



Viticulture, enology and marketing for cold-hardy grapes



Copper and Sulfur Sensitivity of Northern Grape Cultivars

Sturgeon Bay, WI and Madison, WI

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Background and Rationale: While many synthetic fungicides are failing owing to the emergence of fungicide-resistant pathogen populations, copper- and sulfur-based fungicides remain effective despite decades of use in vineyards. In grape production, sulfur is used primarily to control powdery mildew, whereas copper is used primarily to control downy mildew. Some copper- and sulfur-based products are allowed for use in organic production, and many formulations are relatively inexpensive. Thus, copper and sulfur continue to have an important place in modern grape production. Unfortunately, many important grape cultivars are sensitive to injury from copper and/or sulfur, but the sensitivity of the “northern” cultivars is not known. In Year 3 of the project we continued field studies to assess sensitivity of several cultivars to copper and sulfur.

Treatments:

- The following 10 cultivars in an established vineyard were treated at Peninsular Agricultural Research Station (PARS) in Sturgeon Bay, WI: Brianna, Foch, Frontenac, LaCrescent, LaCrosse, Leon Millot, Marquette, Noiret, NY76, and Vignoles.
- In an established vineyard at West Madison Agricultural Research Station (WMARS), all those varieties (except Noiret and Vignoles) plus MN1220 and Petite Pearl, were treated.
- The following 8 cultivars in 2-year old vineyards were treated at PARS and WMARS: Brianna, Frontenac, Frontenac Gris, LaCrescent, LaCrosse, Marquette, St. Croix, and Valiant.
- Treatments were applied six times at approximately 2-week intervals from June through August at WMARS. At PARS treatments were applied in June and early July, but a severe hailstorm on 14 July stripped leaves from vines, prevent us from continuing studies there in 2014. The fungicides applied were Cuprofix Ultra 40 Disperss (copper hydroxide) at 3 lb/acre (= 1.2 lb metallic copper); and Microthiol Disperss (micronized sulfur) at 10 lb/acre (= 8 lb sulfur).

Methods: At approximately 2-week intervals starting in early July and ending in early September, foliage was rated on a visual scale of 1 (= no injury) to 4 (= severe injury) by one person (VK) for all treatments. Individual leaves were not assessed; rather, the canopy as a whole was evaluated. Data were analyzed separately for each date by a protected Least Significant Difference Test ($P \leq 0.05$).

Results: There were statistically significant differences in sensitivity to copper and sulfur among cultivars. However, to make graphs easier to read, season-long data from both years at PARS are presented without error bars or letters designating significant differences (Figures 1 and 2). A rating of 2 or higher represents a level of injury that would be noticeable and possibly alarming to growers. In the legends to Figures 1 and 2, cultivars that had both an average injury rating greater than 2 and that were statistically different from the control, and the

dates on which both criteria were met, are noted. Most cultivars showed little response to repeated applications of copper or sulfur. Notable exceptions are that Foch and Leon Millot sustained severe injury from sulfur. The sensitivity of these sibling cultivars to sulfur has been noted before, and they served as good indicators in our trials.

What the results mean:

- We are documenting sensitivities to copper and sulfur that need to be considered when developing spray programs.
- Since we initiated these studies in 2012, we have had some very consistent results (e.g., sensitivity of Foch and Leon Millot to sulfur), but also some contradictory results (e.g., Brianna highly sensitive to copper in 2012 and 2013 but not in 2014). We are reviewing data to determine there are trends based on weather.
- We will conduct additional trials to further determine sensitivity of northern cultivars to copper and sulfur. With several site-years of data, we believe that trends will emerge from which we can advise growers on using these fungicides.

