++	+
Vanessa	+++	++	++	+	+	?	+	?	?	?	+	?
Vidal blanc	+	++	+++	+	+	+	++	+++	No	?	++	+++
Vignoles	+	++	+++	+++	++	++	++	+++	No	?	+	+++

Fungicide Timing



Grape Spray Schedule

Note on Disease Control Recommendations

The following information is intended to provide general guidelines for use in developing a fungicide spray program for grapes in the Midwest. This spray schedule presents various fungicide options that growers can consider.

The major grape diseases that generally require at least some fungicide application for control on an annual basis include black rot, powdery mildew, downy mildew, and Phomopsis cane and leaf spot. Several recommendations in this guide include tank mixes of different fungicides that are intended to provide a program that will control all of these diseases simultaneously. In some cases, recommendations for a single disease alone are provided as well.

Growers who wish to make a fungicide application intended to control only one specific disease, can refer to Table 1, Effectiveness of Fungicides for the Control of Grape Diseases on page 33 of this guide.

Please pay special attention to the notes and comments.

Dormant

Apply before buds swell.

Pest/Problem	Material	Rate/Acre	Comments
Anthracnose	**Fungicide Resistance Alert:** See note on page 32 on fungicide resistance development in powdery and downy mildew.		
	Lime sulfur solution *or*	10 gal	This dormant application is aimed at reducing overwintering inoculum on canes. See pages 28-29 for more information on anthracnose.
	Sulforix	1 gal	

Bud Swell

Apply just before buds show green.

Pest/Problem	Material	Rate/Acre	Comments
European red mite and/or scale insects	Superior oil (70-sec.)	4 gal	
Grape scale	Lorsban Advanced	1 qt	
Flea beetle adults	Scout at least weekly as bud swell occurs.		
	Baythroid XL (1EC)	2.4-3.2 fl oz	
	Danitol 2.4EC	5.3-10.7 fl oz	
	Renounce 20WP	3-4 oz	
	Scorpion 35SL	2-5 fl oz; 9-10.5 fl oz	Use the low rate for foliar application; use the high rate for soil application.
	Sevin XLR Plus (4F)	2 qt	Other formulations may be available.
Climbing cutworms	Scout at least weekly as bud swell occurs.		
	Same as for flea beetles above, or		
	Altacor 35WDG	3-4.5 oz	
	Baythroid XL 1EC	2.4-3.2 fl oz	
	Belt 4SC	3-4 fl oz	
	Danitol 2.4EC	10.7-21.3 fl oz	
	Delegate 25WG	3-5 oz	
	Lorsban 4E or Lorsban Advanced	1 qt	Apply as a spray drench ground application. Do not use now if Lorsban will be used later for root borer.

Based on Plant Growth Stages

Dormant
Bud Swell
Bud Break to Bloom
10” Inch Shoots
Pre-Bloom
Bloom
Shatter
First Cover to Veraison
Verasion to Harvest
Post Harvest

Pest Material Rate/Ac Comments

Table 8. Fungicide Harvest Restrictions and Restricted-Entry Intervals (REI)

Trade name	Common name	Harvest restrictions Days before harvest and limitations (Maximum amount/acre/season)*				REI[b]	FRAC[c] Code
		Grape	Blueberry	Brambles	Strawberry		
Abound	azoxystrobin	14*	0	0	0	12 hr	11
Aliette	fosetyl-AL	15*	0*	60	0 (30 lb)	12 hr	33
Basic copper sulfate	copper sulfate	0	—	0	0	24 hr	M
Bayleton	triadimefon	14 (18 oz)	—	—	—	12 hr	3
Cabrio	pyraclostrobin	—	0 (56 oz)	0 (56 oz)	0 (56 oz)	24 hr	11
Captan	captan	0 (24 lb)	0 (70 lb)	3[d]	0 (48 lb)	see note[e]	M
CaptEvate	captan plus fenhexamid	—	0 (21 lb)	0 (21 lb)	0 (21 lb)	24/72 hr[e]	M 17
Dithane M-45, others	mancozeb	66*	—	—	—	24 hr	M
Elevate	fenhexamid	0*	0	0	0*	12 hr	17
Elite	tebuconazole	14	—	—	—	12 hr	3
Endura	boscalid	14*	—	—	—	12 hr	7
Ferbam	carbamate	7	—	—	—	24 hr	M
Flint	trifloxystrobin	14*	—	—	—	12 hr	11

Table 9. Insecticide and Miticide Harvest Restrictions and Restricted-Entry Intervals

Consult product label for complete restrictions and limitations.

