SNOW ON WINE

March 2024

Dr. Jeff Snow

Education Director of the Spokane Enological Society

The Great White Way

During our first visit to Schloss Johannesburg Winery, where wine grapes have been cultivated for 1200 years, Julie and I visited their deep and ancient cellar. At the deepest end was a massive barrel head upon which was carved, in four languages, (Greek, Hebrew, Latin and German), the inspiring words of Psalms 104:15; ***"God made wine to gladden the heart of man[1]"***. It reminds us that most of the long history of winemaking preceded our modern era of science. Neither alcohol nor microorganisms such as yeast had been discovered. The conversion of sweet grape juice into intoxicating wine was thus attributed to **spiritual intervention**. As were the pleasant and mystical feelings wine drinkers experienced. And so, wine developed a central role in many religions. Today of course we know that fermentation changes chemicals called sugars into ones called ethyl alcohol and carbon dioxide. And the responsible microscopic beast is yeast – specifically *Saccharomyces cerevisiae*. This process, known as fermentation, is the key part of all the involved steps by which winemakers Sheppard ***fruit of the vine*** from crush to a finished ***bottle of wine***.

But let's focus on the primary, or initial, fermentation of ***white wine***. "What" you say, "and why not rose' and red wine?" Because ***red wine*** fermentation is too complicated. ***Red*** grapes first go into the "***stemmer crusher***" resulting in a pulpy mass which gets dumped in its entirety into a vat or tank. Fermentation may begin then, or a winemaker may delay it to allow days of "cold soak". Others do prolonged soaking after fermentation. It's all about extraction of flavor, tannin and color from the skins into the wine. Then there is the "cap". That solid matt of skins floated-up to the surface by carbon dioxide gas, which twice daily must be broken up by "punch down" or "pump over". Then getting that mass of soggy skins into a ***wine press*** to remove "press wine" after the "free run wine" has been racked-off for barrel aging. Then onward to fining and filtering. And don't even get me started on whole clusters – crushed or fully intact!

Rose is simpler – it begins just like red, but no "cold soak" -- immediate fermentation. And after just a few hours the still fermenting juice is racked-off the skins.

Getting back to ***white wine,*** grapes of ***any color***[2] arrive at the winery and after sorting go directly into a ***wine press.*** The resulting clear ***uncolored grape juice*** goes directly into fermentation vats or tanks. No dealing with skins, seeds and stems and no having to fine or filter out their debris. They are no longer involved[3]. This simplicity will allow us to focus on the subtleties of fermentation itself!

Native yeast on the surface of wine grapes comes across with the juice. Winemakers often choose to use native yeasts in vineyards where they produce consistently good results. When that is not the case, native yeasts are eliminated, usually by sulfiting, and a yeast culture chosen for reasons such as flavor difference, alcohol tolerance or temperature tolerance is inoculated into the juice. Left alone, fermentation generates surprising heat (up to 130^0F) which will "boil" away most volatile flavor chemicals leaving an awful tasteless wine. That's why today white wine is essentially always fermented in stainless steel tanks with refrigerated cooling jackets. Fermentation is markedly slowed by the cold. The goal is not slowing but the lowering of the temperature which retains the flavor compounds of white wine which are volatile at much lower temperature than in reds.

This primary fermentation will continue until either: 1) all sugar has been converted to alcohol, or 2) the amount of alcohol is high enough to kill the yeast. With riper grapes high alcohol may kill the yeast before all the sugar has been fermented to alcohol leaving "residual sugar". But the winemaker can stop fermentation any time, choosing the exact amount of alcohol and sugar desired. Simply lowering the temperature well below 50^0 F will do this, as will sulfites, or removing the yeast by filtration. Now on to bottling, right? Wrong Kemosabe! We are getting there, but first must address acid balance and stabilization!

White grapes grown in areas with very cool nights will typically retain lots of Malic acid. Named for the Latin word *Malum,* for apple, it is sharp and crisp like a not quite ripe Granny Smith apple. Too much makes the wine unbalanced and harsh with poor mouth feel. Malic acid has double the acid strength of other wine acids, but a secondary fermentation by *lactobacillus*, (a bacteria, not a yeast), can convert it into much less acidic and creamy textured lactic acid. ***Malolactic Fermentation*** (MLF) often occurs in barrels while wine is aging but can be done just as well in tanks when barrel aging is not desired. By monitoring the changing pH (acid) levels, mouth feel and taste, winemakers can tailor the amount of MLF to give pleasing mouth feel and wonderful balance of acid with the alcohol and residual sugar. Often only a part of the wine is racked into barrels for MLF. Then after MLF is completed it will be racked back into a tank and reunited with the original wine. Sometimes at this point further blending of wine from different lots with varying flavors may be done to optimize quality and flavor as described in the February, 2024 **Snow on Wine**[4] article titled **Assemblage**'.

Now all that remains before bottling is to "stabilize tartrates" in the wine to prevent formation of what German's call "Weinsteine" or wine stones, crystals of potassium tartrate (aka cream of tartar). *"In white wine these can look alarmingly like shards of glass….and may frighten less sophisticated customers[5]."* Classically this was done by lowering tank temperature to near freezing (17.5^0 F)[6] and waiting a week or more for crystals to form and fall to the bottom. The wine was then racked off and filtered to remove smaller unprecipitated crystals. Because this fairly drastic treatment often reduced a wines' quality, stabilization is now usually done by "seeding" the wine with fine potassium bitartrate crystals. With thorough mixing at normal temperature the seed crystals will grow rapidly, precipitating out crystals of excess tartaric acid salts in only a few hours. This undamaged and stabilized wine can then be immediately racked off for botteling[5].

In modern times the spiritual mysteries of how sweet grape juice becomes wine have been supplanted by scientific knowledge. Today we understand microorganisms such as yeast and lactobacillus, and how they interact with and change chemicals like sugar, alcohol and carbon dioxide and a host of others. But has the gain in science been matched by a loss of romance and spirituality? To me it doesn't diminish the words of the Psalmist[1]. All of creation was by the Big Guy upstairs, and He did, after all, create grapes with yeast naturally on the skins. And he gave us the brains to learn the science behind fermentation. Largely, because of this science, almost all wine today is flawless or nearly so. And enjoyment of today's superior wines is surely still a gift from Him ***"…to gladden the heart of man[1]".***

Notes and references:

1) Holy Bible RSV, The Psalms, 104: 15.
2) The juice from grapes of all colors is clear and essentially unpigmented.
3) The pressed skins still contain some sugar, they are set aside, usually on the winery grounds, and the native yeast on the skins ferments that remaining sugar into alcohol. In fall, after the "crush rush" they are picked up and heated in a still of sorts and the alcohol captured becomes Grappa (Italy) or Schnapps (Germany)
4) Snow, J., The WineMinder, Feb. 2024, Snow on Wine, Assemblage.
5) Harding, Julia & Robinson, J., The Oxford Companion to Wine, 5th Ed, 2023, Oxford Univ Press, P 739.
   Cream of Tartar, the potassium salt of tartaric is needed by the food industry. Since grapes are the only plant which produces significant tartaric acid, the crystals recovered during stabilization can be sold by wineries for some additional income.
6) Alcohol and other dissolved solutes (primarily sugar) in wine act as "antifreeze" and lower the freezing point. The higher the alcohol and/or sugar, the lower the temperature.