A Note on Atypical Aging in White Wine

By Thomas Henick-Kling, Professor of Enology, WSU Viticulture & Enology
November 2022

This has been a very *INTERESTING* vintage in Washington State. In the end, mother nature was very kind and brought us some great ripening weather and I think we can look forward to many excellent wines from 2022.

Extreme Heat

One part of this interesting growing season that raises a bit of concern for me was the extreme heat we had in July and August.

There is the direct impact of heat on the fruit which can cause the formation of cooked, jammy, fruit flavors and a lack of tannin development. In Riesling is causes the formation of TDN which at high concentrations give the wines a very dominant, candle wax, wet wool, kerosene, or gasoline aroma. This can only be avoided by providing excessive water stress and possibly nutrient stress as the fruit ripens. TDN rarely occurs in grape berries. It is produced from glycosylated carotenoid-derived precursors during fermentation and wine aging. We don't know if heat increases those precursors, but light exposure does, at least before veraison (Markus Keller, personal communication). There is no after vinification treatment to suppress the expression of these flavors.

The other effect of this high heat was potentially high water stress. Excessive water stress can lead to the formation of the Atypical Aging flavor defect ATA. Sometimes, ATA is also called UTA and premature aging. These are all the same flavors. All white wine grape cultivars and Pinot Noir and possibly Syrah are susceptible to this flavor defect. The good news is that there are two ways to avoid this dominant flavor taint: 1) limit the water stress in the vineyard and 2) add ascorbic acid (vitamin C) early in the wine's development.

This flavor defect was first described in Germany in the early 1980s [called *Untypischer Alterungston*, (UTA)], and is found in essentially all winegrowing areas of the world.

Early on, German winemakers and scientists saw a correlation between drought stress and the occurrence of ATA. Wines from hot and dry growing seasons, and from dry vineyard sites, were prone to developing ATA, while wines from cooler seasons and sites without drought stress were not. Later, experience showed that over-cropping and possibly nitrogen deficiency in the vineyard are also contributing factors. Unfortunately, these connections have not been conclusively demonstrated (Markus Keller, personal communication).

I have found wines with this defect in every state in the USA (including WA), and in Germany, Austria, Switzerland, Italy, France, Spain, Portugal, New Zealand, and Australia. In WA, I have not seen a high percentage of wine with ATA; this is likely due to our control over vineyard water supply through irrigation.

ATA is found in wines from any white wine grape cultivar. Wines affected by ATA quickly lose their varietal aromas; often within one year. With this premature loss of varietal flavors, atypical flavors appear, and are described as candle wax, wet wool, furniture varnish, and dirty dish cloth. The atypical aromas quickly dominate the flavor of the wines.

Many researchers propose that 2-aminoacetophenone and other not identified compounds generated by degradation of indole-3-acetic acid are the causal agents. Yet, the addition of this compound does not produce the ATA aroma impact and the presence of this compound is not well correlated to the expression of ATA – in some studies it is, in others it is not at all correlated. So, we are still unsure about the chemistry of the off-odor and the pathway(s) in which it forms.

People who are not familiar with this flavor defect will often notice a problem in affected wines, but generally label it as “old” or “oxidized”. This flavor defect should not be confused with degradation by oxidation; with oxidation the wines still retain varietal and regional flavor characteristics and can be improved through the addition of sulfur dioxide.”

So, what can you do now?

Early addition of ascorbic acid (vitamin C) can delay the expression of ATA flavors for 2 years and even longer. To be most effective, ascorbic acid should be added as early as possible, as soon as the wine has stable free SO2. You should add a minimum of 100 mg/L ascorbic acid. Since ascorbic acid slowly degrades in wine, I like to add a little more, about 150 mg/L. This addition is small enough that it will not make your wine perceptibly more acidic, but it is effective in locking the ATA development and it helps protect the freshness of your other wine flavors as well.

It is important to add the ascorbic acid early! Best to add it now, as close to the end of the year as possible. If you wait until March-May, it might be too late, with the off-flavors already developed, which then cannot be reversed. I had this experience with a late ascorbic acid addition we made in March one year.

There is a predictive test that can be done to assess the potential of a wine to develop the ATA flavor defect. This ATA Quick Test is described below.

Remember the presence of ascorbic acid interferes with SO_2 analysis by the Ripper method. The distillation/titration method (A/O) and the FOSS Fiastar method are not affected by the presence of ascorbic acid. We will test the Admeo method for SO_2 analysis to make sure it also is not affected.

Further information

Mitigating ATA in the Vineyard. The first step in preventing ATA is to avoid extreme water stress on white wine grape cultivars, particularly around véraison. In addition, ensure that fruit is fully ripened before harvest, as delayed ripening can be a sign of water stress or over cropping, which are associated with the development of ATA as described above.

Process drought stressed fruit gently; it tends to be more phenolic. Consider whole cluster pressing to minimize extraction of phenolics and potential ATA precursor. Fining may be necessary to remove the bitterness.

Separate press fractions (over 1.5 bar), ferment and treat affected fruit separately.

Some skin contact can help extract the small amount of fruit flavor from under-ripe fruit; 4 to 24 hours at 5°C (41°F) is likely enough. Carefully evaluate bitterness in this fruit.

Add plenty of nutrients to the must before and during fermentation for yeast and bacteria. Use a combination of DAP (diammonium hydrogen phosphate) and complex yeast nutrients such as Go-Ferm, Fermaid K, or Yeast Superfood. For drought stressed fruit, it is very important to maintain adequate nutrient levels (aim for a minimum of 250 mg/L of Yeast Available Nitrogen).

Prolong contact with yeast lees and malolactic fermentation in white wines where appropriate. If necessary, add acidity back using tartaric or malic acid.

After alcoholic and malolactic fermentations are complete, sulfite the wine promptly. Make sure the wine holds free SO_2; check the SO_2 at least two times after your addition. When the wine holds SO_2, add ascorbic acid as described above.

ATA QUICK TEST

1. ***Divide wine into two aliquots of 100 mL or more.***
2. ***Add 150 mg/L ascorbic acid to one of the aliquots, add nothing to the other.***
3. ***Pour each of the aliquots into their own glass bottles, avoiding large headspace. Seal well.***
4. ***Place glass bottles into an oven set at 40°C (104°F). Keep bottles in the oven from 12 to 48 hours.***
5. ***Remove bottles from oven. Let the wines cool, and then taste both wines.***
6. ***If both wines (with and without ascorbic acid) taste the same, then the wine likely will not develop ATA. If the wine without the ascorbic acid tastes differently than the wine with ascorbic acid, then the wine is at high risk to develop ATA.***

Information from: Staatliche Fachschule für Gartenbau und Weinbau Veitshöchheim, Germany

ACKNOWLEDGEMENT
I appreciate the very helpful review comments from Dr. Markus Keller, Washington State University, and Linn Scott, winemaker, Sparkman Cellars.

REFERENCES

Henick-Kling, T. et. al. (2008). "Studies on the origin and sensory aspects of atypical aging in white wines". Proc. 15th Int'l Enol. Sym., Trier, Germany.

Schneider, V. *Atypical Aging Defect: Sensory Discrimination, Viticultural Causes, and Enological Consequences. Am J Enol Vitic.65: 277-284, 2014. DOI: 10.5344/ajev.2014.14014*