Trade Name	Common name	Harvest Restrictions: Days before harvest and limitations				REI[a]	IRAC[b]
		Grape	Blueberry	Brambles	Strawberry		
Acramite	bifenazate	14	—	—	1	12hr/5days	25
Actara	thiamethoxam	—	3	—	3	12 hr	4A
Admire	imidacloprid	—	7	—	14	12 hr	4A
Agri-mek (RUP)	abamectin	28	—	—	3	12 hr	6
Applaud	buprofezin	30	—	—	—	12 hr	16
Asana (RUP)	esfenvalerate	—	14	7	—	12 hr	3
Assail	acetamiprid	7	—	—	—	12 hr	4A
Baythroid	cyfluthrin	3	—	—	—	12 hr	3
Brigade (RUP)	bifenthrin	—	—	3	0	12 hr	3
Capture (RUP)	bifenthrin	30	—	3	—	12 hr	3
Confirm	tebufenozide	—	14	14	—	4 hr	18A
Danitol (RUP)	fenpropathrin	21	3	—	2	24 hr	3
Deadline	metaldehyde	0	0	0	0	12 hr	-
Diazinon (RUP)	diazinon	28	7	—	5*	24 hr	1B
Dibrom	naled	3	—	—	1	48/72 hr	1B

PHI = Pre-Harvest Interval

&

REI = Re-Entry Interval

Organic Fungicide Spray Examples

Anthracnose : Lime sulfur in April.

Black Rot : Bordeaux Mixtures, Copper Hydroxide 20% DF (ie., or Champ WP), Copper Sulfate (all give marginal control)

Downy Mildew: copper compounds, Bordeau Mixture, Copper Hydroxide, and Serenade (Bacilus subtilis)

Powdery Mildew: sulfur compounds, stylet oil, fatty acid oil soaps, baking soda, sodium or potassium carbonate (Armicarb or Kaligreen), Serenade or AQ10 (Ampelomyces quisqualis) Bacillus amyloliquefacens & hydrogen peroxide.

Phomopsis Bunch Rot – Bordeaux mixture, Copper Hydroxide all give marginal control.

Phomopsis Cane & Leaf Spot: Dorman Lime Sulfur

Botrytis Bunch Rot: Serenade, Plant Shield (Trichoderma barzianum) and berry thickening sprays.

Note 1. Copper hydroxide and copper sulfate are very corrosive to metal, especially galvanized metal.

Note 2. Many grape cultivars are sensitive to copper or sulfur applications. Mixing copper hydroxide with hydrated lime will often lessen the phytotoxic affects. Temperatures above 85F will increase the potential of leaf burning with sulfur compounds. Spraying copper compounds under cold (below 60F) and wet conditions can cause phytotoxic effects.

Regalia Biofungicide made from Giant Knowweed extract increases the plant's defenses against all the major grape diseases.

Primary Organic Disease Control Strategies

- Select disease tolerant cultivars.
- Select full sunlight southern oriented site.
- Cane pruned better than cordon pruned.
- Good canopy management to allow sun and air to enter canopy.
- Well drained soil with good fertility.
- “SANITATION” clean up plant debris.
- Remove wild grapes within 300 ft. of vineyard aids in Powdery Mildew control
- Prompt Harvesting before bunch rots develop.

