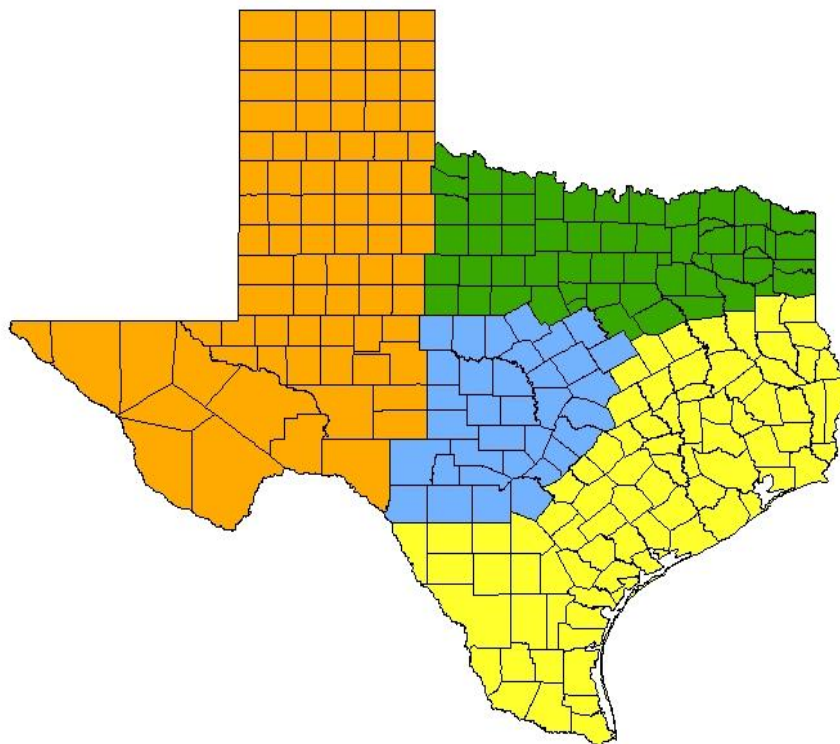


Texas Grape Spray Guide

2012



A Publication of the Texas AgriLife Viticulture Extension Team

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The Texas Grape Spray Guide 2012

The Texas Grape Spray Guide was designed to provide specific recommendations for the prevention and management of the most common grape diseases and pests of vineyards.

Features of this guide include:

- Recommendations of product brands and rates per acre to apply
- Suggested growth stages to apply specific products
- Spray options for low and high disease pressure conditions
- Additional guidelines and tables to assist with tracking product use and rotation
- A recommended spray guide is provided for each region of the state, for *Vitis vinifera* and hybrid varieties.
- A recommended spray program is included for non-bearing vines

Description of Spray Guide Features

Growth Stage

The spray guide is broken into specific phenological stages or “*Growth Stages*” that represent the best time for providing protective fungicide or insecticide products. Each vineyard spray application is designated to a specific growth stage, beginning with vine dormancy and ending with post harvest spray recommendations. In the early part of the growing season shoot length is used as an indication of when to spray. Other critical times for applying protective fungicide and insecticide products are listed by specific growth stages such as “*Immediately after fruit set*” or “*Immediately before bunch closure*.” Vineyards containing several grape varieties may experience variability in growth stage across blocks at a given time and blocks should be sprayed accordingly. If varieties are relatively close in growth stage it is possible to spray multiple blocks at the same time. Please contact your regional AgriLife Viticulture Advisor if you have any questions regarding spray timing.

Target Problems

Some pests and diseases can be more problematic during different growth stages. The “*Target Problems*” column lists the major diseases and pests of concern in virtually all seasons in Texas. Products are recommended to prevent the major diseases and pests, although the product efficacy may not be limited to only those target problems listed. A more complete list of product options and efficacy on target problems can be found in the supplemental fungicide and insecticide spray tables in this guide.

Products

Specific products are recommended in this guide based on widespread availability, common use, and observed efficacy in Texas. Other products labeled for grapes may be substituted for those herein

recommended; consult the fungicide and insecticide spray tables for expanded listings of available products.

In some cases there are several products recommended for application as one combined tank mixture. Several tank mixture options may also be listed under certain growth stages to provide options for vineyard operations of all scale. Additionally, there are recommendations for products to use during “*Low Disease Pressure*” and “*Moderate to High Disease Pressure*.” In general, dry and windy conditions with low humidity are considered to be low disease pressure conditions, and wet and humid conditions are considered to be moderate to high for disease pressure. The comments in the guide will provide some additional information to determine disease pressure.

Disclaimer

This publication contains pesticide recommendations. Read the label before applying any pesticide and follow all directions for use including, but not limited to, use of personal protective equipment, re-entry intervals, pre-harvest intervals, application rates, and maximum rate allowed per season. The Texas A&M University System and its employees assume no responsibility for the effectiveness or results of any chemical pesticide usage. No endorsements of products are implied.

Rate/Acre (Rate per Acre)

Product rates are available on the label of each fungicide and insecticide recommended in this guide. The rates provided in this guide are those which have historically been effective in Texas vineyards for each product brand specified. Rates may vary depending on the seasonal conditions. For example, the rate per acre of a product may be greater during moderate to high disease pressure conditions than during low disease pressure conditions.

