Project type: Research and Development

Title: Grapevine downy mildew control: exploring alternatives to metalaxyl

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Abstract

Downy mildew is a debilitating disease of grapevines. In years of excessive rainfall, poorly-controlled infections can decimate the crop and defoliate vines well before harvest, severely hindering fruit ripening and damaging vine health. Effective disease management requires integration of non-chemical vineyard practices and well-timed fungicide sprays. Among the most effective fungicides is metalaxyl, labeled for use on NY grapes since the late 1980's. However, low concentrations of metalaxyl have recently been discovered in Long Island test wells associated with several commodities, including grapes. We explored the activities of recently labeled fungicides to promote alternatives to the use of metalaxyl in vineyards. Though disease pressure was low, all fungicides tested provided good control of downy mildew.

Background and justification

Long Island is an ecologically fragile region where shallow, sandy soils sit atop underground aquifers that provide drinking water. Contamination of surface and groundwater with nitrates and pesticides, first documented in the 1970's, has been an ongoing concern. Based on test well sampling in 2009-2010, a range of pesticides have been identified as contaminants in agricultural/horticultural commodity wells. In vineyards, metalaxyl (Ridomil) has been detected in 55% of test wells from trace levels to 2.7 ppb (1).

Downy mildew control requires thoughtful planning to avoid economically devastating losses. Canopy management techniques promote air circulation around susceptible fruit and foliage, reducing microclimate humidity and facilitating drying (2). While this limits the quantitative degree of chemical intervention necessary, regular applications of effective fungicides are still needed to obtain commercial levels of control when conditions favor disease development. Certain American and hybrid cultivars show genetic resistance to downy mildew. However, the Long Island industry is focused on cultivars of *Vitis vinifera*, the European grape species, due to land and labor costs and a marketplace that necessitates high value wines. *V.vinifera* cultivars are universally susceptible to downy mildew since this species evolved in isolation from the downy mildew pathogen, which is native to eastern North America.

Metalaxyl controls only oomycetes; on grapes, it controls only downy mildew and is ineffective against other diseases. However, metalaxyl is perhaps the most effective downy mildew

fungicide ever developed due to an unusual combination of strong protective, post-infection, and anti-sporulant properties (2). However, several new oomycete-specific products have recently been registered for downy mildew control, but their specific activities are not well known. Given concerns about detections of metalaxyl in test wells, it is imperative to evaluate alternative control options.

References

1 - Paulsen, R. Suffolk County Pesticide Monitoring Program. Presentation given to the grape industry March 14, 2012 at the Long Island Horticultural Research and Extension Center, Riverhead.
2 - Wilcox, WF. Grape Disease Control, 2012. This annual report is published in regional NY newsletters and is currently located at http://ccesuffolk.org/viticulture.

Objectives

1. On Long Island, implement a replicated trial to evaluate the efficacy of three recently-labeled products -Revus, Presidio and Ranman-for control of downy mildew.
2. In Geneva, NY, trials evaluating the protective, post-infection, and antisporulant activities of these materials will be implemented on a Cornell University research farm.
3. Evaluate efficacy of treatments through field assessments of fruit and foliage and laboratory assessment of anti-sporulant activity.
4. Project evaluation - Disseminate results to local and regional audiences via electronic media and oral presentations. Gauge impact of results through grower polls.

Procedures

1. A replicated trial (CRD) was implemented in a Chardonnay block at the LI Horticultural Research and Extension Center, Riverhead. Each treatment consisted of 4 replications, one panel (4 vines)/rep. Treatments were applied with a pressurized CO2 backpack, 90 GPA, on June 26, July 16 and August 16. Treatments were tank mixed with powdery mildew fungicides, primarily sulfur. Treatment regimes included Presidio (fluopicolide) + Manzate ProStick (mancozeb) or Captan 50W (captan) (tank mix required by label); Ranman (cyazofamid); Revus (mandipropamid); and Manzate or Captan alone as a standard treatment. Additional fungicides were applied in this vineyard approximately every 10-14 days with a commercial sized Lipco recycling sprayer. To avoid contamination of research plots, ProPhyt (potassium phosphite) was used for control of downy mildew. Data was arc sin transformed then analyzed using the JMP Statistical program one-way anova with Tukey's test for means separation.

