

# **GRAPEVINE**

## **Dormant sprays, P.M. & Phomopsis**

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# It's not too late

- The goal of the dormant spray is to eliminate fungal pathogens that overwinter in or on the woody parts of the vines in our Vineyards.
- While it is not possible to eradicate all spores , dormant sprays can kill or slow down the fungus so it produces fewer spores,
- reducing disease pressure during the growing season.
- Dormant sprays are useful for management of Phomopsis, powdery mildew, black rot, and anthracnose.

- In most years we have seen a benefit from dormant sprays,
- but the degree has varied .
- Results were not as good in very wet springs, which probably led to washing off of the dormant spray before it was able to do its job.
- To cover your bases, two dormant sprays may be applied,
- . If bud burst has occurred, you can still apply dormant spray materials at 1-2" of shoot growth for Phomopsis control.
- Dormant sprays should not be used as a stand-alone disease control measure.

- Lime Sulfur
- copper product
- DF Sulfur
- JMS Stylet Oil or other oil.

Formulations that “stick” to the wood are best. To get the maximum benefit out of dormant sprays,

it is important to ensure thorough coverage of the trunk and canes

focusing nozzles of spray equipment, lowering air intake, slowing down and spraying at a moderately low volume (e.g., 20-30 gpa) which allows good coverage of the canes while keeping the product fairly concentrated

For

- Using a high volume in this case only results in dilution of the product and run-off. Spraying every row is advised.
- Small vineyards are better sprayed with a hand pump sprayer.

- Alternating fungicides with different modes of action is essential to prevent pathogen populations from developing resistance to classes of fungicides.
- This resistance management strategy should not include alternating or tank mixing with products to which resistance has already developed.
- Rotate with fungicides that have a different mode of action.
- Research has shown that sequential sprays of products with the same mode of action can lead to the development of reduced sensitivity to the active ingredient as well .
- Some fungicides have two active ingredients and thus two modes of action. When using such materials, do not alternate with other fungicides that contain one of the same modes of action (i.e. they represent the same fungicide class).



Use the index to determine disease pressure and how often you need to spray to protect the vines. Spray intervals can be shortened or lengthened depending on disease pressure, as indicated in the table below. The schedule assumes adequate coverage; the use of calibrated sprayers and sufficient gallons per acre appropriate for type of sprayer and vineyard trellis.

### SPRAY INTERVALS BY FUNGICIDE GROUPS BASED ON DISEASE PRESSURE USING THE UC DAVIS POWDERY MILDEW RISK INDEX MODEL

			Suggested spray schedule			
Index	Disease pressure	Pathogen status	Biologicals <sup>1</sup> and SARs <sup>2</sup>	Sulfur	Demethylation-inhibitors (DMI) <sup>3</sup>	Strobilurins and Quinolines <sup>4</sup>
0-30	low	present	7- to 14-day interval	14- to 21-day interval	21-day interval or label interval	21-day interval or label interval
40-50	moderate	reproduces every 15 days	7-day interval	10- to 17-day interval	21-day interval	21-day interval
60 or above	high	reproduces every 5 days	use not recommended	7-day interval	10- to 14-day interval	14-day interval

<sup>1</sup> *Bacillus pumilis* (Sonata) and *Bacillus subtilis* (Serenade Max)

<sup>2</sup> SAR = Systemic acquired resistance products

<sup>3</sup> Tebuconazole (Elite), triflumizole (Viticure), and myclobutanil (Rally)

<sup>4</sup> Trifloxystrobin (Flint), kresoxim-methyl (Sovran), and pyraclostrobin/boscalid (Pristine)

A. NARROW RANGE OIL# (JMS Stylet Oil, Saf-T-Side, etc.)	1-2%	4	0
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MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): A contact fungicide with smothering and barrier effects (NC)  
 COMMENTS: Never mix oil and sulfur or apply one within 2 weeks of the other. Can be used as a protectant or eradicant. As a protectant, alternate it prebloom with the sterol inhibitors. At the 1-2% rate, this oil is an excellent eradicant and can be used as a stand-alone program at anytime during the season (except within 2 weeks of a sulfur treatment); good coverage is essential. Apply at 14- to 18-day intervals. Oils can vary in their potential for phytotoxicity. Do not use on table grapes after berry set. For certified organic production, rotate to a fungicide approved by your certifier.

