Vinification of Botrytised Must*

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In the previous issue of this publication, changes in fruit composition caused by Botrytis cinerea were discussed. These changes pose special vinification problems to a winemaker. In this issue these problems and how they can be handled will be discussed.

1. Fermentation

In the case of a Botrytis infected must, the fermentation rate is usually slow. There are several factors that contribute to slow fermentation. The important ones include:

a. High sugar concentration.
b. Presence of a themo-labile yeast inhibitor called botryticine.
c. Low assimilable nitrogen content in must.

High must sugar content (>28 brix) exerts a retarding influence on yeast activity. Therefore, a yeast strain tolerant to high sugar levels should be used to conduct the fermentation.

Botryticine also has an adverse effect on yeast activity, and its presence is associated with increased formation of acetic acid and glycerol during the alcoholic fermentation. Botryticine has been identified as a complex polysaccharide.

Botrytised musts have also been shown to be deficient in available nitrogen. Nitrogen is an important yeast nutrient and its deficiency in a must can lead to the problem of a sluggish or stuck fermentation. For this reason adequate amounts of yeast nutrient should be added to the must. The yeast nutrient should preferably contain a source of nitrogen and important vitamins such as thiamin and pantothenic acid.

2. Clarification

Wines made from Botrytised musts are often difficult to filter. The problem of poor filtration occurs due to the presence of high molecular weight glucans. The glucan is a component of the viscous jelly-like compound produced by the fungus and is located between the skin and the pulp of infected berries. During processing, i.e. crushing and pressing, the glucan is dispersed into the must and consequently in the wine. A delicate handling of grapes can reduce dispersion of glucans in the must and thus improve the filterability of a wine. Another approach to solve this filtration problem is to treat the must with enzymes called Beta 1-3 glucanases. These enzymes break down glucans and improve filterability.

3. Oxidation

Oxidation and browning is a serious problem in musts infected with noble rot. The fungus produces the enzyme laccase, which is a powerful oxidizing enzyme.

Unlike another naturally occurring polyphenol oxidase enzyme tyrosinase, laccase is more stable in wine, is less sensitive to sulfur dioxide and is capable of oxidizing a broader range of phenolic compounds. In red grapes it destroys the pigments. Because of browning and pigment degradation, it is difficult to produce good red wine from Botrytised must.

Sulfiting the must to prevent oxidation and browning is difficult, not only because the enzyme is relatively resistant to SO_2 but because these musts (with noble rot) contain high levels of SO_2 binding compounds. This means that very high doses of SO_2 are required to compensate for the SO_2 binding compounds and also to inactivate SO_2 tolerant laccase.

Using an inert gas such as CO_2 to blanket the wine during processing can minimize the problem of browning. However, such a treatment does not address the problem of potential browning when the wine is exposed to air. Heat treatments have been reported to be a useful method for dealing with enzymatic browning. Heating the wine for 20-30 seconds at 70°C (158°F) inactivates the enzyme and thus makes the wine stable.

An important feature of laccase is its low isoelectric point, near 2.5. This means that in the usual wine pH range of 3-4, this enzyme (in wine) is negatively charged. Wine makers are familiar with using bentonite to remove unstable proteins (enzymes are also proteinacious compounds).

However, bentonite treatment of Botrytised must is not likely to remove this enzyme because both the bentonite and the enzyme (at wine pH 3-4) are negatively charged.

In order to address the problems of fermentation, clarification and oxidation in Botrytis infected musts, the following measures are suggested:

1. The grapes for making wine should have only noble rot. From a practical viewpoint, a very small amount of other rots in grapes infected with Botrytis may be unavoidable.
2. Handle grapes gently to minimize the dispersion of glucans in the must.
3. Use osmophilic (sugar tolerant) yeast and yeast nutrient.
4. Use enzymes Beta (1-3) glucanases to break down the glucans.
5. Employ a combination of inert gas, SO_2 and heat to minimize oxidation.

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