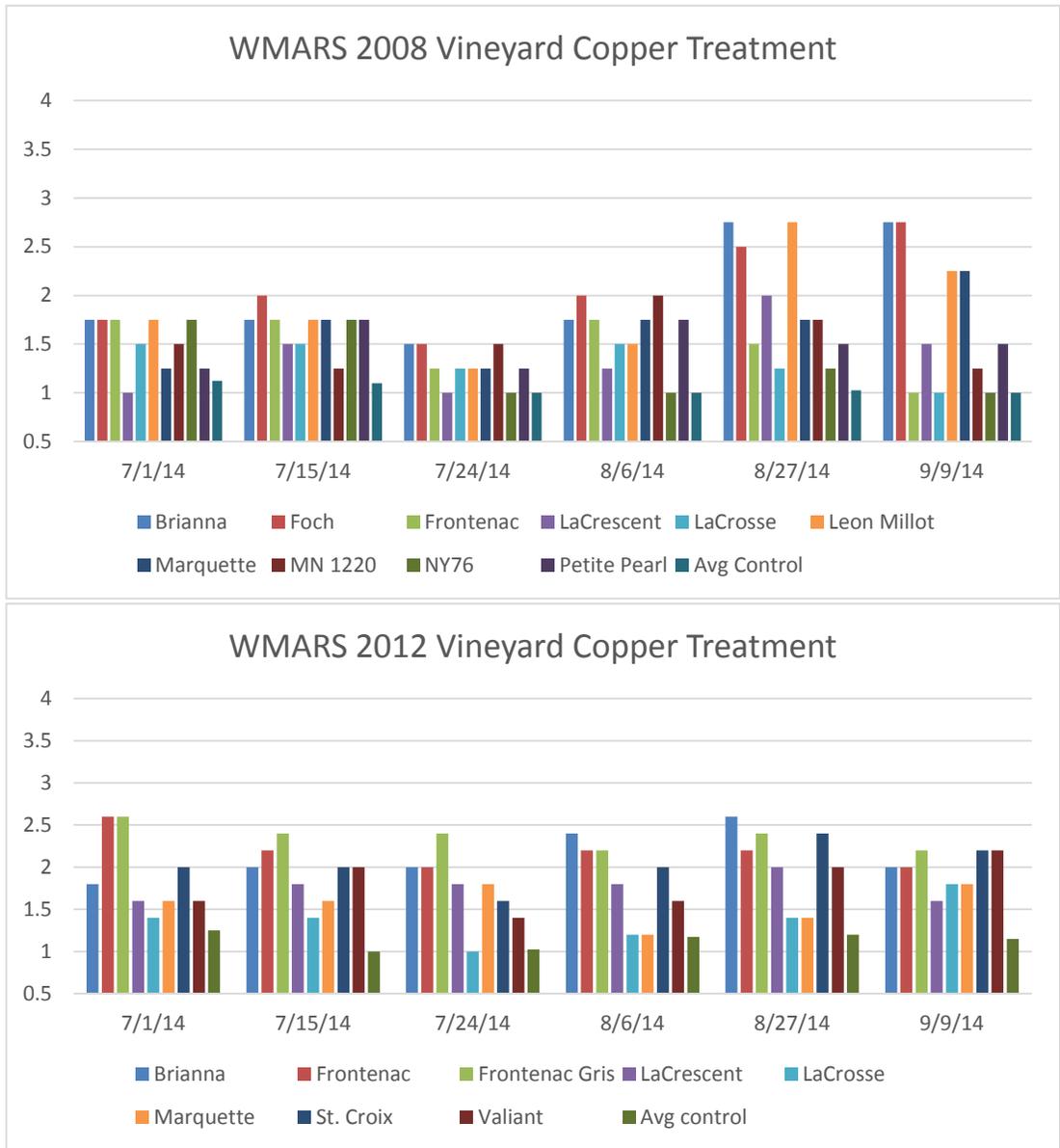


Figure 1. Sensitivity of grape leaves to copper (Cuprofix Ultra Disperss) at WMARS in 2014. 1= no injury; 2 = mild injury; 3 = moderate injury; 4 = severe injury. In the 2008 vineyard, varieties that had significantly greater injury than the control *and* had average rank greater than 2: Brianna on 8/27 and 9/9; Foch on 8/27, and 9/9; Leon Millot on 8/27, and 9/9; and St. Croix on 9/9. In the 2012 vineyard, varieties that had significantly greater injury than the control *and* had average rank greater than 2: Brianna on 8/27; Frontenac on 7/1, 7/15, 8/6, and 8/27; Frontenac Gris on 7/1, 7/15, 7/24, 8/6, 8/27, and 9/9; and St. Croix on 8/27.