Comments

The “Comments” column contains specific tips and recommendations to help the grower to improve efficacy or timing of spray products. Comments in this column may also provide information regarding potential toxicity of products if used improperly or during specific weather conditions, or short spray intervals. The comments are intended to be brief and specific to the products recommended in the guide. For any additional information please refer to the product label and consult with your regional AgriLife Viticulture Advisor.

Recommended Grape Spray Program

Texas Hill Country & North Texas

***Vitis vinifera* Grapes**

Recommended Grape Spray Program for the Hill Country & North Texas Regions (Vinifera Grapes)

Growth Stage	Target Problems	Products	Rate/Acre	Comments
		See Fungicide & Insecticide Efficacy Tables for Alternatives		
Dormant: Within 24 hours after final pruning	Grapevine canker diseases that infect pruning wounds (e.g. Bot Canker)	Rally 40WSP	6oz in 50 gpa* water or 5oz in 42 gpa water or 4oz in 33 gpa water *gpa = gal. per acre	To prevent new fungal trunk infections spray within 24 hours of final pruning and again 2 weeks later if wet conditions persist. Thoroughly cover cordons, spurs and all cut surfaces. As a dormant spray, Rally must be applied using either power operated ground application equipment or a backpack sprayer.
Shoot length: 0.5- 2"	Phomopsis	Dithane F45 (mancozeb)	2qt	Dithane (mancozeb) is a protectant fungicide. Immediate reapplication may be needed if rainfall exceeds 1 inch after applying. Apply with a minimum of 50 gallons of water per acre. Do not apply more than 19.2 quarts Dithane per acre per season.
Shoot length: 5-10"	Black rot Downy mildew Phomopsis Powdery mildew	Low Disease Pressure Dithane F45 + Sulfur	(2qt) + (3-6#)	If rainfall occurred since the last fungicide application or is forecast within 7 days after this application, or if high humidity and morning dew are persistent, use one of the product options under " Moderate to High Disease Pressure. " Phosphorous acid fungicides (Rampart, Prophyt) should not be applied in concentrations greater than 0.6% active ingredient or on intervals shorter than 7 days to avoid leaf burn. Do not make more than 3 Rally, Revus Top or Quintec applications per season (in addition to dormant Rally application). To avoid leaf burn, Sulfur should not be applied if temperatures are greater than 85F or if they will be within one week following application. Do not combine Sulfur with oil sprays.
		Moderate to High Disease Pressure Revus Top or Dithane F45 + Sulfur + Rampart	7oz (3.2qt) + (3-6#) + (2.15pt/50 gal water)	
		or Dithane F45 + Rally 40WSP + Rampart	(3.2qt) + (5oz) + (2.15pt/50 gal water)	
		or Dithane F45 + Quintec + Rampart	(3.2qt) + (6.6oz) + (2.15pt/50 gal water)	

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Hill Country and North Texas Grape Spray Program (Vinifera Grapes) continued

Shoot length: 15-30" *If bloom is less than 5 days away skip to "Pre-bloom" spray*	Black rot Downy mildew Phomopsis Powdery mildew	Low Disease Pressure See shoot length 5-10" Moderate to High Disease Pressure See shoot length 5-10"		If an EBI fungicide (Rally, Revus Top) was used for previous spray, switch to other mode of action for powdery mildew control to tank mix with Dithane . Rotate products with different mode of action groups for mildew each spray. See fungicide table on page 18.
Pre-bloom Immediately before flower cap fall	Black rot Downy mildew Phomopsis Powdery mildew	Low Disease Pressure Dithane F45 + Sulfur Moderate to High Disease Pressure Dithane F45 + Rally 40WSP or Revus Top	(2qt) + (3-6#) (3.2qt) + (5oz) 7oz	If rainfall occurred since the last fungicide application or is forecast within 7 days after this application, or if high humidity and morning dew are persistent, use one of the product options under " Moderate to High Disease Pressure ."
Immediately after fruit set	Black rot Downy mildew Phomopsis Powdery mildew Grape berry moth	Low Disease Pressure Dithane F45 + Vivando Moderate to High Disease Pressure Revus Top Pristine Use one fungicide option above + one insecticide below Intrepid 2F or Sevin XLR Plus	(2qt) + (10.3oz) 7oz 12.5oz 12oz 2qt	Dithane should not be used within 66 days of harvest. Refer to the pre-harvest interval (PHI) for all products used for the remainder of the growing season. Do not make more than 2 Pristine or 3 Vivando applications per season. Use Intrepid unless pest other than Grape Berry Moth are also in need of control. Do not make more than 2 Intrepid applications per season. For other common insect pests see page 20.
Pierce's disease insecticide treatment	Pierce's disease vectoring insects (sharpshooters, etc.)	Admire Pro (imidacloprid)* *Various imidacloprid products are available, see labels for rates and maximum use per season.	14 oz or (7oz) + (7oz, 30-days later)	Imidacloprid treatment for Pierce's disease begins approximately from fruit set to 5-6mm berry size. The full annual rate can be applied through the chemigation system at once (14oz) or in a split application of the first half (7oz) followed by the second half (7oz) 30 days later to coincide with peak insect vector populations. Consult with your regional viticulture advisor to determine start date. For insecticide options in addition to imidacloprid , see table on page 20.

