Overview of insects & fungal diseases in the vineyard

Grape Camp 2011

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Texas Gulf Coast Region

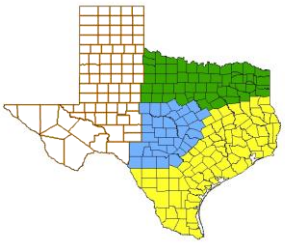
Part 1

Major Insect Pests

Grape Berry Moth

Grape Berry Moth

- **Geographical Distribution**
  - East Texas, Gulf Coast, Hill Country



- **Timing of Control**
  - Begin first insecticide within 7 to 10 days of first male moths captured in pheromone traps. Rotate another product in 2 weeks.

- **Common Insecticides**
  - Intrepid
  - Sevin
  - Delegate

Grape Cane Borer

Grape Cane Borer

- **Geographical Distribution**
  - East Texas, Hill Country, West Texas

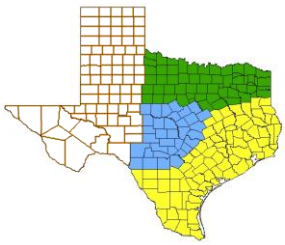
- **Timing of Control**
  - Prune out dead wood during winter pruning.
  - Apply insecticides in spring when cane borer is active (difficult to time).

- **Common Insecticides**
  - Sevin

- **Cultural Practices**
  - Sanitation, remove and destroy dead wood.

Green June Beetle

Green June Beetle



- **Geographical Distribution**
  - East Texas, Hill Country, Gulf Coast
- **Timing of Control**
  - Spray at first sight. Beetles infest vineyard close to harvest.

Post-veraison

Harvest

- **Common Insecticides** (check pre-harvest intervals)
  - Provado
  - Sevin

LEAFHOPPERS

LEAFHOPPERS

- **Geographical Distribution**
  - Hill Country, West Texas

- **Timing of Control**
  - Begin first insecticide when population threshold reaches about 5 nymphs per leaf on about 50% of leaves. Soil applied insecticides may need earlier application.

- **Common Insecticides**
  - Neonicotinoids
    - Soil: Admire, Platinum
    - Foliar: Assail, Provado
  - Sevin

- **Cultural Practices**
  - Control weeds
  - Keep shoots off of vineyard floor

Minor Insect Pests

- Mealybugs

- Grape Flea Beetle

- Mites

- Weevils

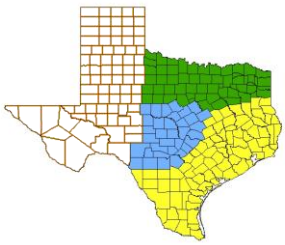
Part 2

Major Fungal Diseases

ANTHRACNOSE

ANTHRACNOSE

- **Geographical Distribution**
  - East Texas, Hill Country, Gulf Coast



- **Timing of Control**

2 – 3 weeks
before budbreak

Bloom

- **Common Fungicides**
  - Lime Sulfur (dormant application)
  - Rally
  - Pristine

Black Rot

Black Rot

- **Geographical Distribution**
  - Statewide

- **Timing of Control**

First leaves unfolded

Veraison

- **Common Fungicides**
  - Dithane
  - Rally
  - Pristine
  - Revus Top

Trunk Diseases

Trunk Diseases

- **Geographical Distribution**
  - Statewide

- **Timing of Control**

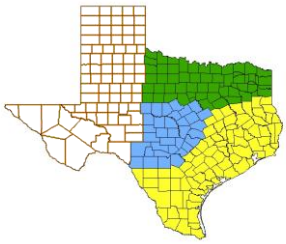
Within 24 hours of pruning cuts

Season long control of phomopsis and other diseases is essential

- **Common Fungicides**
  - Rally
- **Cultural Practices**
  - Sanitation, remove and destroy dead wood.

Cotton Root Rot

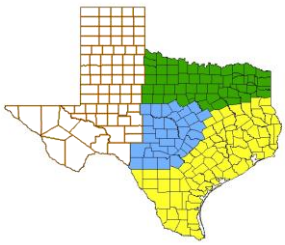
Cotton Root Rot



- **Geographical Distribution**
  - East Texas, Hill Country, Gulf Coast
- **Control methods not well established**
- **Most common in clay soil with pH of 7.0 or greater**
- **Some rootstocks appear more tolerant**
- **Common Fungicides**
  - More testing needed

Downy Mildew

Downy Mildew



- **Geographical Distribution**
  - East Texas, Hill Country, Gulf Coast

- **Timing of Control**

First leaves unfolded

Leaf drop

- **Common Fungicides**
  - Dithane
  - Pristine
  - Captan
  - Revus Top
  - Phosphorous Acid