B. POTASSIUM BICARBONATE# (Kaligreen)	2.5-5 lb	4	1
(MilStop)	2.5-5 lb	1	0

MODE OF ACTION: An inorganic salt (NC)  
 COMMENTS: Conditionally acceptable for use on organically grown produce; check with your certifier. Apply by ground only in sufficient water (25 gal/acre minimum) to ensure complete and thorough coverage of foliage and crop. Most effective when alternated with a sterol inhibitor and used as a protectant. Field reports suggest eradicant activity; but this has not been demonstrated in University research. If used as an eradicant, contact with the disease organism is essential. Use of non-acidifying spreader-sticker or nonphytotoxic crop oil is recommended.

C. FUNGICIDAL SOAP# (M-Pede)	1.5-2%	12	0
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MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): A contact fungicide with smothering and barrier effects.  
 COMMENTS: Alternate use with a fungicide of a different mode of action; for certified organic production rotate to a fungicide approved by your certifier. Apply in 100 to 150 gal water/acre. Complete coverage of upper and lower leaf surfaces, as well as grape clusters, is essential for control. Apply every 7 to 10 days. Do not combine with sulfur or apply within 3 days of a sulfur application. Do not apply to Calmeria or Italia varieties of grapes. Do not apply past veraison.

D. LIQUID LIME SULFUR# (Brandt lime sulfur)	10 gal in 100 gal water	See label	See label
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MODE OF ACTION: Multi-site contact (M2)  
 COMMENTS: As a dormant application, reduces overwintering structures of powdery mildew as well as *Phomopsis* and *Botrytis*. Sprays should be directed to the cordons and fruiting wood to ensure drenching occurs.

## DEMETHYLATION INHIBITORS (DMIs)

A. TEBUCONAZOLE (Elite 45WP)	4 oz	12	14
MODE-OF-ACTION GROUP NAME (NUMBER <sup>1</sup> ): Demethylation inhibitor (3)			
COMMENTS: Do not apply more than 2 lb of product/acre per season.			
B. TRIFLUMIZOLE (Viticure)	4-8 fl oz	12	7
MODE-OF-ACTION GROUP NAME (NUMBER <sup>1</sup> ): Demethylation inhibitor (3)			
COMMENTS: Do not apply more than 32 fl oz of product/acre per season.			
C. MYCLOBUTANIL (Rally 40WSP)	4-5 oz more gal water/acre	24	14
MODE-OF-ACTION GROUP NAME (NUMBER <sup>1</sup> ): Demethylation inhibitor (3)			
COMMENTS: Do not apply more than 1.5 lb of product/acre per season.			
D. TETRACONAZOLE (Mettle 125ME)	3-5 fl oz	12	14
MODE-OF-ACTION GROUP NAME (NUMBER <sup>1</sup> ): Demethylation inhibitor (3)			
COMMENTS: Do not apply more than 10 fl oz of product/acre per season.			
E. FLUTRIAFOL (Rhyme)	4-5 fl oz	12	14
MODE-OF-ACTION GROUP NAME (NUMBER <sup>1</sup> ): Demethylation inhibitor (3)			
COMMENTS: The R.E.I. is 5 days for girdling or turning of grapes. The R.E.I. for all other activities is 12 hours.			

## STROBILURINS (QUINONE OUTSIDE INHIBITORS)

### A. AZOXYSTROBIN

(Abound)

10–15.5 fl oz

4

14

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Quinone outside inhibitor (11)

COMMENTS: Do not apply more than 92.3 fl oz of product/ acre per season.

### B. TRIFLOXYSTROBIN

(Flint)

1.5–2 oz

12

14

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Quinone outside inhibitor (11)

COMMENTS: Do not apply to Concord grapes or crop injury may result. Do not apply more than 24 oz of product/acre per season.

### C. KRESOXIM-METHYL

(Sovran)

3.2–4.8 oz

12

14

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Quinone outside inhibitor (11)

COMMENTS: Do not apply more than 1.6 lb of product/acre per season.

## QUINOLINES

### A. QUINOXYFEN

(Quintec)

3–6.6 fl oz

12

See label

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Quinoline (13)

COMMENTS: Do not apply more than 33 fl oz of product/acre per season.