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Hill Country and North Texas Grape Spray Program (Vinifera Grapes) continued

"Pea size" berries (5-6mm)	Black rot Bunch rots Downy mildew Powdery mildew	Low Disease Pressure No spray or Captec 4L + Vivando Moderate to High Disease Pressure Captec 4L + Vivando + Rampart	 (2qt) + (10.3oz) (2qt) + (15.4oz) + (2.15pt/50 gal water)	Do not combine Captec or Captan with oil sprays.
Immediately before bunch closure	Black rot Bunch rots Downy mildew Powdery mildew Grape berry moth	Low Disease Pressure Captec 4L + Quintec Moderate to High Disease Pressure Pristine or Captec 4L + Quintec + Rampart Use one fungicide option above + one insecticide below Intrepid 2F or Delegate WG or Sevin XLR Plus	 (2qt) + (4oz) 12.5oz (2qt) + (6.6oz) + (2.15pt/50 gal water) 12oz 6oz 2qt	If Intrepid was used for Grape Berry Moth during spray immediately after fruit set, rotate with either Delegate or Sevin for this insecticide spray. If pest other than grape berry moth are also in need of control, see table on page 20 for other common insect pests of grapes in Texas.
After bunch closure	Black rot Bunch rots Downy mildew Powdery mildew	Low Disease Pressure No spray or Captec 4L + Vivando Moderate to High Disease Pressure Rally 40WSP + Rampart or Captec 4L + Vivando	 (2qt) + (10.3oz) (5oz) + (2.15pt/50 gal water) (2qt) + (15.4oz)	

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Hill Country and North Texas Grape Spray Program (Vinifera Grapes) continued

Veraison (50% color change)	Bunch rots Downy mildew Powdery mildew	Low Disease Pressure No spray or Quintec + Rampart	(4oz) + (2.15pt/50 gal water)	Do not make more than 2 Pristine , 3 Quintec or 3 Revus Top applications per season.
		Moderate to High Disease Pressure Pristine or Captec 4L + Quintec or Revus Top	12.5oz (2qt) + (6.6oz) 7oz	
30 days pre-harvest to harvest	Bunch rots Downy mildew Powdery mildew	Low Disease Pressure Vivando	10.3oz	Check pre-harvest interval (PHI) for all products. Follow all labeled restrictions. Captec/Captan residue on grapes may cause problems with sluggish or stuck fermentation in the winery. Use of Captec within 30 days of harvest should be communicated with the winemaker.
		Moderate to High Disease Pressure Captec 4L + Vivando or Vivando + Rampart or Pristine	(2qt) + (10.3oz) (15.4oz) + (2.15pt/50 gal water) 12.5oz	
Post-harvest	Downy mildew Powdery mildew	Dithane F45 + Sulfur	(2qt) + (3-6#)	To avoid leaf burn, Sulfur should not be applied if temperatures are greater than 85F or if they will be within one week following application.

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Recommended Grape Spray Program

High Plains & West Texas

***Vitis vinifera* Grapes**

Recommended Grape Spray Program for the High Plains & West Texas Region (Vinifera Grapes)

Growth Stage	Target Problems	Products	Rate/Acre	Comments
		See Fungicide & Insecticide Efficacy Tables for Alternatives		
Dormant: Within 24 hours after final pruning	Grapevine canker diseases that infect pruning wounds (e.g. Bot Canker)	Rally 40WSP	6oz in 50 gpa* water or 5oz in 42 gpa water or 4oz in 33 gpa water *gpa = gal. per acre	To prevent new fungal trunk infections spray within 24 hours of final pruning and again 2 weeks later if wet conditions persist. Thoroughly cover cordons, spurs and all cut surfaces. As a dormant spray, Rally must be applied using either power operated ground application equipment or a backpack sprayer.
Shoot length: 0.5- 2"	Phomopsis Powdery Mildew	Dithane F45 + Sulfur	(2qt) + (3-6#)	Dithane (mancozeb) is a protectant fungicide. Immediate reapplication may be needed if rainfall exceeds 1 inch after applying. Apply with a minimum of 50 gallons of water per acre. Do not apply more than 19.2 quarts Dithane per acre per season.
Shoot length: 5-10"	Black rot Phomopsis Powdery mildew	Low Disease Pressure Dithane F45 + Sulfur	(2qt) + (3-6#)	If rainfall occurred since the last fungicide application or is forecast within 7 days after this application, or if high humidity and morning dew are persistent, use one of the product options under “ Moderate to High Disease Pressure. ” To avoid leaf burn, Sulfur should not be applied if temperatures are greater than 85F or if they will be within one week following application. Do not combine sulfur with oils .
		Moderate to High Disease Pressure Revus Top or Dithane F45 + Rally 40WSP	7oz (3.2qt) + (5oz)	
		or Dithane F45 + Quintec	(3.2qt) + (6.6oz)	
Shoot length: 10-20" *If bloom is less than 5 days away skip to "Pre-bloom" spray*	Black rot Phomopsis Powdery mildew	Low Disease Pressure See shoot length 5-10" Moderate to High Disease Pressure See shoot length 5-10"		If an EBI fungicide (Rally , Revus Top) was used for previous spray, switch to other mode of action for powdery mildew control to tank mix with Dithane . Rotate products with different mode of action groups for mildew each spray. See fungicide table on page 18.