2. Tests to determine protective, post-infection, and anti-sporulant properties were conducted in a replicated (RCBD) experiment in a block of cv. 'Lakemont' at NYS Agr Expt Sta in Geneva. Five terminal leaves on each of 10 shoots/plot were inoculated in the afternoon of the same day

and incubated overnight by enclosing the shoot tips in large plastic bags to promote infection. Each plot was sprayed either 3 days before (protective assay) or 3 days after (post-infection assay) inoculation with one of the candidate fungicides, or was left unsprayed.

3. To evaluate efficacy in Chardonnay, downy mildew was assessed on 30 leaves (5 leaves/shoot x 6 shoots) from the center of each plot. Disease incidence was calculated as % leaves showing any infection; disease severity (% leaf area infected) was estimated visually for each leaf. To evaluate the Lakemont trial, disease severity was estimated on each leaf as described above, and compared against the check treatment to determine degree of control. Then, the leaves were excised and transported to the lab, where sporulation was induced by incubating them overnight at 100% humidity in a closed container. Sporangia were washed off the next day, enumerated under a microscope with a hemacytometer, and the number of sporangia/leaf was calculated.

Results and discussion

Downy mildew was well-controlled in most Long Island vineyards in 2012. It was not present in research plots throughout the season. Leaf infections were minimal at harvest. By October 12, ten days post-harvest, there was sufficient visual evidence of downy mildew to conduct an evaluation. All three treatments with translaminar activity demonstrated improved control of downy mildew compared to the schedule with protectant-only treatments.

Control of downy mildew on Chardonnay grapes, Oct. 12, 2012

	Treatment, rate/A	Incidence % leaves[1]	Severity % leaf area[1]
1	Presidio, 3.5 oz + Manzate 2.5 lbs, 6-26 Presidio, 3.5 oz + Captan, 2.5 lbs, 7-16, 8-16	1.35 b	0.26 b
2	Ranman, 2.5 oz 6-26, 7-16, 8-16	5.31 ab	0.06 b
3	Revus, 8 oz 6-26, 7-16, 8-16	5.94 ab	0.04 b
4	Manzate ProStick, 2.5 lbs, 6-26 Captan 50W, 2.5 lbs, 7-16, 8-16	20.73 a	3.03 a

1 Significance at 0.05.

Cost of control will factor into the choice of material. The cost per acre of the Presidio regime (a second protectant fungicide is required by the label) is substantially higher than other fungicides. Ranman an Revus appear to provide equivalent control and therefore can be recommended as more cost effective alternatives. Cost per acre: Presidio + Manzate - $49.65/acre; Ranman – 18.65; Revus – 26.56; Manzate – 13.23; Captan – 21.13 (1).

Agriculture is Long Island's largest industry with over $1 billion in annual revenue (2). The wine industry, 2500 acres and 56 wine producers, is symbolic of the high value agricultural commodities that thrive on Long Island (2). With 1.3 million tasting room visitors annually, the industry is a critical component of the East End's tourism-based economy.

In 2011, many NY vineyards lost crop and a portion of their canopy well before harvest due to poorly controlled downy mildew. These infections typically start in June and can infect both foliage and fruit. When conducive weather occurs in July and August, leaf infections progress rapidly and can lead to defoliation if left untreated. Under these conditions, it is necessary to use the most effective fungicides available so that photosynthesizing canopy is retained to ripen fruit and maintain vine health. The impact of these infections will continue in subsequent seasons as oospores can persist in soil for more than a year. Evaluation of alternatives to metalaxyl provides growers the tools for informed decisions when downy mildew pressure is high. Use of alternative materials will also avoid potential inputs of metalaxyl to groundwater.

References

1 - Cost of fungicides provided by the Long Island Cauliflower Association, Riverhead, as of December, 2012.
2 – Long Island Farm Bureau website, http://www.lifb.com.
3 - Long Island Wine Council website, http://www.liwines.com.

4. Dissemination of results will take place as follows:

a) Results will be posted on the CCE-SC grape program website (http://ccesuffolk.org/viticulture) and to Long Island vineyard manager list serv (75 subscribers);

b) Results will be presented in the LI Fruit & Vegetable Update (weekly, 141 grape subscribers, distributed to 12 states) and/or the Suffolk County Ag News (monthly). Results will be detailed in Wilcox's annual summary Grape Disease Control – 2013. This summary (36 pp. in 2012) is recognized as an essential tool for disease management in eastern vineyards.

c) Presentations will take place at winter/spring pest management meetings. Growers will be polled to determine planned rates of adoption. Wilcox will incorporate results into regional extension presentations given throughout the east.

Project locations

Suffolk County, Long Island, NY and Ontario County, NY