PRODUCTION OF WINE FROM BOTRYTIZED GRAPES

Peter Bell

When grapes become infected with the desirable form of *Botrytis cinerea*, giving rise to 'noble' rot (as opposed to gray/sour/bunch rot), a number of important transformations occur. These chemical and physical changes in the grape berry have a large impact on the behavior of the fermentation and on the organoleptic qualities of the finished wine. The following is a list of these changes and their implications for winemakers. The changes can be either desirable (+); undesirable or problematic (-): both, depending on circumstances (+/-); or questionable (?)

1) Concentration of Sugar (+)

Under ideal conditions, the germination of *Botrytis* conidia results in a mat of mycelial growth on the intact grape berry skin. Conidiophores which penetrate the skin initiate a dehydration of the berry, and the sugars are concentrated. In fully infected berries which are completely mummified by *Botrytis*, sugar concentration can easily be **doubled.**

While high sugar content is central to the dessert wine style, the high osmotic pressure of the sugar on the yeast cells at the onset of fermentation can present a problem. High V.A. production during fermentation is one sign of a struggling yeast. A yeast strain which can tolerate high sugar concentrations (juices of up to 60 degrees brix are not unknown) should be chosen. Lalvin EC-1118 (Prise de Mousse) is a good choice since it does not seem to be inhibited either by high sugar concentrations or by the high alcohol that can be present late in the fermentation.

2) Decrease in Tartaric and Malic Acids; Increase In pH (+)

As water is lost from the berry, its constituent acids are concentrated. However, at the same time the *Botrytis* fungus is metabolizing these organic acids for use as an energy source. This results in an increase in pH and a decrease in acid concentration. The juice and wine thus taste sweeter and softer.

3) Production of Glycerol (+) and Polysaccharides (-)

Glycerol is excreted by the *Botrytis* fungus, and as a result the glycerol concentration of the wine can be up to four times higher than normal--as high as 30 g/L. Glycerol makes a slight contribution to increased mouthfeel and possibly sweetness, although its effect is often overrated.

In addition to glycerol, glucans can be formed in the juice, and their presence makes clarification and filtration very difficult. These long-chain polysaccharides, with a molecular weight of up to 1 x 10^6, tend to be expressed from the grapes during heavy pressing. Commercial enzyme preparations are of questionable value in their treatment.

4) Oxidation of Polyphenols (+/-)

The enzyme produced by *Botrytis*, laccase, is secreted through the hyphae into the berry. It is completely soluble, and thus finds its way readily into the juice. Laccase activity causes the juice to change in color to a deep gold. It also causes a modification of those phenolic compounds causing bitterness and astringency, making their impact less pronounced.

On the 'down' side, laccase is much more resistant to deactivation than polyphenol oxidase. Its effect diminishes more slowly over time, and it can tolerate significantly higher levels Of SO_2.

5) Oxidation of Sugars (+/-)

The oxidation of glucose and fructose in the grape berry gives rise to a range of honey/caramel flavors which contribute positively to wine quality as well as to color. However, oxidized sugars bind readily to bisulfite, and their presence in the juice and wine makes attaining adequate free $S0_2$ very difficult without attendant high total $S0_2$ (often 250-300 mg/L).

6) Oxidation of Monoterpenes (?)

In varieties with high concentrations of volatile monoterpenes, such as Riesling, oxidation of these compounds by *Botrytis* fungi will result in a loss of varietal character intensity. In practice this does not seem to be a problem, since sufficient varietal character is usually retained in successful examples of these wines.

7) Exhaustion of Nutrients (-)

Botrytis juices are usually deficient in essential nutrients (ammonia, free amino acids, thiomin), and unless additions are made to the juice, fermentation is likely to be sluggish and excessive amounts of H_2S will be produced.

8) Production of Botryticine (?)

Botryticine is an antibiotic produced by *Botrytis* that is inhibitory to yeast growth. It is not clear whether botryticine has any significant inhibitory effect on wine yeast during fermentation. Its presence seems to prevent subsequent yeast growth in finished wines, as *Botrytis* wines do not referment as easily as wines from uninfected grapes.

The list of descriptive terms for *Botrytis* wines is necessarily long and wide-ranging. The following list of descriptors was developed by Brian Croser. He stresses that not all words are appropriate to all variants of the botrytized wine class.

Aroma and Flavor	Bouquet	Taste and texture
floral	estery	oily
perfume	honey	luscious
rose oil	caramel	viscous
dried flowers	toffee	slippery
thyme flower	golden syrup	rich
cardamom	treacle	bittersweet
muscaty	nutty	
passionfruit	roasted	
Tropical fruit	burnt match	
mango	tea leaf	
fruit salad		
citrus		
orange peel		
mandarin peel		
apricot		
dried apricot		
peach		
quince		
lemon		
marmalade		

References

Croser, B. "Botrytis Affected Wines". Aust. and NZ Wine Industry Journal, 4:3, 155-158.