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High Plains West Texas Grape Spray Program (Vinifera Grapes) continued

Treatment of piercing/sucking insects (Pre- bloom)	Leafhoppers & Pierce's disease vectoring insects (sharpshooters, etc.)	Admire Pro (imidacloprid)	14 oz or (7oz) + (7oz, 30-days later)	Imidacloprid treatment for Pierce's disease begins approximately from fruit set to 5-6mm berry size. The full annual rate can be applied through the chemigation system at once (14oz) or in a split application of the first half (7oz) followed by the second half (7oz) 30 days later to coincide with peak insect vector populations. Consult with your regional viticulture advisor to determine start date. For insecticide options in addition to imidacloprid, see table on page 20.
Pre-bloom Immediately before flower cap fall	Black rot Phomopsis Powdery mildew	Low Disease Pressure Dithane F45 + Sulfur Moderate to High Disease Pressure Dithane F45 + Rally 40WSP or Revus Top	(2qt) + (3-6#) (2qt) + (5oz) 7oz	If rainfall occurred since the last fungicide application or is forecast within 7 days after this application, or if high humidity and morning dew are persistent, use one of the product options under " Moderate to High Disease Pressure. "
Fruit set to "pea size" berries	Black rot Powdery mildew	Low Disease Pressure Dithane F45 + Vivando Moderate to High Disease Pressure Revus Top or Pristine	(2qt) + (10.3oz) 7oz 12.5oz	Dithane should not be used within 66 days of harvest. Refer to the pre-harvest interval (PHI) for all products used for the remainder of the growing season. Do not make more than 2 Pristine or 3 Vivando applications per season.
Immediately before bunch closure	Black rot Bunch rots Powdery mildew	Low Disease Pressure Captec 4L + Quintec Moderate to High Disease Pressure Pristine or Switch 62.5WG + Quintec or Switch 62.5WG + Revus Top	(2qt) + (4oz) 12.5oz (14oz) + (6.6oz) (14oz) + (7oz)	Do not combine Captec or Captan with oils. Switch is an option for varieties that are susceptible to botrytis bunch rot and sour rot.
After bunch closure	Black rot Bunch rots Powdery mildew	Low Disease Pressure No spray or Vivando Moderate to High Disease Pressure Captec 4L + Vivando	 10.3oz (2qt) + (15.4oz)	

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High Plains West Texas Grape Spray Program (Vinifera Grapes) continued

Veraison (50% color change)	Bunch rots Powdery mildew	Low Disease Pressure No spray or Quintec	4oz	
		Moderate to High Disease Pressure Pristine or Captec + Quintec	12.5oz (2qt) + (6.6oz)	
30 days pre-harvest to harvest	Bunch rots Powdery mildew	Low Disease Pressure Vivando	10.3oz	<p>Check pre-harvest interval (PHI) for all products. Follow all labeled restrictions.</p> <p>Captec/Captan residue on grapes may cause problems with sluggish or stuck fermentation in the winery. Use of Captec within 30 days of harvest should be communicated with the winemaker.</p> <p>Do not make more than 2 Pristine or 3 Vivando applications per season.</p>
		Moderate to High Disease Pressure Captec 4L + Vivando or Pristine	(2qt) + (10.3oz) 12.5oz	
Post-harvest	Powdery mildew	Sulfur	3-6#	To avoid leaf burn, Sulfur should not be applied if temperatures are greater than 85F or if they will be within one week following application.

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Recommended Grape Spray Program

Texas Hybrid Bunch Grapes

Blanc Du Bois & Lenoir

Recommended Grape Spray Program for Hybrid Grapes (e.g. Blanc Du Bois, Lenoir)

Growth Stage	Target Problems	Products	Rate/Acre	Comments
		See Fungicide & Insecticide Efficacy Tables for Alternatives		
Dormant: Within 24 hours after final pruning	Grapevine canker diseases that infect pruning wounds (e.g. Bot Canker)	Rally 40WSP	6oz in 50 gpa* water or 5oz in 42 gpa water or 4oz in 33 gpa water *gpa = gal. per acre	To prevent new fungal trunk infections spray within 24 hours of final pruning and again 2 weeks later if wet conditions persist. Thoroughly cover cordons, spurs and all cut surfaces. As a dormant spray, Rally must be applied using either power operated ground application equipment or a backpack sprayer.
Dormant: 1-2 weeks before bud swell	Anthrachnose	Lime Sulfur (calcium polysulfide 18%)	5 gal in 50 gpa water	Apply Lime Sulfur to cordons after final pruning and before bud swell.
Shoot length: 0.5- 2"	Phomopsis	Dithane F45 (mancozeb)	2qt	Dithane (mancozeb) is a protectant fungicide. Immediate reapplication may be needed if rainfall exceeds 1 inch after applying. Apply with a minimum of 50 gallons of water per acre. Do not apply more than 19.2 quarts Dithane per acre per season.
Shoot length: 5-10"	Black rot Downy mildew Phomopsis	Low Disease Pressure Dithane F45	(2qt)	If rainfall occurred since the last fungicide application or is forecast within 7 days after this application, or if high humidity and morning dew are persistent, use one of the product options under “ Moderate to High Disease Pressure. ” Phosphorous acid fungicides (Rampart , Prophyt) should not be applied in concentrations greater than 0.6% active ingredient or on intervals shorter than 7 days to avoid leaf burn.
		Moderate to High Disease Pressure Dithane F45 + Rampart	(3.2qt) + (2.15pt/50 gal water)	
Shoot length: 15-30" *If bloom is less than 5 days away skip to "Pre-bloom" spray*	Black rot Downy mildew Phomopsis	Low Disease Pressure See shoot length 5-10"		
		Moderate to High Disease Pressure See shoot length 5-10"		