# ALL-PURPOSE ACTIVE INGREDIENT FORMULATIONS

## A. FLUOPYRAM + TEBUCONAZOLE

(Luna Experience)

6-8.6 fl oz

12

14

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Succinate dehydrogenase inhibitor (7) + Demethylation inhibitor (3)

COMMENTS: For use on wine grapes only. The R.E.I. is 5 days for treated wine grapes when conducting cane tying, turning, or girdling. Do not apply more than 34 fl oz/acre per season.

## B. DIFENOCONAZOLE + CYPRODINIL

(Inspire Super)

14-20 fl oz

12

14

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Demethylation inhibitor (3) and Anilinopyrimidine (9)

COMMENTS: Do not apply more than 80 fl oz of product/acre per season.

## C. DIFENOCONAZOLE + AZOXYSTROBIN

(Quadris Top)

10-14 fl oz

12

14

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Demethylation inhibitor (3) and Quinone outside inhibitor (11)

COMMENTS: Do not apply more than 56 fl oz/acre per season.

## D. PYRACLOSTROBIN + BOSCALID

(Pristine)

8-12.5 fl oz

12

14

MODE-OF-ACTION GROUP NAME (NUMBER<sup>1</sup>): Quinone outside inhibitor (11) and Carboxamide (7)

COMMENTS: Do not use on Concord, Worden, Fredonia, Niagara, or related grape varieties. The R.E.I. is 5 days for treated grapes when conducting cane tying, turning, or girdling. Do not apply more than 69 oz/acre per season.

# BIOLOGICALS

## A. BACILLUS PUMILIS#

(Sonata)

2-4 qt

4

0

MODE OF ACTION: Microbial (44)

COMMENTS: Begin making applications before disease onset or when disease pressure is low. Repeat at 7- to 10-day intervals until disease pressure is intermediate, then switch to a strobilurin, sterol inhibitor, oil, or sulfur; for certified organic production rotate to a fungicide approved by your certifier. Apply in sufficient water to obtain thorough coverage.

## B. BACILLUS SUBTILIS#

(Serenade Max)

1-3 lb

4

0

MODE OF ACTION: Microbial (44)

COMMENTS: Begin making applications before disease onset or when disease pressure is low. Repeat at 7- to 10-day intervals until disease pressure is intermediate, then switch to a strobilurin, sterol inhibitor, oil, or sulfur; for certified organic production rotate to a fungicide approved by your certifier. Apply in sufficient water to obtain thorough coverage.

# Phomopsis

- Field surveys recently conducted in California and in other grape-growing regions in the United States showed *Phomopsis viticola* to be one of the most prevalent fungi isolated from grapevine perennial cankers in declining vines.
- A current study has confirmed the presence of *Phomopsis viticola* from grapevine cankers in California
- trials conducted were on mature cordons of *Vitis vinifera* 'Syrah' , as well on dormant canes,

# Phomopsis

- showed *Phomopsis viticola* isolates to be capable of causing perennial cankers.

discoloration caused by *Phomopsis viticola* were similar to those caused by *Eutypa* , which is also a well-known grapevine trunk disease .

A lack of spring growth was commonly observed in dormant canes inoculated with *Phomopsis viticola* spores .

As part of the study, 'Cabernet Sauvignon' and 'Zinfandel' wood was shown to be more susceptible to infection by *Phomopsis viticola* than 'Barbera', 'Chardonnay', &'Merlot', in the wood .

- After more than 40 years in California overlooking *Phomopsis viticola* as a grapevine wood pathogen, the study I Read provided strong evidence of the role of *Phomopsis viticola* as a canker-causing organism, and suggests its addition to the fungi involved in the grapevine trunk disease issues.
- Sealing all your cut ends after pruning and continuing a fungicide rotation through the year will help keep this issue at bay ...

- Symptoms and signs: Phomopsis symptoms are commonly seen first in the spring as
- elongated lesions near the base of shoots on the first 3 to 6 internodes. The lesions are
- dark brown to black, can be deep, give the base of the shoot a dark, crusty appearance, and
- may not be observed until the shoots are several feet long but Shoot lesions can also extend onto the cluster stems.

Severely affected shoots are subject to wind breakage and stunted growth.

- The most significant result of shoot infections is the establishment of the fungus within the woody portions of the vines

- years.
- Phomopsis also
- causes leaf lesions
- primarily on the lower
- leaves of the shoot, and
- appear as small yellow or
- light-green spots with
- dark centers (Fig. 2).
- Leaf lesions can drop out
- giving a “shot-hole” appearance. Severely affected leaves are distorted with a crinkle
- appearance, are smaller than normal, and may drop prematurely. Elongated lesions similar
- to those on young shoots may develop on petioles causing leaves to turn yellow and drop if
- severe.