PHOMOPSIS

Early Season

Late Season

PHOMOPSIS

- **Geographical Distribution**
  - Statewide
- **Timing of Control**

First leaves unfolded

Veraison

- **Common Fungicides**
  - Dithane
  - Pristine

Powdery Mildew

Powdery Mildew

- **Geographical Distribution**
  - Statewide

- **Timing of Control**

First leaves unfolded

Leaf drop

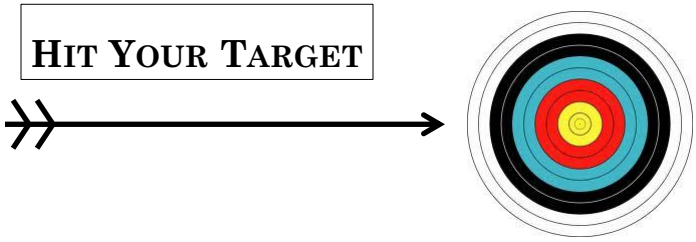
- **Common Fungicides**
  - Sulfur
  - Rally
  - Pristine
  - Revus Top
  - Quintec
  - Vivando

Part 3

Tips for Improving Spray Efficacy

Tips for Improving Spray Efficacy

Hit Your Target



- **Calibrate pesticide sprayer frequently**
  - Evaluate coverage with spray cards
  - Re-calibrate & increase water rate per acre as season progresses
  - Spray in best weather conditions possible

http://winegrapes.tamu.edu/grow/airblast.pdf

Spraying in the Wind

7 to 10 mph wind

THANK YOU.

QUESTIONS?

TIPS FOR IMPROVING SPRAY EFFICACY

PREVENT RESISTANCE DEVELOPMENT

- **Use full labeled rate of product**
  - Some exceptions
    1. Intrepid is effective at 10-12 ounce per acre rate
    2. Pristine is effective at 10.5-12 ounce per acre rate
       - 18.5 to 23 ounce rate is specific for Botrytis
- **Rotate products with different modes of action**
  - **Sterol Inhibitors**
    - Rally
    - Revus Top

  Rotate with

  - **Strobilurins**
    - Pristine
    - Abound

TIPS FOR IMPROVING SPRAY EFFICACY

SPRAY PROACTIVELY *NOT* REACTIVELY

- **Spray to prevent disease (spray before the rain)**
- **Tighten intervals during prolonged wet periods and use systemic materials**
- **Adjust spray program according to rainfall**
  - **According to research at Michigan State:**
    - **1 inch of rain can remove 50% of protectant fungicide**
    - **2 inches of rain can remove most of a protectant fungicide**
    - **Systemic fungicides are most resistant to wash off**

Tips for Improving Spray Efficacy

Practice Good Canopy Management

- **Canopy management practices that increase airflow and reduce leaf layers have proven to improve spray coverage and light interception of leaves and fruit, both of which can reduce disease incidence.**
  - Shoot positioning and leaf pulling on rot susceptible varieties
  - Train vines to maximize spray coverage of leaves and fruit
  - Maximize leaf area receiving full sunlight
    - According to research at Cornell University:
      - Direct sunlight exposure significantly reduced powdery mildew severity on clusters and foliage compared to shaded leaves and fruit.

Additional Tips for Improving Spray Efficacy

- **Use proper rate of water per acre for canopy size**
- **Monitor and scout vineyard frequently**
  - Products for eradication differ from those for prevention
- **Adjust pH of spray water as needed**
  - neutral (pH 7) to slightly acidic (pH 6.0 to 6.5) is best
- **Use of surfactants may help (see label)**
  - Or buy products pre-packaged with surfactant (Dithane 45F Rainshield)
- **Spray during best possible weather conditions**
- **Spray every row every time you spray (not every other row)**

Airblast Sprayer Calibration Worksheet

Ed Hellman

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.

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

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

43,560 sq ft/acre = (**F)** ____ **gal/min 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		**Right side**
Nozzle # 1 _____ gal/min		Nozzle # 1 _____ gal/min
Nozzle # 2 _____ gal/min		Nozzle # 2 _____ gal/min
Nozzle # 3 _____ gal/min		Nozzle # 3 _____ gal/min
Nozzle # 4 _____ gal/min		Nozzle # 4 _____ gal/min
Nozzle # 5 _____ gal/min		Nozzle # 5 _____ gal/min
Nozzle # 6 _____ gal/min		Nozzle # 6 _____ gal/min
Nozzle # 7 _____ gal/min		Nozzle # 7 _____ gal/min
Left total _____ 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)