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Pre-bloom Immediately before flower cap fall	Black rot Downy mildew Phomopsis	Low Disease Pressure Dithane F45	2qt	If rainfall occurred since the last fungicide application or is forecast within 7 days after this application, or if high humidity and morning dew are persistent, use one of the product options under " Moderate to High Disease Pressure. "
		Moderate to High Disease Pressure Dithane F45 + Rally 40WSP or Revus Top	(3.2qt) + (5oz) 7oz	
Immediately after fruit set	Black rot Downy mildew Phomopsis	Low Disease Pressure Dithane F45	2qt	Dithane should not be used within 66 days of harvest. Refer to the pre-harvest interval (PHI) for all products used for the remainder of the growing season. Rotate QoI fungicides (Pristine) with downy mildew products with different modes of action to manage resistance. See fungicide table on page 18. Do not make more than 2 Pristine or 3 Revus Top applications per season. Use Intrepid unless pest other than Grape Berry Moth are also in need of control. Do not make more than 2 Intrepid applications per season. For other common insect pests see table on page 20.
		Moderate to High Disease Pressure Revus Top or Pristine	7oz 12.5oz	
		Use one fungicide option above + one insecticide below Intrepid 2F or Sevin XLR Plus	12oz 2qt	
	Grape berry moth			
"Pea size" berries (5-6mm)	Black rot Bunch rots Downy mildew	Low Disease Pressure No spray or Captec 4L	2qt	Do not combine Captec or Captan with oil sprays.
		Moderate to High Disease Pressure Captec 4L + Rampart	(2qt) + (2.15pt/50 gal water)	

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Hybrid Grape Spray Program (e.g. Blanc Du Bois, Lenoir) continued

Immediately before bunch closure	Black rot Bunch rots Downy mildew	Low Disease Pressure Captec 4L	2qt	If Intrepid was used for Grape Berry Moth during spray immediately after fruit set, rotate with either Delegate or Sevin for this insecticide spray. If pest other than grape berry moth are also in need of control, see table on page 20 for other common insect pests of grapes in Texas.
		Moderate to High Disease Pressure Pristine or Captec 4L + Rampart	12.5oz (2qt) + (2.15pt/50 gal water)	
	Grape berry moth	Use one fungicide option above + one insecticide below Intrepid 2F or Delegate WG or Sevin XLR Plus	12oz 6oz 2qt	
After bunch closure	Black rot Bunch rots Downy mildew	Low Disease Pressure No spray or Captec 4L	 2qt	
		Moderate to High Disease Pressure Revus Top or Captec 4L + Rampart	7oz (2qt) + (2.15pt/50 gal water)	
Veraison (50% color change)	Bunch rots Downy mildew Powdery mildew	Low Disease Pressure No spray or Pristine	 10.5oz	Do not make more than 2 Pristine or 3 Revus Top applications per season.
		Moderate to High Disease Pressure Pristine or Captec 4L + Rampart	12.5oz (2qt) + (2.15pt/50 gal water)	
30 days pre-harvest to harvest	Bunch rots Downy mildew	Low Disease Pressure No spray or Captec 4L + Rampart	 (2qt) + (2.15pt/50 gal water)	Check pre-harvest interval (PHI) for all products. Follow all labeled restrictions. Captec/Captan residue on grapes may cause problems with sluggish or stuck fermentation in the winery. Use of Captec within 30 days of harvest should be communicated with the winemaker.
		Rampart	2.15pt/50 gal water	
Post-harvest	Downy mildew	Dithane F45	2qt	

Recommended Grape Spray Program

Non-Bearing Vines

Recommended Grape Spray Program for Non-Bearing Vines

Growth Stage	Target Problems	Products	Rate/Acre	Comments
		See Fungicide & Insecticide Efficacy Tables for Alternatives		
Shoot length: 1- 2"	Black rot Downy mildew Phomopsis Powdery mildew	Dithane F45 (mancozeb) + Sulfur	(2qt) + (3-6#)	Dithane (mancozeb) is a protectant fungicide. Immediate reapplication may be needed if rainfall exceeds 1 inch after applying. To avoid leaf burn, Sulfur should not be applied if temperatures are greater than 85F or if they will be within one week following application. Sulfur is not needed for hybrid grapes such as Blanc Du Bois or Lenoir, or other hybrids that are resistant to powdery mildew. Contact your AgriLife Viticulture Advisor for more information about hybrid grapes and disease resistance.
Shoot length: 5-10"	Black rot Downy mildew Phomopsis Powdery mildew	Low Disease Pressure Dithane F45 + Sulfur	(2qt) + (3-6#)	If rainfall occurred since the last fungicide application or is forecast within 7 days after this application, or if high humidity and morning dew are presistent, use one of the product options under “ Moderate to High Disease Pressure. ”
		Moderate to High Disease Pressure Dithane F45 + Rally 40WSP or Revus Top	(3.2qt) + (5oz)	
			7oz	
Shoot length: 15-30" Repeat as needed until leaf drop.	Black rot Downy mildew Phomopsis Powdery mildew	Low Disease Pressure See shoot length 5-10"		If sterol inhibitor fungicide (Rally, Revus Top) was used for previous spray, switch to other mode of action for powdery mildew control to tank mix with Dithane . See fungicide table (pg. 18).
		Moderate to High Disease Pressure See shoot length 5-10"		
Pierce's disease insecticide treatment* *Does not apply to Pierce's disease tolerant varieties such as Blanc Du Bois or Lenoir	Pierce's disease vectoring insects (sharpshooters, etc.)	Admire Pro (imidacloprid)* *Various imidacloprid products are available, see labels for rates and maximum use per season.	(7oz) + (7oz, 30-days later)	Imidacloprid treatment for Pierce's disease begins approximately from 12 to 15 inch shoot length. Use of the full or half rate per season will depend upon growth rate of young vines. The full annual rate should be applied through the chemigation system in a split application of the first half (7oz) followed by the second half (7oz) 30 days later to coincide with peak insect vector populations. Consult with your regional viticulture advisor to determine the best start date. For insecticide options in addition to imidacloprid , see table on page 20.