# **Powdery mildew – organic way**

- Vine diseases don't care if you treat your vineyard in conventional, integrated or organic way. The only thing you can be sure about is that you will have them, no matter what. While conventional growers fight diseases with synthetic fungicides, organic growers have to search for more nature-friendly solutions.
- Powdery mildew is probably one of the most serious grapevine fungal disease worldwide. It is present in almost every vineyard and represents the biggest challenge for organic wine producers to fight with. To determine the timeframe in which the disease is most susceptible, the organic wine growers are using disease predictive models. Which actions can organic wine grower take in order to successfully manage powdery mildew?

# Powdery mildew – organic way

- **(Micro) climate**

- Humidity, air drainage, and wind exposure are influencing vineyard humidity and the drying rate of vine foliage. In general regions with hot, dry, sunny climate are less favorable for powdery mildew.

- **Row orientation & Canopy structure**

- The goal is to create an environment less favorable for powdery mildew and other diseases, which means a reduction of the humidity level as much as possible. We can achieve that by adjusting canopy structure, it should be opened and designed to maximize exposure of the foliage to sunlight and to maximize air movement. We can increase air movement in the rows if we face the end of the rows into the prevailing wind. If the canopy is properly managed, we can also reduce levels of shading and improve spray application efficiency and distribution throughout the canopy.

- **Flag shoot removal**

- Spores that overwintered on the grapevine is the primary source for powdery mildew. First infections come from flag shoots and removing them can significantly decrease the number of necessary spraying. This early season task minimizes early spore production and so reduces the impact of powdery mildew.



# Powdery mildew – organic way

## **Spraying**

- Sulphur is probably the most used sprays against Powdery mildew in organic wine growing. It does not kill the fungus itself. It is used to prevent the vines from being infected.
- Potassium bicarbonate disrupts the cell walls, causing the fungi hyphae and spores to collapse. Usually, it is applied with canola oil for powdery mildew control. PB does not protect the vine against new infections and requires more frequent application than sulfur.
- Other alternative fungicides such as various oils, dilute hydrogen peroxide, sodium salt and diluted milk can be as effective as sulfur, but they are often suggested for use under certain conditions such as low to moderate disease pressure.

## **Fighting Powderly mildew in an organic way is no longer a fairytale for naive »eco trend« buyers.**

It is real, and organic wine growers are practicing it. Good vineyard management software with the disease prediction system and regular monitoring of the vineyard are key factors winegrower needs to pay attention to in order to win the fight with Powdery mildew and other vine diseases, and to produce the wines of excellent quality.

# **PRICING FOR VITISEAL and FUNGICIDES**

- Vitiseal 1Gal Concentrate \$ 207.67 per gallon
- Vitiseal 1Gal RTU \$70.39 per gallon

# **PRODUCT – 1 acre price – what you need to buy**

*All pricing is subject to change after 30 days*

**Green is ORGANIC Product**

**Sytlet Oil \$60.90 per acre** 2.5 Gal \$ 76.13

**Saf-t-side –Tri Tek Oil \$34.53 per acre** 2.5 Gal \$43.16

**M-Pede \$85.12 per acre** 2.5 Gal \$106.39

**Kaligreen \$42.40 per acre** 5lbs \$52.99

**Lime Sulfur \$214.88 per acre** \$26.86 2.5 gal

<b>Rhyme</b>	<b>\$25.00 per acre</b>	\$249.23 per 50oz
<b>Rally 40</b>	<b>\$18.80 per acre</b>	\$75.18 per 1.25lbs
<b>Elevate</b>	<b>\$23.45 per acre</b>	\$93.80 per 2lbs
<b>Microthiol Sulfur</b>	<b>\$15.20 per acre</b>	\$45.59 30lbs
<b>Luna Experience</b>	<b>\$62.18 per acre</b>	\$231.40 1qt
<b>Flint</b>	<b>\$48.30 per acre</b>	\$441.35 1qt
<b>Quintec</b>	<b>\$18.80 per acre</b>	\$140.86 30oz
<b>Eagle 20 EW</b>	<b>\$21.00 per acre</b>	\$267.90 1 Gal
<b>Pristine</b>	<b>\$46.38 per acre</b>	\$445.29 120 oz (7.5lb)