SRSFC Project 2020-04a and b Research Proposal Report

Title: Efficacy and crop safety of untested fungicides for diseases of muscadine grape

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Objective:

Establish the efficacy and crop safety of labeled grape fungicides that have not been previously tested on muscadine grape.

Justification and Description:

Muscadine grapes (*Vitis rotundifolia*, syn. *Muscadinia rotundifolia*) are widely grown in the southeastern US for wine, commercial fresh market and pick-your-own sales. Production is increasing and has expanded to other countries, especially production of fresh-market cultivars. Muscadines are resistant to many fungal diseases that affect bunch grapes, such as downy mildew (*Plasmopara viticola*) and botrytis bunch rot (*Botrytis* sp.), but are susceptible to other common grape diseases such as powdery mildew (*Uncinula necator*), black rot (*Guignarida bidwellii* f. sp. *muscadinii*), bitter rot (*Greeneria uvicola*) and ripe rot (*Colletotrichum* spp.) (Fig 1).

Muscadines are included with all other grapes for purposes of pesticide labeling, and so products that are tested and approved on bunch-type grapes (*V. vinifera, V. labrusca*) are also legal to use on muscadine grapes. However, most new products have never been tested on muscadines. We do not know if the products will work on this species, or if they are safe to use. Spray injury from untested products or tank mixes can render grapes unmarketable (Fig 2). Testing of new fungicides on muscadine grapes is not funded by fungicide manufacturers, who may not even be aware of the need for separate testing on this species. This lack of information prevents specialists and agents from recommending products (those for which we have no data), thus hindering growers in their efforts to control plant diseases, and limiting our ability to manage fungicide resistance.

The following studies were needed in order to give southeastern muscadine growers information that is currently unavailable from any source, regarding the efficacy and safety of previously untested fungicides that could be useful on their unique crop.

Figure 1.Ripe rot (left) and powdery mildew (right).

Figure 2. Spray burn on muscadine grapes caused by a phytotoxic tank mix

Field Trials in North Carolina and Georgia

Experiments were conducted on 12-yr and 2-yr-old 'Carlos' vines at the research station in Castle Hayne, NC and at the Horticulture Research Farm in Watkinsville, GA, respectively. At both locations, plots consisted of single vines, and a randomized complete block design was utilized with four (NC) or five (GA) replications. Treatments were the same in NC and GA, except that Badge SC (copper oxychloride + copper hydroxide) was tested in NC, and Elite (tebuconazole) was tested in GA; for other treatments, see Table 1. For the NC trial, spray treatments were applied using a CO_2-powered backpack sprayer delivering the equivalent of 50 gallons per acre (gpa) at ~ 55 psi with two hollow cone nozzles vertically spaced 20 inches apart; on each spray date, applications were made in a timed pass down the west (windward) side of each plot. For the GA trial, applications were made with a CO_2 backpack sprayer with a single TeeJet adjustable cone tip nozzle (5500-PPX12) at a pressure of ~25 psi to runoff; both sides of the vine were treated. Applications were made in NC on 20 May, 4 June, 26 June, and 28 July; in GA, applications were made on 27 April, 8 May, 21 May, 17 Jun, 6 July, 15 July, 30 July, and 13 August. Treatments in NC were also applied to nearby mixed cultivar rows as an additional non-replicated screen for phytotoxicity. Phytotoxicity was rated visually on 19 August and 9 September (NC) and 11 August and 4 September (GA). Significant disease was not observed in GA, so no disease ratings were conducted. Leaf spot incidence and severity was recorded on 28 August in NC, and fruit was collected for rot evaluations on 9 September. Fruit was randomly obtained along the length of each plot by catching hand-detached fruit in a gallon bucket until approximately two-thirds full. Buckets of fruit were held at 75ºF for 48 hrs then weighed and sorted into marketable vs rots. Statistical analysis was performed using PROC ANOVA (www.sas.com).

Table 1. Disease control of common muscadine diseases afforded by chemical treatments.

Treatment and rate per acre	Ripe rot %[z]	Bitter rot %	Macrophoma rot %	Marketable %	Angular leaf spot[y]	
					incidence	severity
Untreated control	2.9 abcd[x]	5.6 a	8.1 a	86.8 a	80.0 a	15.0 a
Aprovia 10.5 fl oz	1.4 abcd	2.6 bc	1.4 cd	94.8 cd	12.5 bc	2.2 bc
Aprovia Top 13.3 fl oz	1.4 abcd	0.1 c	0.9 cd	97.4 cd	1.2 c	1.2 c
Gavel 2.5 lb	2.0 abcd	2.0 bc	3.8 bc	92.2 abc	0.2 c	0.2 c
Switch 14.0 oz	0 d	1.0 c	0.2 d	98.9 d	23.8 b	5.0 b
Miravis Prime 13.4 fl oz	0.3 d	1.2 c	1.1 cd	97.7 cd	7.5 c	1.5 bc
Luna Experience 8.6 fl oz	4.1 a	2.0 bc	3.6 bc	92.2 abc	0 c	0 c
Topguard EQ 8.0 fl oz	0.6 bcd	1.0 c	1.8 cd	97.0 cd	0 c	0 c
Kenja 22.0 fl oz	0.5 cd	1.7 c	0.8 cd	97.4 cd	13.8 bc	2.0 bc
Badge SC 3.5 pt	3.5 abc	4.6 ab	6.0 ab	87.7 ab	8.8 bc	2.8 bc
Procure 8.0 fl oz	3.8 ab	0.6 c	2.6 cd	92.7 bc	10.0 bc	3.5 bc
Merivon 5.5 fl oz	0.8 bcd	0.2 c	1.5 cd	97.4 cd	0.2 c	1.2 c
LSD	3.18	2.78	3.26	5.91	15.76	3.73

[z] Percent rots by row (plus marketable) may not total 100 since some fruits had more than one pathogen present.
[y] Incidence = percent leaves with at least one lesion; Severity = average number of spots per infected leaf.
[x] Means in columns followed by the same letter are not significantly different, P = 0.05.

Results and Discussion: Disease pressure was adequate for evaluation of fungicides against bitter rot, macrophoma rot and angular leaf spot. Incidence of ripe rot was sparse although treatment effects were visible. Black rot and powdery mildew were minimal and were not evaluated. No phytotoxic effects were observed on fruit or leaves at either location.

Impact: Based on these studies, a total of 12 fungicides have been reviewed for phytotoxicity on muscadines, and none was observed. In addition, efficacy of several fungicides for control of numerous muscadine diseases was evaluated at one location; most fungicides provided efficacy against more than one disease, and several were particularly active against multiple diseases. The addition of these fungicides to the SRSFC IPM guide will increase choices for muscadine producers, while providing resistance management alternatives for the limited number of fungicide classes available for disease management.