FUNGICIDE	TRADE NAME(S)	PHOMOPSIS CANE/LEAF SPOT	BLACK ROT	DOWNY MILDEW	POWDERY MILDEW	BOTRYTIS BUNCH ROT	LEAF BLIGHT	MODE OF ACTION GROUP (FRAC)	PHI	REI
EBI COMPOUNDS - Systemic, limited protection, good reachback activity										
Difenoconazole+(Mandipropamid)	Revus Top	+	+++	+++	+++	0	a	3 (40)	14 Days	12 Hr.
Fenarimol	Rubigan	0	++	0	+++	0		3	30 Days	12 Hr.
Myclobutanil	Rally, (Nova)	0	++++	0	+++	0	+++?f	3	14 Days	24 Hr.
Tebuconazole	Elite	0	++++	0	+++	0		3	14 Days	12 Hr.
Triflumizole	Procure	0	++?	0	+++	0		3	7 Days	24 Hr.
Qol COMPOUNDS - Systemic, also called Strobilurins or "Strobies"										
Azoxystrobin	Abound	++	++++	++++	++++a	+	+++?f	11	14 Days	4 Hr.
Kresoxim-methyl	Sovran	++	++++	++	++++a	++	?	11	14 Days	12 Hr.
Pyraclostrobin+(Boscalid)	Pristine	++	++++	++++	++++a	++/++++b	+++?f	11 (7)	14 Days	12 Hr.
Trifloxystrobin	Flint	++	++++	+	++++a	++/++++b	?	11	14 Days	12 Hr.
OTHER PRODUCTS										
Boscalid	Endura	0	0	0	++++	++/++++b		7	14 Days	12 Hr.
Captan	Captan, Captec	++++	+	+++	0	+		M4	1 Day	72 Hr.
Cyprodinil	Vangard	0	0	0	0	++++		9	7 Days	12 Hr.
Cyprodinil+(fludioxonil)	Switch	0	0	0	0	++++		9 (12)	7 Days	12 Hr.
Dihydrogen Potassium Phosphate	Nutrol	0	0	0	++	0		Not Classified	?	?
Fenhexamid	Elevate	0	0	0	++	++++		17	0 Days	4 Hr.
Ferbam	Ferbam	+++	+++	++	0	0		M3	7 Days	24 Hr.
Fixed Copper & Lime	Several	+	+	+++	++	0		M1	See label	See label
Iprodione	Rovral	0	0	0	0	+++d		2	7 Days	12 Hr.
Mancozeb	Dithane, Manzate, Penncozeb,Mankocide	++++	+++	+++	0	0		M3	66 Days	24 Hr.
Mefenoxam	Ridomil	0	0	++++	0	0		4	66/42 Days	48 Hr.
Metrafenone	Vivando	0	0	0	+++	0		Unknown	14 Days	12 Hr.
Phosphorous Acid	ProPhyte, Aliette, Rampart	0	0	+++	0	0		Not Classified	P(0) A(15)	4 Hr.
Potassium Bicarbonate	Kaligreen, Armicarb100	0	0	0	++	0		N/A	1 Day	4 Hr.
Pyrimethanil	Scala	0	0	0	0	++++		9	7 Days	24 Hr.
Quinoxifen	Quintec	0	0	0	++++	0		13	14 Days	12 Hr.
Spray Oil	JMS Stylet, PureSpray	0	0	0	+++	0		Not Classified	0 Days	4 Hr.
Sulfur	Several	+	0	0	+++c	0		M2	0 Days	24 Hr.
Thiophanate-methyl	Topsin-M	++	+	0	e	e		1	14 Days	7 Days
Ziram	Ziram	+++	+++	++	0	0		M3	21 Days	48 Hr.

- a. NOTE:** Powdery mildew resistance to the strobilurin fungicides, specifically Abound, has occurred in multiple vineyards in Texas, sometimes resulting in significant crop loss. When such resistance occurs, none of the strobilurin fungicides should be counted on to provide significant powdery mildew control and should be tank-mixed with a fungicide of a differing mode of action group to avoid crop loss.
- b.** Fair control at the lower rate labeled for powdery mildew, good to excellent control at the higher rate labeled for *Botrytis*.
- c.** Sulfur activity is strongly influenced by rate and frequency of application, and by weather. It is highly effective when applied at relatively high rates and short (7-day) spray intervals, but efficacy can decline as intervals increase and/or rates decrease, especially in rainy weather.
- d.** *Botrytis* resistance to Rovral has been widely documented throughout various grape growing regions of the U.S., *B. cinerea* is thought to be a minor player in the bunch rot complex that is problematic near harvest. Fungicides that are effective at specifically controlling Botrytis are ineffective at controlling bacteria and other fungi involved in bunch rot complex.
- e.** Topsin-M is a benzimidazole fungicide very similar to Benlate. It is only registered for control of bitter rot, black rot, and powdery mildew, however it is not recommended for powdery mildew control due to widespread resistance to benzimidazole fungicides.
- f.** Fungicide efficacy for the management of Leaf Blight (*Pseudocercospora vitis*, syn. *Isariopsis clavispora*) is not well understood. When used for other labeled grape pathogens, these products may also provide some level of protection against Leaf Blight.

