

Grape Disease Control Update

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Time for the annual review of new developments and various options on the disease-control front. As always, I'd like to acknowledge the outstanding team of grape pathologists here in Geneva, including faculty colleagues (D. Madoury, R. Seem), research technicians (Duane Riegel, Judy Barr), and graduate students and postdocs becoming too numerous to mention, all of whose research efforts are the bases for most of the following.

Fungicide Changes And News

1. **Benlate cancellation.** As many now know, Benlate is history. Worldwide manufacture halted in 2001, sale and distribution of product remaining in the "pipeline" will be allowed through the end of 2002. All registrations have been cancelled, although it still is legal to use whatever product is on hand, according to label directions. EPA "expects" that use of such product will end in 2003, and is seeking comment on its proposal to revoke residue tolerances thereby making any residue in fruit or wine illegal after a reasonable length of time. So, use what you have, but don't stockpile. Benlate is a minor fungicide in N.Y. grape producers, used primarily to protect major pruning wounds against *Eutypa*. An application to register a closely-related benzimidazole fungicide (Topsin-M) for use on grapes is currently being considered by the EPA.

2. **Phyt, Alette, and phosphorous acid.** ProPhyt (potassium phosphite) is a formulation of phosphorous acid (PA) that is now labeled by the EPA to control downy mildew on grapes (N.Y. registration is still pending, but may be forthcoming by summer). It does not control any other major grape disease. Various formulations of PA have been used for approximately 15 years to control downy mildew in Australia, and I repeatedly have gotten excellent results with several different formulations (including ProPhyt) in my own trials, even under very high pressure.

PA provides good post-infection control of downy mildew, but because it is highly mobile in the plant, the Aussies contend that it has only a few days' worth of residual (protective) activity before it gets shipped down into the roots. Thus, they tend to spray it after infection period has occurred, tanking with a traditional protectant such as mancozeb or copper) to provide forward protection against the next one. In my own trials, I've applied at 14-day intervals without any sort of tank mix and obtained virtually complete control every year, even in very wet seasons such as 2000, where nearly 70 percent of the berries on unsprayed vines became diseased. However, I haven't scrutinized these trials to determine just when the various infection periods occurred with respect to the timing of applications.

PA is so popular in Australia because it is quite cheap there (just a few dollars per acre). Since ProPhyt is not yet sold in N.Y., I don't know what the price will be locally (probably more than in Australia!). If they are priced right, this and other PA formulations that may come along could certainly find a place in eastern vineyards, particularly if an otherwise-desirable disease management program is weak on downy mildew control. They're worth getting some experience with, provided they make economic sense. (A note on rates: The ProPhyt label that I've seen specifies a concentration of 0.3 percent, but this assumes a sufficient water volume for complete coverage. Thus, we've used 1.2 pints per acre prebloom (assuming a spray volume of 50 gal/A for complete coverage) and 2.4 pints per acre postbloom (assuming 100 gal/A spray volume+).

Alette is a product that has been around for many years, but just received registration on grapes last summer. It breaks down into PA once it rains have entered the plant, so basically does the same thing as PA products but at a much higher cost (about \$30-50 per acre at the recommended rate for grapes). Patent issues protected Alette against cheaper PA products in the past, but the patent has now expired.

Nationally, there are additional products containing PA that are being sold as nutritional supplements or plant conditioners, without claims of their disease control activities. Of course they're effective nevertheless, as such product that we worked with last year is Prudent Plus, a mixture of a monopotassium phosphate (which

is labeled for powdery mildew control as Nutrol), and various organic compounds that are claimed to improve plant growth and health. In our trials last year, treated vines were virtually free of downy mildew and powdery mildew control was fair to good (better than Nutrol, worse than conventional fungicides).

3. **Messenger.** Messenger is a unique and interesting product now registered for control of grape diseases. It is a nontoxic protein that stimulates natural defense responses in some plants, thereby providing variable levels of resistance to disease-causing organisms. The only problem is, there is no convincing evidence that this occurs in grapevines. On the contrary, such an "induced resistance" response is notoriously difficult to elicit in grapes, although many people (including a graduate student in my own program) have tried to do so using various techniques and products. Furthermore, I have obtained poor disease control in previous grape trials where Messenger has been used without additional fungicides, however, these were conducted a few years ago and it's possible that the formulation has improved by now. Results from several grower demonstrations that I helped evaluate last year in cooperation with a juice grape processor could best be described as "inconclusive." Although my experience with the product is limited, it is not consistent with some claims in recent advertising. Those interested in the product may wish to evaluate it for themselves on a limited, trial basis.

4. **Serenade.** Serenade is a product whose active ingredient is a soil bacterium (*Bacillus subtilis*), which is registered for biological control of powdery mildew and Botrytis. In two trials last year (light disease pressure) we got good control of powdery mildew when Serenade was rotated with Sovran on both the hybrid variety Rosette and on Concord. In a Botrytis trial in 2000 (moderate pressure), four applications of Serenade alone (no other fungicide) provided zero control of that disease. We're continuing to evaluate it this season. Limited experience causes me to still view it as an experimental product; on a commercial crop, I'd be more comfortable experimenting to control powdery mildew rather than botrytis. A formulation being sold in N.Y. is certified for organic production.

