

Effects of Fruit Rot on Wine Stability

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[Editor's note: Due to excessive rain we have had in July-Sept, fruit rot is expected to be a problem this year. In this season, there may be a need for fruit inspection and fruit culling at the winery. The article below graciously contributed by Dr. Zoecklein, Extension Enologist in Virginia, describes the effect of fruit rot on juice quality. It also describes the cause of wine haziness, which winemakers may experience...well not winemakers, rather the wines!].

Both *Botrytis cinerea* and sour rot have significant influence on wine chemistry (Table 1). The largest quantitative changes occurring in the fruit as a result of *Botrytis* growth are those of sugars and organic acids.

Table 1. Comparison between Virginia White Riesling Musts

	'Clean Grapes'	<i>Botrytis cinerea</i>	Sour Rot
°Brix	18.5	21	16.0
Titrateable Acidity (g/L)	8.0	6.5	5.0
pH	3.3	3.5	>3.4
Gluconic acid (g/L)	0.5	1-5	>0.5
Acetic acid (g/L)	0	1.1	>1.5
Glycerol (g/L)	trace	1-10	trace
Ethanol (% , v/v)	0	0-trace	>0.2%
Laccase (µg/mL)	trace	0.1-8	trace to 0.5
Glucan (mg/L)	0	247	65

Botrytis and sour rot use ammonia nitrogen, reducing the levels available for yeast metabolism. Additionally, thiamine (vitamin B₁) and pyridoxine (vitamin B₆) are depleted. This is a primary reason why I have suggested that wines produced from *Botrytis* and/or sour rot infected grapes generally require supplementation with nitrogen and vitamins to help avoid stuck fermentations and possible H₂S/mercaptan formation. Like other fungi, *Botrytis cinerea* produces laccase, which catalyzes phenolic oxidation. This coupled with loss of varietal aroma is a major problem with fruit rots. The main nonflavonoid phenolic compounds of grapes are caffeic and *p*-coumaric acids, both free and esterified with tartaric acid. These are transformed to quinines by laccase, with resultant polymerization responsible for browning of the fruit. Excessive browning and the concentration of laccase can generally be limited by whole cluster pressing, the elimination of the first 10-15 gallons/ton and the use of PVPP. Laccase is resistant to sulfur dioxide, cannot easily be removed with bentonite, and is active in the presence of alcohol. Therefore, the reduction pre-fermentation is important. Elevated levels of acetic and lactic acid are frequently seen in wines made from *Botrytis*-

infected fruit. These spoilage acids arise from growth of yeast and bacteria associated with the mold. *Aspergillus*, *Botrytis*, and *Penicillium* sp. oxidize glucose to produce gluconic acid. Since gluconic acid is not utilized by yeast or bacteria it may be used as an indicator of fruit deterioration. Gluconic acid levels in “clean” fruit and in wines made from clean fruit are near 0.5 g/L, whereas in wines produced from fruit infected with *B. cinerea* levels range from 1 to 5 g/L. In the case of sour rot or vulgar rot, where bacterial growth occurs along with the mold growth, levels may also reach 5 g/L.

Polysaccharide Instability

One of the greatest impacts of *Botrytis* growth and sour rot is the formation of polysaccharides that create clarification problems. Pectins are hydrolyzed by mold-produced polygalacturonase, with the formation of *beta*-1,2- and 1,6-glucans. In wine, ethyl alcohol causes the glucan chains to aggregate, thus inhibiting clarification and filtration. Commercially, several glucanases are available to minimize these clarification problems. Polysaccharides can form protective colloids in juices and wines inhibiting clarification, fining, and filtration. In grape juices and wines polysaccharides may be in the form of pectins and/or glucans, each forming gelatinous aggregates in an alcohol solution. Several Virginia producers have reported polysaccharide instabilities this season. The following, adapted from Zoecklein et al. (1995), are two simple lab procedures for determining pectin and glucan instability.

Pectin Instability

Pectins are structural components of plant cell walls. If pectins are present, the addition of pectolytic enzymes to a laboratory sample and subsequent pectin precipitation test is recommended.

Procedure: To a 25-mL aliquot of the wine containing unidentified haze, add 50 mL of a 95% ethanol: 1% HCl or alternatively, isopropanol: 1% HCl reagent.

Interpretation: Formation of gel after several minutes is indicative of pectin.

Glucan Instability

Dubourdieu et al. (1981) developed two precipitation tests for glucans. The first procedure given is for the presence of glucans in concentrations greater than 15 mg/L, the second for levels as low as 3 mg/L. Even at low concentrations, glucans can cause filtration problems. A positive test for the presence of glucans should be followed by a laboratory fining trial using glucanases and retesting.

Procedure for Glucans > 15 mg/L: Add 5 mL of 96% ethanol (vol/vol) acidulated with 1% HCl to a tube containing 10 mL of juice or wine.

Interpretation: The formation of a white filament is indicative of the presence of glucans at levels greater than 15 mg/L. Because much lower levels can cause problems, an additional test that will detect glucans at concentrations above 3 mg/L may be warranted.

Procedure for Glucans > 3 mg/L:

1. 5 mL of wine is mixed with 5 mL of 96% ethanol (vol/vol) acidulated with 1% HCl.
2. After 30 minutes at room temperature the mixture is centrifuged at 3,000 g for 20 min.
3. The supernatant is carefully removed and the precipitate redissolved in 1 mL water. The precipitate is then mixed with 0.5 mL acidulated ethanol.

Interpretation: The formation of filaments is indicative of glucans.