KEY

Excellent	++++
Good	+++
Moderate	++
Slight	+
Not Effective	0
Pre-Harvest Interval	PHI
Re-Entry Interval	REI

Disclaimer:

This publication contains pesticide recommendations. Changes in pesticide regulations occur constantly and human error are possible. Questions concerning the legality and/or regulation status for pesticide use should be directed to the appropriate Extension Agent/Specialist or state regulatory agency. Read the label before applying any pesticide. The label is law. The Texas A&M University System and its employees assume no responsibility for the effectiveness or results of any chemical pesticide usage. No endorsements of products are made nor implied.

This table was compiled by P. Adams & J. Kamas, Texas AgriLife Extension Service, and is based on the work of W. Wilcox, Cornell University, New York State Agricultural Experiment Station in Geneva, NY.

Common Insect Pests of Grapes in Texas & Common Insecticides

Insect Pest	Admire	Assail	Clutch	Couraze	Delegate	Intrepid	Malathion	Movento	Mustang Max ^a	Platinum	Provado	Sevin	Venom
Grape Berry Moth													
Grape Flea Beetle (Steely Beetle)													
Grape Leafroller													
Green June Beetle													
Leafhoppers/Sharpshooters													
Mealybugs													
IRAC code (mode of action group) ^b	4A	4A	4A	4A	5	18A	1B	23	3	4A	4A	1A	4A

^aRestricted use pesticide

^bTo prevent insect resistance to one chemical mode of action, avoid successive applications of insecticides with the same IRAC code.

Shaded blocks indicate that a product is labeled for control of the corresponding insect pest.

If the pest you observe in your vineyard is not listed above, contact your AgriLife Viticulture Advisor for more information

Airblast Sprayer Calibration Worksheet

Sprayer calibration should be done at least once per season, but preferably every time there is a significant difference in the desired spray volume (gal/acre). For example, early-season applications cover a small canopy and therefore require a lower spray volume for thorough coverage compared to later applications to a full canopy. This worksheet is intended to take you stepwise through the calibration process.

Materials Needed:

- Water-sensitive paper
- 100 ft tape measure
- Stopwatch
- Chemical resistant gloves
- Labels or tape, pen or pencil
- 5-gallon bucket
- Calculator
- Wrenches
- Spray nozzle catalogue

1. Check spray pressure and spray pattern.

Fill the tank with water. Engage the fan, turn on the manifold, and make a test run in your vineyard at your preferred operating speed. Before you start, observe the spray pattern and turn off nozzles that do not spray the plant canopy. Record the pressure gauge reading while spraying.

Spray pressure = _____ psi

2. Check spray coverage

Effectiveness of fungicides and some insecticides is highly dependent upon good spray coverage to the grapevine canopy. Spray coverage is influenced by total spray volume applied per acre and airspeed produced by the fan. Total spray volume is determined by sprayer output per minute and tractor speed. The pesticide label will provide a range of spray volumes that are suitable for the product. Be aware that spray volume requirements will increase during the season, corresponding to the size of the canopy as shoots grow.

To test whether your sprayer is currently providing good coverage, place water-sensitive cards within several vines that have a typical-sized canopy that is representative of the vineyard. Be sure to place some cards in the fruit zone to evaluate coverage on the clusters. Cards should accurately represent cluster exposure, so do not remove leaves in front of water-sensitive cards or selectively place cards only in exposed cluster locations. Fill the sprayer with water and conduct a test run past the vines with water-sensitive cards using your established tractor speed, fan speed, and nozzle setup. Evaluate spray coverage and adjust target application rate if coverage is either inadequate or excessive.

Target application rate (A) _____ gal/acre

3. Determine tractor speed.

Establish a preferred operating speed in a pre-set gear. Note gear and throttle settings. Fill the spray tank half full with water for a speed test. Insert numbers into the equation below and calculate the result.

A. Measure the length of a vineyard row selected for the test run. (B) ____ ft.

B. Determine the time required to travel the row at the preferred speed. (C) ____ sec.

*Multiply the distance traveled in test run (B) by 60 sec/min
Divide the result by the time (C) required to travel the test distance*

(B) ____ ft. X 60 sec./min.

____ = (D) ____ ft/min tractor speed
(C) ____ sec.

4. Determine required total nozzle output in gal/min (gpm).

Fill in the following known quantities, insert into the equation below, and calculate the result.

(D) ____ ft/min. Preferred tractor speed, measured above.

(A) ____ gal/acre Target application rate per acre for thorough spray coverage
determined above in step 2.

(E) ____ ft Distance between rows.

Calculate total required nozzle output in gpm:

*Multiply the tractor speed (D) times target application rate (A) times distance between rows (E)
Divide the result by the number of square feet per acre*

(D) ____ ft/min X (A) ____ gal/acre X (E) ____ ft

____ = (F) ____ gal/min
43,560 sq ft/acre total required nozzle output

5. Can the nozzles in your sprayer deliver the required output?

Determine the expected output of each nozzle from the manufacturer's catalog at your selected spray pressure (recorded above). Enter output in the spaces below. Enter a zero for nozzles turned off for the upcoming application.