5. **Other "alternative" products** for powdery mildew. As discussed last year, a number of non-traditional products have been registered recently to control powdery mildew on grapes. They work, to variable extents, but it helps to understand why. Powdery mildew (PM) is an unusual disease, since the fungus that causes it lives almost entirely on the surface of infected leaves and berries (the powdery stuff you see when control breaks down). Thus, it is "naked" and subject to (temporary) eradication following topical treatment with a range of products that don't affect other disease-causing fungi, which do their dirty work down inside the plant tissues where they're protected from such treatments. Some such products are listed below.

• **Nutrol** (monopotassium phosphate) We've been working with this dual purpose material (foliar

nutrient plus powdery mildew fungicide) every year since 1996, with moderate results. In greenhouse tests, we've found that Nutrol provides no significant control when applied before plants are inoculated with powdery mildew spores. In contrast, it provided significant control when applied within 3-7 days after exposure to the spores, i.e., when applied directly to the developing PM colonies.

This scenario suggests that Nutrol should be more effective when applied relatively frequently (repeated knock-downs), rather than relying on residual protectant activity between sprays. Indeed, we've gotten significantly better control in two seasons of field trials when applying 4 lb/A every 7 days rather than 8 lb/A every 14 days. I strongly suspect that this same general principle (one-shot knock-down against young colonies, with little subsequent protective activity) will apply to most of the "alternative" PM control products. Thus, they may need to be applied more frequently than many traditional products.

• **Kaligreen, Armicarb 100** (potassium bicarbonate). We haven't worked with Kaligreen, but Armicarb 100 has performed similarly to Nutrol in field trials. Photos in the trade press showing dead PM fungus on treated plants also is consistent with the activity we've seen from Nutrol (topical, eradication effects with no evidence of residual protectant activity).

• **Oxidate** (hydrogen peroxide). Registered for control of powdery mildew and Botrytis. We haven't worked with it. I believe the claims for PM control, but doubt those for Botrytis (see above). Will probably require frequent applications.

Finally, remember that the activity of these topical materials is entirely dependent upon their contact with the PM fungus. Don't waste your time and money if you can't provide thorough coverage.

6. **Strobilurin fungicides.** These materials (Abound, Sovran, Flint) have been discussed at length for the last two years. Thus, just a few updates and reminders:

• The "strobies" are retained primarily in the waxy cuticle of treated leaves and berries. Thus, they are excellent protectant fungicides when applied before an infection period begins but have only limited postinfection activity against most diseases (can't get down into the deeper tissues where the fungus gets established). Although they

appear to have additional postinfection activity against powdery mildew (which lives mostly on the surface, remember), over-reliance upon such activity increases the risk that the fungus will become resistant to these materials.

• **Resistance development** is a very real and serious threat. Although nobody understands why, it appears that the risk and speed of this happening may be significantly different for different disease-causing fungi. For instance, several specific diseases on grasses and grains, cucumbers, and melons can no longer be controlled with strobies in some production regions, after only a few years of use. In contrast, similar problems have not yet surfaced with respect to control of powdery mildew on grapes, despite considerable worldwide use, although there have been some overseas reports of problems with downy mildew. These products still work for us, but there's no guarantee that will continue indefinitely. Because of their current importance to producers throughout the Northeast, they should be used conscientiously in order to reduce the probability of resistance developing, so that they will continue to be effective.

• The only sure-fire way of reducing the risk of resistance is by reducing the number of sprays applied. Use the strobies when they're really needed, but don't overdo it. The seasonal limit for wine grapes is four applications, but two or three is better. Juice grape growers may make up to three applications per season, but they should be sure to rotate with other fungicides to control the two mildews and black rot, even if they're only applying two or three such sprays in total. And trying to "put out a fire" with these materials if disease gets out of hand is just asking for trouble. This is a simple numbers game: the more fungal individuals that are present, the greater the chance of selecting a resistant one when you spray.

• In addition to the numbers game cited above, recent research suggests that resistance is more likely to develop when strobies are applied to a growing fungus (i.e., postinfection) rather than in a protectant mode which prevents spore germination and infection to begin with. Other than avoiding deliberate postinfection

applications, this means that excessive spray intervals (greater than 14 days) also should be avoided. For powdery mildew, in particular, almost every day in the late spring and summer is a potential infection period (rain not necessary, temperatures very favorable). Thus, whenever a new (unsprayed) leaf emerges after a given fungicide application, the next spray will be "reaching back" to provide postinfection control of whatever mildew may have started after that leaf emerged. Thus, the longer the spray interval, the more infections that may have occurred and the longer the necessary reach back activity will be.

• Finally, consider these factors but keep them in perspective. The sky isn't falling. These materials do work. But be responsible and keep it that way.

7. **Mancozeb and mites.** This has been talked about quite a bit the last few years. Trials supervised by Jan Nyrop and Greg English-Loeb in the Entomology Department have consistently shown that fungicide programs that include regular mancozeb sprays will reduce the level of predatory mites (those that eat the spider mites), by an average of about 50 percent relative to programs where mancozeb was substituted instead. In a few cases, this encouraged the buildup of spider mites, but not in the majority of trials. In an experiment last year, there was no effect on predators when mancozeb was limited to two sprays prior to bloom.

These effects are real. As with so many things, the risk (incompletely defined) and benefits (broad spectrum and economical disease control, 24 hr REI) need to be balanced. How to, specifically, is a personal decision. My feeling is that mancozeb still has a place, but that it should not be used indiscriminately. We're still working on trying to supply you more specific details than that.

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