Insecticide Effectiveness

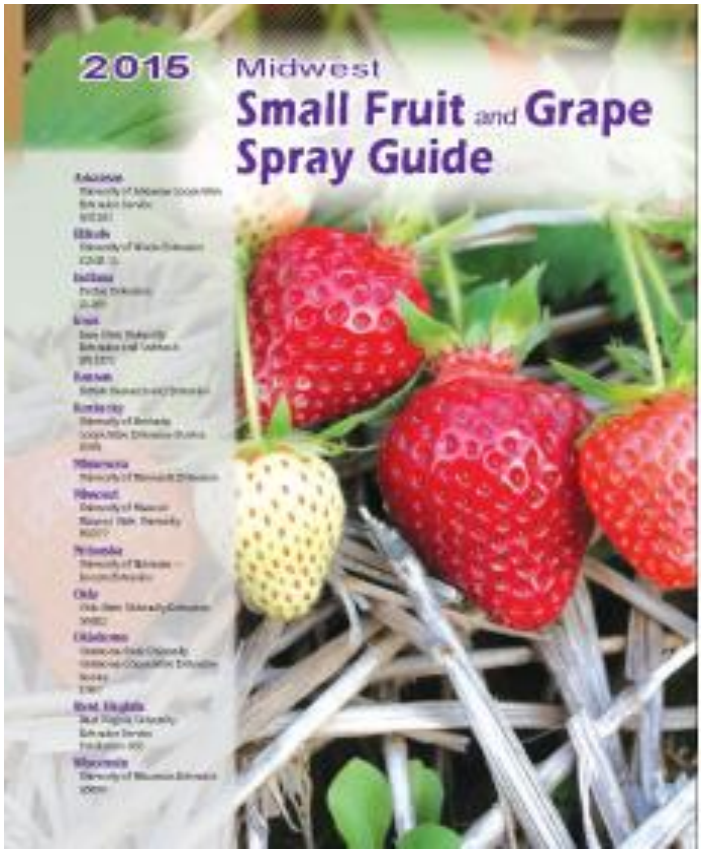
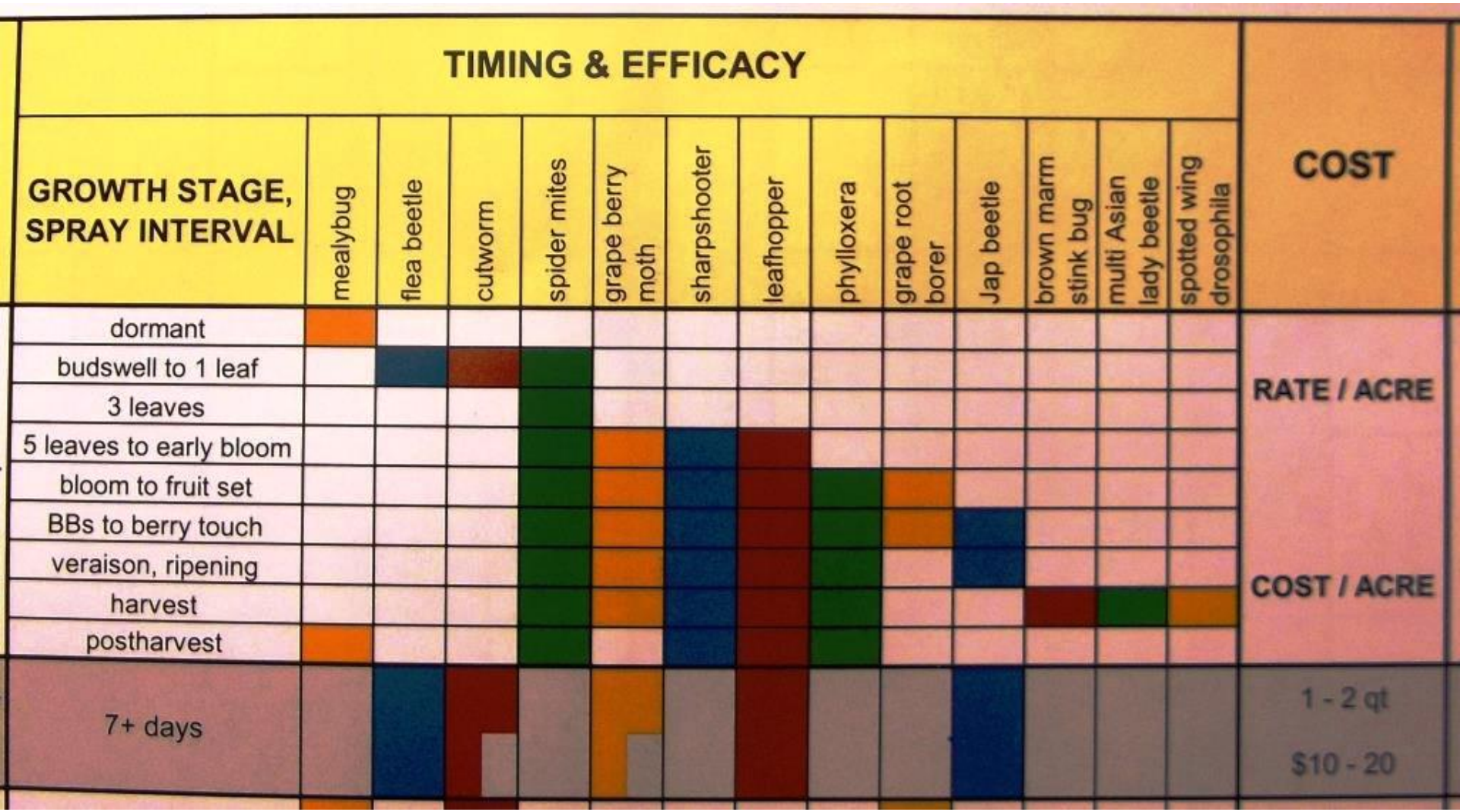


