



Measuring Field-Applied Sulfur Residues in Juice and Wine

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Vessels and test apparatus used to determine elemental sulfur from spray applications in fermenting wines and juice. One goal of the project is to find out how long before harvest sulfur applications need to be stopped to avoid impacts during fermentation.

Photo by Chris Gerling

Sulfur, the fungicide. We know that sulfur is useful. In the words of Wayne Wilcox, “Sulfur is the original fungicide. It is credited with saving the European grape industry, where powdery mildew (PM) caused widespread destruction of a host plant (*Vitis vinifera*) that had never encountered this exotic pathogen before. To this day, it remains the most widely used fungicide worldwide against the most common disease of grapes (PM), for three main reasons: (1) It works; (2) It’s relatively economical; and (3) Even after 160 years of intensive use, the PM fungus has not developed resistance to it, nor is it likely to.” Alternative materials are more expensive, not approved for organic production, and vulnerable to the development of resistance by the fungus. So what’s the catch?

Sulfur and wine defects. The catch (isn’t there always a catch?) is that yeast in fermenting wine convert sulfur into hydrogen sulfide (H₂S), a compound that smells like rotten eggs and is the bane of winemakers everywhere. From work performed by several groups over the last 50 years, including Terry Acree’s group, we know that added sulfur can and does contribute to meaningful, and potentially horrible, increases in H₂S production. H₂S appears in wines during fermentation and storage for many reasons, not all of them clearly understood, and as a result winemakers do whatever they can to eliminate any definite causes. Sulfur in vineyards is an obvious target, so these days sulfur applications are stopped anywhere from two weeks after berry set to two weeks before harvest. How do we know who is being too cautious and who isn’t being cautious enough? Misha Kwasniewski, currently a graduate student working with Gavin Sacks and Wayne Wilcox, is developing a rapid, safe, and inexpensive assay to measure sulfur residues on grapes.

Simple juice/wine test for elemental sulfur. Gavin and Misha have developed a simple test for elemental sulfur from fungicide applications in wine – which is surprisingly difficult, given all of the sulfur-containing compounds naturally present in wine. They point out that sulfur is not particularly soluble, and may settle out with traditional analytical methods (but not just rinsing off from rain and/or hoses).

How late can sulfur be applied without affecting wine? The assay will be able to give useful information to both vineyards and wineries. The \$64,000 question has already been discussed: how long can sulfur be safely used to control powdery mildew without leaving too much residue on harvested fruit? Timing will depend on lots of factors- weather, spray formulations, etc.-but these things can now be checked. There's more that we can learn, however. A winery can determine what processing techniques might help to reduce sulfur concentrations prior to fermentation. Sulfur is not particularly soluble, and may settle out with traditional methods (but not just rinsing off from rain and/or hoses). Tests run before and after can identify the best cellar operation for limiting sulfur, be it whole cluster pressing, extended settling, fining, flotation, etc.

Two versus six weeks preharvest. Early work- and before anyone gets too far ahead of themselves, go back and look at the first word again- showed no detectable amount of sulfur found on grapes where sulfur application had ceased at six weeks before harvest. Whole cluster-pressed chardonnay where sulfur was applied two weeks prior to harvest did still have a meaningful amount of sulfur, however. Keep in mind that there are a lot of factors at work here, so the answer to when to stop sulfur is not as easy as extrapolating from the above. The work is continuing this year, and we hope that more people will be able to check more variables as the assay is made available. Eventually, it may be part of a sampling program just like brix, TA and pH.

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