Pest e-alerts

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Preparation for the 2009 Grape Growing Season

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Grape Fungicide Information

Now is the time to start planning grape fungicide programs. Waiting until there is a problem is the wrong strategy when managing plant diseases. Having some knowledge of the common disease that occur in the vineyard and when they occur is important. Vineyard managers should keep good records as these will be invaluable for future decision-making, such as fungicide purchases and timing of preventative applications of fungicide. Remember that the most critical time to control many diseases (including black rot) of grape is during the pre-bloom to bloom period. Once the fruit are infected by a pathogen it is too late to manage the disease for that cropping season. Related to this, I hear many folks talk about fungicides being classified as systemic and having "curative" effects while contact fungicide are protectant only. This is partially true, however, understanding fungicide mobility and how various fungicides are classified based on mobility is important when making decisions pertaining to fungicide application timing and making the proper choice of compound for the problem of concern.

Fungicides can be classified into two basic mobility groups: contact or penetrant. No matter what type of mobility, no fungicide will be effective after the development of visible disease symptoms and spores are produced. Fungicides can slow or stop the formation of new symptoms if applied in a timely fashion, but they will not 'heal' existing disease symptoms. Therefore, understanding fungicide mobility, fungicide mode of action, and the biology of the

target pathogen are important so that timely fungicide applications can be performed before the disease is established.

Contact fungicides are applied to the surface of a plant and will remain where they are applied. There is no movement of the fungicide into, or across the plant surface. These fungicides are prone to being washed off the plant and must be re-applied to parts of the plant that grow after the fungicide application. Contact fungicide typically prevent fungal propagules (e.g. spore) germination, therefore they must be applied prior to infection and have no effect once the infection takes place.

Penetrant fungicides are absorbed into the plant tissue. Because these fungicides are absorbed into plant tissue to some degree, then all penetrant fungicides are considered systemic fungicides. Penetrant fungicides have different degrees of systemic capability. Some fungicides are only locally systemic, and after initial contact with the plant material, move very little into the plant tissue. Second, tranlaminar fungicides are absorbed into the leaf and move through the leaf to the opposite surface. Tranlaminar fungicides are not transported throughout the plant. Other fungicides can be xylem-mobile in which they will be absorbed into the plant and moved upward from the point of entry via the plant's xylem. Finally, true systemic fungicides move throughout the plant through the xylem and phloem elements (very few fungicides have this capability). Regardless of the type of systemic fungicide, these compounds have limited "curative" capability. They can only stop or slow infections within the first 48-72 hours of fungal exposure. Therefore, penetrant (systemic) fungicides must be applied shortly after infection and are ineffective once the fungus begins producing spores.

Vineyard managers should also consider fungicide resistance when developing a fungicide program. Resistance is a genetic adjustment by a fungus that results in reduced sensitivity to a fungicide. Reduced sensitivity is thought to be a result of genetic mutations which occur at low frequencies (one in a million or less) or of naturally occurring sub-populations of resistant individuals. The resistance trait may result from single gene or multiple gene mutations. Single-gene mutations that confer resistance to site-specific fungicides are more likely to develop than the simultaneous occurrence of mutations in multiple genes needed to confer resistance to multi-site inhibiting fungicides.

Fungicides are grouped by similarities in chemical structure and mode of action. Site-specific fungicides disrupt single metabolic processes or structural sites of the target fungus. Multi-site fungicides interfere with many metabolic processes of the fungus. There are two codes currently used to classify fungicides by mode of action (see table below). The mode of action group (A, B, etc.) refers to the general target site in the pathogen. Sub-groups (A1, A2, etc.) within a mode of action group refer to specific biochemical target sites of fungicide activity. The FRAC (Fungicide Resistance Action Committee) code is used on fungicide label registrations. The FRAC code refers to fungicides that have same site-specific mode of action and share the same resistance problems across members of the group (cross-resistance). FRAC groups are currently numbered from 1 to 43 in order of their introduction to the marketplace. The table at the end of this newsletter was modified from the recent revision of fact sheet EPP-7663

"Fungicide Resistance Management." In the table, are presented many of the common fungicides used on grapes in the United States, and their properties. When developing a fungicide program, the vineyard manager should use fungicide rotation and incorporate as many different fungicide modes of action in the program as possible. Remember to use the proper spray volumes and only use fungicide rates as indicated on the fungicide label.

New Grapevine Disease Testing Services

The Plant Disease and Insect Diagnostic Laboratory (PDIDL) now offers special grapevine disease testing services. A new leaflet, L-328 "Grapevine Disease Testing Services" has been developed by Jen Olson and is available from the Oklahoma State University Cooperative Extension Service. The leaflet describes various grapevine diseases, symptoms of each disease with color photographs, and includes a seasonal timeline for testing vines for each disease. Tests range from complete screens for all diseases, to 'ala carte' testing for only one or a few diseases. A price list is included in the leaflet. Testing for grapevine diseases is extremely expensive. We must charge in order to recover our costs for testing grapevines. However, we have tried to keep the costs as minimal as possible. Also included in the leaflet is a form that should be filled out, detached, and included with each sample.


