Inspiring innovation.

GLASS ALTERNATIVES
PART 2 - THE ALUMINIUM CAN

Background

The wine industry has historically been one which resists major changes and does not simply accept new practices until they are proven to benefit quality, production, economics, or more recently, sustainability. This cultural trait is rooted in the inherent risks involved with small changes in the production process of winemaking. In addition to these factors, the wine industry has classically been a beverage which evokes romanticism, tradition, and artistry. With this in mind, it is easy to understand how changes to one of the most iconic aspects of wine, the glass bottle, could stir up the industry.

While the notion of wine in a can would have been considered blasphemous 20 years ago, in the past decade wineries that have championed this format have seen some of the fastest and most significant growth among the industry. While a category increase of 3800% in the past 6 years seems outrageously fast, in reality this growth rate may have been slowed by some of the initial challenges presented by the new packaging.

Shelf-Life Problems

The most common shelf-life issue that winemakers and researchers have reported is the development of reductive aromas caused by volatile sulfur compounds (VSCs). The most prevalent VSC reported is hydrogen sulfide (H_2S) post packaging. The development of H_2S can be significant, and upwards of 50 µg/L (sensory threshold is 1-3 µg/L). As you can imagine, a consumer opening a can of wine for the first time and smelling this fault could impart the wrong impression of this category of wine.

Attributed Causes of H_2S – Sulfites and Copper-bound sulfides

While several wine parameters have been determined to increase the development of H_2S, the two most significant and actionable are copper-bound sulfides and sulfites.

Sulfite Impact

Research at Cornell University showed that SO_2 can interact with aluminum foil to produce hydrogen sulfide. With canned wines, ideally the liner would prevent any permeation and contact between the wine and aluminum surface of the can, however work at the Australian Wine Research Institute (AWRI) showed some cases of pitting in the surface of aluminum of canned wines post aging. This suggests possibly that some interaction between components in the wine and the aluminum surface of the can. Additionally, increases in aluminum concentrations in canned wines also points to interaction between the wine and can surface.

Lowering SO_2 levels has shown to reduce the development of VSCs with canned wines. However, producing a wine with low SO_2 levels can be challenging as SO_2 serves multiple purposes in winemaking. Fortunately, Enartis has been developing strategies for producing low SO_2 wines for over 5 years with great success. In particular, significant research and development led to the creation of Hideki, a tannin blend which has very high antioxidant and microbiostatic activity. With Hideki, winemakers can significantly lower SO_2 levels while maintaining oxidative and microbial protection.

Copper-Sulfides Impact

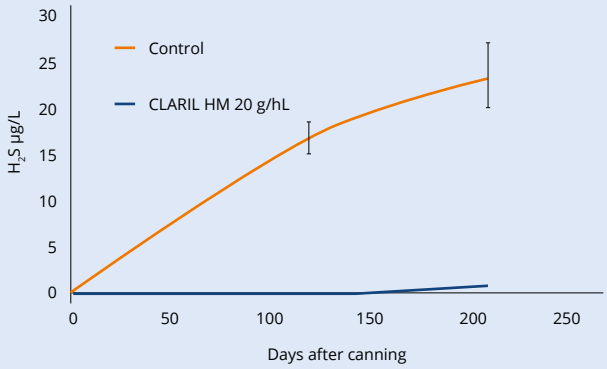
Until recently, the wine industry largely understood that any copper added to wine for remediating VSCs would bind to the sulfides and form an insoluble precipitate. This precipitate would theoretically settle out from the wine, and/or be removed by rough filtration. Work at Charles Sturt University and the Australian Wine Research Institute has since shown that this is not the case, and copper which is bound to sulfides can remain in wine even through sterile filtration.

These copper-bound sulfides have also shown to be able to break in reductive conditions, releasing the sulfide component. This is particularly problematic for canned wines since cans are a hermetically sealed, anoxic environment. In fact, most often winemakers report reductive aromas appearing after storage of 3-6 months, which is often the same time that oxygen is fully depleted post packaging.

Research at the AWRI has shown that Stabyl Met and Claril HM, two fining agents containing PVI/PVP, have the ability to remove copper-bound sulfides from wine. This treatment has shown to dramatically decrease the formation of hydrogen sulfide in canned wines.

Often canning companies will recommend less than 0.3 mg/L of total copper in wine prior to packaging to prevent issues. While this is true, even in wines with less than 0.05 mg/L of copper, shelf life has been improved with treatment with Claril HM prior to packaging. While 0.05 mg/L of copper sounds like a low amount of residual copper, it's important to note that sulfides such as H_2S are detectable at 1-3 µg/L, roughly 25 - 50 times less than the limit of detection. With this in mind, even residual amounts of copper-bound sulfides could potentially contribute to release of sulfides.

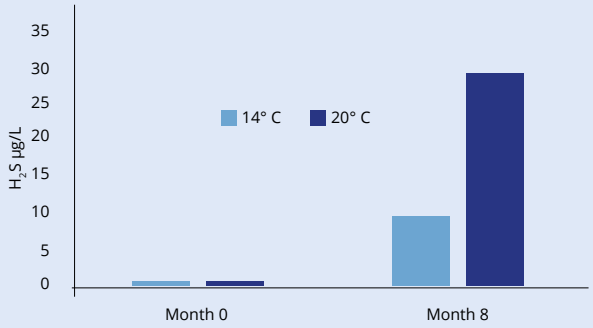
2020 Chardonnay wine tracked for H_2S development over 7 months, stored at 20° C



Role of Temperature

Temperature plays an important role in the development of VSCs for canned wines. Increased temperatures lead to faster development of VSCs. This is important, as wineries that are doing regular QC on canned wines must recognize that cans which enter the market may develop VSCs faster than inventory at the winery. This is primarily related to the increased temperatures during transport and storage in retail compared to warehouse temperatures at wineries.

Impact of temperature on H_2S development on 2020 Chardonnay with 25 mg/L of free SO_2 at canning.



Recommendations for extending canned wine shelf life

Parameter	Recommended threshold level at canning	Recommended treatment	Dosage
Oxygen	< 0.4 mg/L	Nitrogen sparge	Sparge until threshold level is reached
Copper	< 0.10 mg/L	Claril HM	25 - 50 g/hL
Storage temperature	13° C	N/A	N/A
SO_2 Free	15 mg/L	Hideki	3 – 6 g/hL

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