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

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

$$\frac{\text{60 sec/min}}{\text{\_\_\_\_ sec}} \text{ X 5 gal} = \text{\_\_\_\_\_ gal/min output}$$

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)

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

7. Determine area covered by one full spray tank

Sprayer tank capacity (J) _____ gal

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

8. Prepare the spray mixture.

Pesticide rate from label **(L)** _____ **(lb, oz, or pint per acre)**

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

AgriLIFE EXTENSION
Texas A&M System

2010
GRAPE FUNGICIDE EFFICACY

FUNGICIDE	TRADE NAME(S)	PHOMOPSIS CANE/LEAF SPOT	BLACK ROT	DOWNY MILDEW	POWDERY MILDEW	BOTRYTIS BUNCH ROT	LEAF BLIGHT	FORMULATION	PHI	REI
EBI COMPOUNDS										
Fenarimol	Rubigan	0	++	0	+++	0		1E	30 Days	12 Hr.
Myclobutanil	Rally, (Nova)	0	++++	0	+++	0	+++?f	40W,40WSP	14 Days	24 Hr.
Tebuconazole	Elite	0	++++	0	+++	0		45WP	14 Days	12 Hr.
Triflumizole	Procure	0	++?	0	+++	0		50WS	7 Days	24 Hr.
QoI COMPOUNDS										
Azoxystrobin	Abound	++	++++	++++	++++a	+	+++?f	2SC	14 Days	4 Hr.
Kresoxim-methyl	Sovran	++	++++	++	++++a	++	?	50WG	14 Days	12 Hr.
Trifloxystrobin	Flint	++	++++	+	++++a	++/++++b	?	50WG	14 Days	12 Hr.
Boscalid + Pyraclostrobin	Pristine	++	++++	++++	++++a	++/++++b	+++?f	38WG	14 Days	24 Hr.
OTHER										
Boscalid	Endura	0	0	0	++++	++/++++b		70WG	14 Days	12 Hr.
Captan	Captan, Captec	++++	+	+++	0	+		50/80/WP,4L	1 Day	72 Hr.
Cyprodinil	Vangard	0	0	0	0	++++		70WG	7 Days	12 Hr.
Dihydrogen Potassium Phosphate	Nutrol	0	0	0	++	0		N/A	?	?
Fenhexamid	Elevate	0	0	0	++	++++		50WDG	0	4 Hr.
Ferbam	Ferbam	+++	+++	++	0	0		76WP	7 Days	24 Hr.
Fixed Copper & Lime	Several	+	+	+++	++	0		Several	SeeLabel	SeeLabel
Iprodione	Rovral	0	0	0	0	+++d		50WP, 4F	7 Days	12 Hr.
Mancozeb	Dithane, Manzate, Penncozeb	++++	+++	+++	0	0		M45,F45,DF	66 Days	24 Hr.
Mefanoxam	Ridomil	0	0	++++	0	0		68/65/WP	66/42 Days	48 Hr.
Phosphorous Acid	ProPhyt, Aliette	0	0	+++	0	0		4.32/4.3L	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	++++		5SC	7 Days	24 Hr.
Quinoxyfen	Quintec	0	0	0	++++	0		2.08F	14 Days	12 Hr.
Spray Oil	JMS Stylet, PureSpray	0	0	0	+++	0		97/98%L	0 Days	4 Hr.
Sulfur	Several	+	0	0	+++c	0		Several	0 Days	24 Hr.
Thiophanate-methyl	Topsin-M	++	+	0	e	e		70 WP	14 Days	7 Days
Ziram	Ziram	+++	+++	++	0	0		76DF, Granuflo	21 Days	48 Hours

AgriLIFE EXTENSION
Texas A&M System

2010
GRAPE FUNGICIDE EFFICACY

a. **NOTE**: Powdery mildew resistance to the stobilurin fungicides, specifically Abound, has occurred in multiple vineyards in Texas, sometimes resulting in significant crop loss. When such resistance occurs, none of the stobilurin fungicides should be counted on to provide significant powdery mildew control and should be tank-mixed with an unrelated effective fungicide 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

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. 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.

***This table is based on the work of Dr. Wayne Wilcox, grape fungal pathologist at the New York State Agricultural Experiment Station in Geneva, NY.**

KEY

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

This Grape Fungicide Efficacy Chart was created by Penny S. Adams, Viticulture Advisor-Texas Hill Country
in cooperation with Jim Kamas, Assistant Professor and Extension Fruit Specialist - Texas AgriLife Extension and Texas Pierce's Disease Program Outreach Coordinator and Dr. Mark Black, Plant Pathologist - Texas AgriLife Extension, Uvalde.