Grapevine Disease Testing Services

Offered by the
Plant Disease and Insect Diagnostic Laboratory (PDIDL)
Oklahoma State University

Viticulture & Enology
Research and Extension

L-328

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Damon Smith, Extension Specialist

Each season, the PDIDL receives inquiries regarding testing services for grapevine pathogens. Beginning in 2009, the PDIDL will offer special laboratory tests for a series of grape pathogens. In this leaflet, growers will find information about diseases of grapevine and sampling and submission guidelines.

Dr. Richard Grantham
Director, Plant Disease and Insect Diagnostic Laboratory

Some fungicides registered for use on grapes in the United States grouped by mode of action and relative risk for developing resistance problems.

Mode of action	Group [1]	Group name	Common name	Trade names for Grapes	Mobility [2]	Risk [3]	Target Disease [4]
Nucleic acid synthesis	A1 (4)	Phenylamide	mefenoxam	Ridomil Gold Copper	S	H	Downy Mildew
Mitosis and cell division	B1 (1)	Benzimidazole	thiophanate-methyl	Topsin M	S	H	Botrytis bunch rot
Respiration	C2 (7)	Carboxamide	boscalid	Endura, Pristine[5] (+ pyraclostrobin)	S	M	Black rot, Phomopsis cane and leaf spot, Powdery mildew, Downy mildew
	C3 (11)	Strobilurin (Quinone outside Inhibitor (QoI))	azoxystrobin	Abound	S	H	Black rot, Phomopsis cane and leaf spot, Powdery mildew, Downy mildew
			kresoxim-methyl	Sovran	S	H	Black rot, Phomopsis cane and leaf spot, Powdery mildew, Downy mildew
			pyraclostrobin	Pristine (+ boscalid)	S	H	Black rot, Phomopsis cane and leaf spot, Powdery mildew, Downy mildew
			trifloxystrobin	Flint[5]	S	H	Black rot, Phomopsis cane and leaf spot, Powdery mildew, Downy mildew
Amino acids and proteins	D1 (9)	Anilino-Pyrimidine	cyprodinil	Vanguard	S	M	Botrytis bunch rot
			pyrimethanil	Scala	S	M	Botrytis bunch rot
Signaling	E1 (13)	Quinoline	quinoxyfen	Quintec	C	M	Powdery mildew
Lipids and membranes	F1 (2)	Dicarboximide	iprodione	Rovral, Iprodione	C	M-H	Botrytis bunch rot
Sterol synthesis	G1 (3)	Demethylation Inhibitor (DMI)	fenarimol	Vintage	S	M	Powdery mildew
			myclobutanil	Nova, Rally, Eagle	S	M	Black rot, Phomopsis cane and leaf spot, Powdery mildew, Downy mildew
			tebuconazole	Elite	S	M	Black rot, Phomopsis cane and leaf spot, Powdery mildew, Downy mildew
			fenhexamid	Elevate	C	L-M	Botrytis bunch rot, Powdery mildew
			cymoxanil	Tanos (+ famoxadone)	S	M	Downy mildew

Mode of action	Group [1]	Group name	Common name	Trade names for Grapes	Mobility [2]	Risk [3]	Target Disease [4]
Cell wall synthesis	H4 (19)	Polyoxins	phosphorous acid	Fungi-Phite	S	L	Downy mildew, Powdery mildew
Unknown	U1 (27)	Cyanoacetamideoxime	copper salts	Kocide, Cuprofix	C	L	Black rot, Downy mildew, Phomopsis cane and leaf spot, Powdery mildew
	U2 (33)	Phosphonate	Sulfur [6]	Sulfur, Kumulus	C	L	Powdery mildew, Phomopsis can and leaf spot
			mancozeb	Dithane	C	L	Black rot, Downy mildew, Phomopsis cane and leaf spot
Multi-site activity			ziram	Ziram	C	L	Black rot, Downy mildew, Phomopsis cane and leaf spot
			captan	Captan	C	L	Black rot, Downy mildew, Phomopsis cane and leaf spot

[1] Subgroups represent specific target sites within a mode of action, cross-resistance may occur within subgroups, Fungicide Resistance Action Committee (FRAC) group is in parenthesis. FRAC code is based on time of product registration and potential for cross-resistance within subgroups.

[2] C=Contact, S=systemic or penetrant.

[3] L=Low, M=Medium, H=High. The resistance risk is assigned based on the worst case-scenario. For example, dicarboximide resistance is serious for some Botrytis diseases, but resistance problems have not developed with other uses.

[4] Be sure to read the label for each fungicide you use. Be sure the target disease is listed, as diseases are added and removed from labels frequently. Not all fungicides can be applied throughout the season, be sure you are applying them at the correct time according to the label.

[5] Do not apply Flint or Pristine to American-type grapes (ex. Concord) as injury may occur.

[6] Some American-type grape varieties are sensitive to sulfur. Avoid applying sulfur when temperatures exceed 85°F as damage to the plant may occur. Sulfur looses efficacy for powdery mildew control when temperatures are below 65°F.