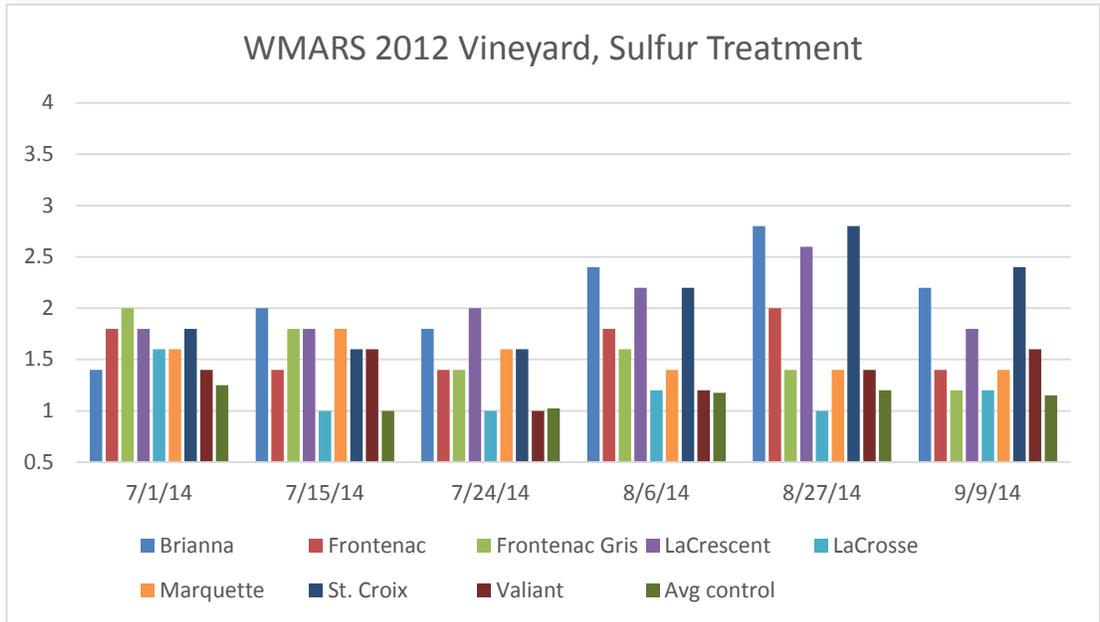
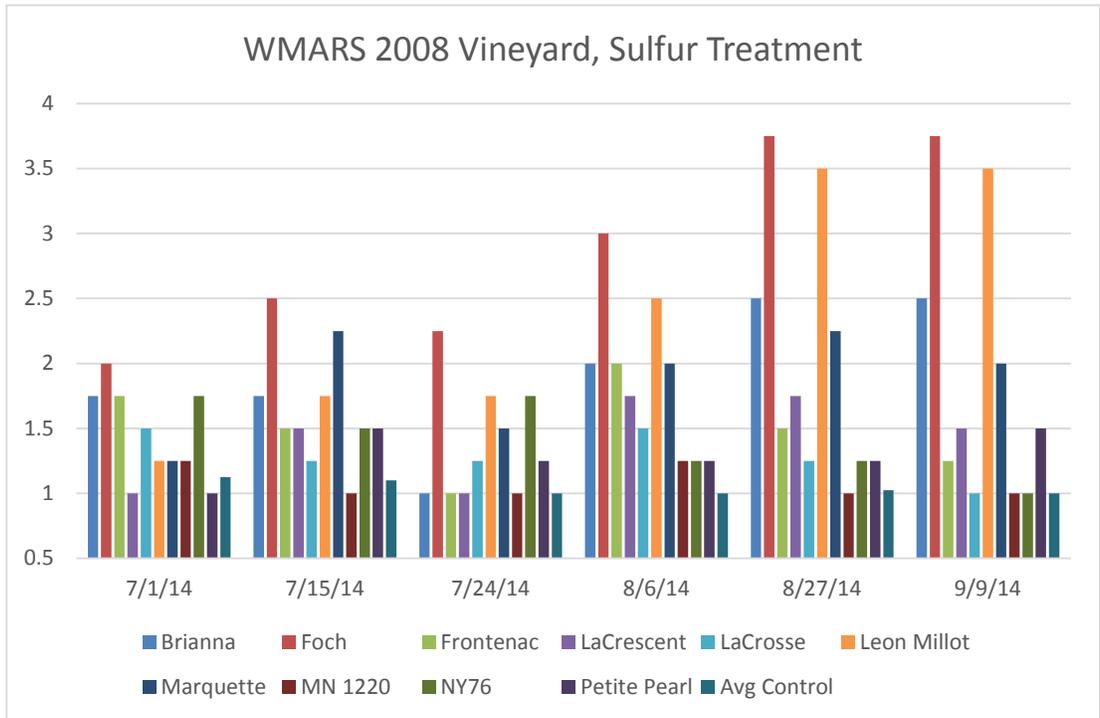


Figure 2. Sensitivity of grape leaves to sulfur (Microthiol Disperss) at WMARS in 2014. 1= no injury; 2 = mild injury; 3 = moderate injury; 4 = severe injury. In the 2008 vineyard, varieties that had significantly greater injury than the control *and* had average rank greater than 2: Brianna on 8/27 and 9/9; Foch on 7/15, 7/24, 8/6, 8/27, and 9/9; Leon Millot on 8/6, 8/27, and 9/9; and Marquette on 7/15 and 8/27. In the 2012 vineyard, varieties that had significantly greater injury than the control *and* had average rank greater than 2: Brianna on 8/6, 8/27, and 9/9; LaCrescent on 8/6 and 8/27; and St. Croix on 8/6, 8/27, and 9/9.