Table 3. Effectiveness of Pesticides for Control of Grape Insects and Mites

	Climbing cutworm	Eight spotted forester	Grape berry moth	Grape cane girdler, Grape cane gallmaker	Grape flea beetle	Grape phylloxera (foliar)	Grape root borer	Japanese beetle	Leafhoppers	Multicolored Asian lady beetle	Redbanded leafroller	Rose chafer	Spider mites	Spotted wing Drosophila, Fruitflies
Insecticides														
Actara		-	-	-	-		-	-	++	-	-	-	-	-
Admire	-	-	-	-	-	++	-	+	+++	++	-	+	-	+
Altacor	-	-	+++		-	-	-	-	-	-	+++	-	-	-
Applaud	-	-	-	-	-	-	-	-	++	-	-	-	-	-
Assail	-	-	-	-	-	++	-	++	+++	-	-	+++	-	+
Baythroid, Renounce (RUP)	-	-	+++	++	++	++	-	+++	++	++	-	+++	-	+++
Belay	-	-	+	-	-	-	-	+	+++	+++	-	-	-	-
Belt	-	-	+++	-	-	-	-	-	-	-	+++	-	-	-
Brigade (RUP)	-	-	++	-	++	++	-	++	++	-	-	++	-	+++
Danitol (RUP)	-	-	+++	-	-	+++	-	+++	++	-	-	-	++	+++
Delegate, Radiant	-	-	+++	-	-	-	-	-	-	-	+++	-	-	+++
Dibrom	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Entrust	-	-	++	-	-	-	-	-	-	-	++	-	-	++
Imidan	-	-	++	-	+	-	-	++	++	-	++	++	-	++
Intrepid	-	-	+++	-	-	-	-	-	-	-	++	-	-	-
Lorsban (RUP EC only)	-	-	-	-	-	-	++	-	-	-	-	-	-	-
Malathion	-	-	+	-	-	-	-	++	++	-	-	++	-	++
Movento	-	-	-	-	-	+++	-	-	-	-	-	-	-	-

Insecticide Timing



Organic Insecticide Spray Examples

Aza-Direct: Neem Seed Oil Extract (Azadiractin)

BT: Bacillus thuringiensis

Entrust: Spinosad

Grandevo: Chromobactrium subtsugae

JMS Mineral Oil: Paraffin Oil

M-Pede: Potassium Salts of Fatty Acids

Pyganic: pyrethrin

Surround – Kaolin Clay

Venerate: Burkholderia species

Summary

1. Know Your Cultivars
2. Know Your Pests
3. Know Your Pesticides
4. Calibrate Your Sprayer
5. Know the Regulations
6. Know When to Spray
7. Know the Weather
8. Know Pesticide Safety
9. Know Your Costs

Additional Resources

1. 2015 Midwest Small Fruit & Grape Spray Guide, 92 pp: https://ag.purdue.edu/hla/Hort/Documents/ID-169.pdf
2. Midwest Small Fruit Pest Management Handbook, 210 pp: http://extension.missouri.edu/sare/documents/MidwestSmallFruitPestManagement2012.pdf
3. Pesticide Resistance Action Groups: http://www.clemson.edu/extension/pest_ed/issues/resistan.html
4. Pesticide Labels and MSDS sheets: http://www.cdms.net/LabelsMsds/LMDefault.aspx
5. Compendium of Herbicide Adjuvants, Southern IL Univ.: http://www.herbicide-adjuvants.com/
6. North Central IPM Guide: http://www.ipmcenters.org/pmsp/pdf/NorthCentralGrapePMSP.pdf
7. ISU Extension Pesticide Safety Program: http://www.extension.iastate.edu/psep/
8. Gempler's Pesticide Safety Equipment: http://www.gemplers.com/
9. ISU Extension Worker Protection Standard (WPS) information : http://www.extension.iastate.edu/psep/WorkerProtect.html
10. USDA National Organic Program: http://www.ams.usda.gov/AMSv1.0/NOP
11. Organic Materials Review Institute: http://www.omri.org/
12. Demeter Biodynamic Certification: http://www.demeter-usa.org/
13. VineSmith Pesticide Guide: http://www.vinesmith.com/spray-guides/

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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
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Videos of Interest
Marketing Tidbits
Notable Quotables
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