Fill in nozzle output for only Left side for sprayers with one-sided delivery.

Fill in nozzle output for Left and Right side for sprayers with two-sided delivery.

Left side

Nozzle # 1 _____ gal/min

Nozzle # 2 _____ gal/min

Nozzle # 3 _____ gal/min

Nozzle # 4 _____ gal/min

Nozzle # 5 _____ gal/min

Nozzle # 6 _____ gal/min

Nozzle # 7 _____ gal/min

Left total _____ gal/min

Right side

Nozzle # 1 _____ gal/min

Nozzle # 2 _____ gal/min

Nozzle # 3 _____ gal/min

Nozzle # 4 _____ gal/min

Nozzle # 5 _____ gal/min

Nozzle # 6 _____ gal/min

Nozzle # 7 _____ gal/min

Right total _____ gal/min = **(G)** _____ gal/min

Total expected output

Compare the total expected output with the total required output.

(F) _____ gal/min total required output

(G) _____ gal/min total expected output

If the difference between expected and required output exceeds 10 percent, replace with appropriate nozzle combinations that will provide the required output at your operating pressure. Keep in mind that all nozzles do not need to have equal output. You may want to have higher output nozzles pointing at the fruit zone of the vines. Remember that total expected output still must equal total required output, so use lower output nozzles elsewhere on the manifold. Repeat this procedure for nozzles on the other side of the two-sided sprayer.

6. What is the spray volume output of your sprayer?

Use one of the two methods below to determine the volume delivered by your sprayer.

Method I. Sprayer Field Run

With appropriate nozzles installed, fill the spray tank with water. Park the sprayer on level ground and mark the water level on the spray tank's sight gauge. Using your preferred tractor speed with the airblast fan engaged and both sides spraying, make a trial application run down your vineyard test row. Return to the same place and position where you marked the sprayer water level. Using a calibrated 5-gallon container, measure the amount of water required to refill the tank to your mark on the sight gauge. Record as test gallons applied.

Fill in the following known quantities, insert into the equation below, and calculate the result.

(B) ____ ft Length of vineyard test row, recorded above

(E) ____ ft Distance between rows, recorded above

(H) ____ gal Test gallons applied

Multiply the number of gallons applied (H) times the number of square feet per acre

Divide the result by the length of test row (B) times the distance between rows (E)

$$\frac{(H) \text{ ____ gal} \times 43,560 \text{ sq ft/acre}}{(B) \text{ ____ ft} \times (E) \text{ ____ ft}} = (I) \text{ ____ gal/acre actual spray volume}$$

Method II. Stationary Sprayer Run

Partially fill the spray tank with water. Mark a line at the water level on the tank. Add exactly 5 gallons of water to the tank. Run the sprayer at your normal operating throttle and record the time required to deliver exactly 5 gallons, which is indicated by the spray tank water level returning to the marked line.

Divide the number of seconds per minute by the time required (seconds) to spray 5 gal

Multiply the result by 5 gal

$$\frac{60 \text{ sec/min}}{\text{____ sec}} \times 5 \text{ gal} = \text{____ gal/min output}$$

Multiply the gal/min output calculated above times the number of square feet per acre

Divide the result by tractor speed (D) times the distance between rows (E)

$$\frac{\text{____ gal/min} \times 43,560 \text{ sq ft/acre}}{(D) \text{ ____ ft/min} \times (E) \text{ ____ ft}} = (I) \text{ ____ gal/acre actual spray volume}$$

7. Determine area covered by one full spray tank

Sprayer tank capacity (J) _____ gal		
Area covered by full spray tank	= $\frac{(J) \text{ _____ (gal)}}{(I) \text{ _____ (gal/acre)}}$	= (K) _____ acres

8. Prepare the spray mixture.

Pesticide rate from label (L) _____ (lb, oz, or pint per acre)		
Area covered by full spray tank (K) _____ acres	Pesticide rate from label (L) _____ (pints, oz per acre)	Quantity of Pesticide = _____ (pints, oz, etc.)

EXAMPLE 1. Many Acres To Treat

Area	14.0	acres
Sprayer output	55.0	gal/acre
Spray tank capacity	400	gallons
Pesticide rate	3	pints /acre

7.3 acres X 3 pints per acre = 21.9 pints of pesticide with water to make 400 gal

14 acres ÷ 7.3 acres (full tank coverage) = 1.9 full tanks needed to cover 14 acres

EXAMPLE 2. Small Acreage To Treat or Partial Tank

Area	1.3	acres
Sprayer output	55.0	gal/acre
Spray tank capacity	400	gallons
Pesticide rate	3	pints/acre

1.3 acres X 3 pints/acre = 3.9 pints pesticide in spray mixture

1.3 acres X 55 gal/acre = 71.5 gal spray mixture (pesticide plus water)

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The Midwest Small Fruit and Grape Spray Guide, 2012. Editors: Bruce Bordelon (Purdue University), Mike Ellis, & Celeste Welty (Ohio State University)
http://www.ag.purdue.edu/hla/Hort/Pages/sfg_sprayguide.aspx

Workbook for an Effective Fungicide Spray Program for Wine Grapes in Virginia, 2012. Dr. Mizuho Nita, Virginia Tech University.
<http://www.virginiavineyardsassociation.com/wp-content/uploads/2012/VA-Wine-Grape-Fungicide-Workbook-2012A.pdf>

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