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TESTING DIFFERENT FERMENTATION VESSELS FOR THE PRODUCTION OF SAUVIGNON BLANC WINES



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[BASIC WINE](#)

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The use of **different and alternative fermentation vessels** for the production of wine has become increasingly popular and fashionable in the wine industry. Examples of these types of vessels include the concrete egg and clay amphoras which have not been used in mainstream winemaking for several decades or even centuries¹. Recent technological developments have led to the commercialisation of **food-grade technical materials** (such as plastics) with well-defined oxygen permeabilities which are also increasingly used in the winery environment.

The vessel in which juice is fermented will **undoubtedly affect the composition of the wine**. The extent to which the wine is affected by the container will mainly depend on the **extractability of compounds from the container into the wine** (for example oak-derived compounds), **the absorption/adsorption of wine components by the container material** (thereby sculpting the wine) and the **ability of the container to exclude oxygen** (either by minimising the headspace volume, the

diffusion of oxygen molecules through the container material and/or ensuring efficient sealing). Other factors such as **vessel shape and size** can also indirectly impact the wine composition. For instance, the use of **oval-shaped vessels supposedly encourages the formation of convection currents** inside the liquid thereby promoting the movement of suspended solids and enhancing extraction.

A recent study titled,

[“Chemical, physical, and sensory attributes of Sauvignon blanc wine fermented in different kinds of vessels”](#)¹

investigated the effect of different fermentation vessels on a Sauvignon Blanc wine. Some of the **main findings** reported in this publication will be addressed in this blog post.

MATERIALS AND METHODS

Sauvignon blanc grapes were hand-harvested from the Leyda Valley in Chile. After processing, the juice was allowed to settle in a 50 000 L stainless-steel tank for 24 hours. The clear juice was racked and distributed into four different vessels (in triplicate):

- 1) **Cylindrical stainless-steel tanks** (150 L)
- 2) **Oval polyethylene tanks** (980 L)
- 3) **Oval concrete tanks** (450 L)
- 4) **Clay jars** (225 L)

The juice had a sugar content of 22.1°Brix, 6.75 g/L titratable acidity (TA), 0.38 g/L volatile acidity (VA), pH 3.4 and 174 mg/L yeast assimilable nitrogen. The juice was inoculated with a 50/50 ratio of VIN13 and VIN7, both from Anchor Oenology. The vessels were all placed in a temperature-controlled room at 18±1°C. After fermentation, the wines were removed from the vessel, SO₂ added, stabilized and bottled. The bottled wines were kept at 16±1°C for six months after which chemical and sensory analyses were conducted.

RESULTS

GENERAL ANALYSIS

All treatments completed fermentation successfully with a residual sugar of less than 2 g/L. The fermentation tempo was **slower when fermentation took place in the stainless-steel tanks** resulting in a five-day delay in completion. A **slightly higher VA** was measured in the wines fermented in the stainless-steel tanks compared to the two oval vessels. The **lower availability of dissolved oxygen** in the stainless-steel tanks compared to the other vessels could explain the difference in fermentation tempo and VA concentration, however, the oxygen content before fermentation was not measured. No significant differences were observed in the alcohol content of the finished wines.

ELEMENTAL COMPOSITION

The **leaching of compounds**, especially from vessels comprising of unsealed concrete and clay could affect the elemental composition of the wine. The results obtained from measuring the **conductivity** (the ability of the wine to pass an electric current) indicated that the wine fermented in the **concrete tanks contained a higher concentration of dissolved salts and other inorganic chemicals** (which conduct electrical current). Elemental analyses showed that the wine fermented in the concrete tanks contained the **highest concentration of potassium, magnesium, iron, manganese and zinc**. This confirms the leaching of concrete constituents into the wine matrix.

ACID AND pH

The pH and TA decreased during the fermentation process for all treatments. **Differences in pH and TA measurements** were also evident **depending on the type of fermentation vessel used**. The wine fermented in the **oval concrete tanks had the highest pH and the lowest TA** concentration when compared to the wines fermented in other vessels. The **highest TA value was measured in the wine fermented in the oval polyethylene tanks**.

The **leaching of inorganic compounds from the concrete tanks into the wine possibly contributed to the differences in acidity observed** in the finished wines by encouraging tartrate precipitation. The

rough inner surface of the concrete tanks could also serve as **nucleation sites** for the formation of tartrate crystals thereby supporting the crystallization of unstable tartrates.

THE EXTRACTION OF MACROMOLECULES

The proposed benefit of the oval-shaped vessels is the continuous movement of the liquid within, thereby enhancing the extraction of macromolecules from suspended solids. In this study, there was **no difference in the turbidity** of the wine samples. However, the turbidity measurements were performed after racking and cold stabilization and is therefore perhaps not a true reflection of the suspended solids content during and directly after fermentation. There was, however, **no significant difference in polysaccharide content** between the wines fermented in different vessels. The wines fermented in the **oval vessels (polyethylene and concrete) had a slightly lower bentonite requirement to achieve protein stability** compared to the other vessels, however, this difference was marginal.

SENSORY ANALYSIS

The treatments with the highest and lowest average intensity scores for the different sensory attributes are shown in Table 1. It seems that the **vessel material had a greater influence on the wine's sensory characteristics than the shape of the vessel**, especially on the scoring of “fruity” and “bitterness”.

It is difficult to ascertain the exact reason for the sensory evaluation results. Factors such as the leaching of compounds, sculpting effects and oxygen exposure can all affect the eventual sensory outcome of the wine.

Table 1. Treatments with the highest and lowest intensity scores for different sensory attributes¹. Intensity scores were only significantly different for “fruity” and “bitterness”.

	Highest average intensity score	Lowest average intensity score
Fruity	Cylindrical stainless-steel tanks Clay jars	Oval concrete tanks
Vegetal	Oval concrete tanks	Oval polyethylene tanks
Typicality	Cylindrical stainless-steel tanks Clay jars Oval concrete tanks	Oval polyethylene tanks
Colour intensity	Clay jars	Oval concrete tanks
Persistence	Clay jars Oval concrete tanks	Oval polyethylene tanks
Bitterness	Oval polyethylene tanks	Oval concrete tanks
Mouthfeel	Cylindrical stainless-steel tanks	Clay jars
Sour	Cylindrical stainless-steel tanks	Clay jars

CONCLUSION

In this study, the effect of different fermentation vessels on Sauvignon Blanc wines manifested more in the **elemental contents and the acidity** of the wines. Wines fermented in **concrete tanks had a higher conductivity and elemental concentration, possibly due to the leaching of compounds** from the vessel wall. The lower TA in the concrete tanks could be due to the enhanced tartrate precipitation due to the increased concentration of minerals and/or the surface of the vessel promoting crystallization. Other chemical parameters differed marginally or were the same for all the treatments.

The sensory results showed differences especially in the intensity of fruity aroma and the perception of bitterness.

Different fermentation vessels will therefore have a direct or indirect impact on the wine chemical and sensory composition. However, the exact reason for the influence is difficult to ascertain.

REFERENCES

- (1) Gil i Cortiella, M., Úbeda, C., Covarrubias, J. I., Peña-Neira, Á. Chemical, Physical, and Sensory Attributes of Sauvignon Blanc Wine Fermented in Different Kinds of Vessels. *Innovative Food Science and Emerging Technologies* **2020**, 66 (October), 102521.
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