

HOW SHIPPING TEMPERATURES AFFECT SAUVIGNON BLANC WINE COMPOSITION

PART 1



Dr. Carien Coetzee

[Basic Wine](#)

19 December 2019

From December 2018 to November 2019 South Africa exported 321 792 681 L of wine in both packaged and bulk form. **Sauvignon Blanc is responsible for 11.9%** of the above-mentioned figure and is the single cultivar with the **highest packaged export percentage** (of both white and red single varietals), while it is the second highest single cultivar export in bulk form ([SAWIS Exports, 2019](#)).

Sauvignon Blanc is clearly an important segment when it comes to South African wine exports and the preservation of the quality of the wine during the process is paramount for the wine industry. Depending on the destination and the route involved, South African wines can be transported over

very long distances and are subjected to **variable and extreme environmental conditions**, which may affect the quality of the wine.

Part 1 of this blog series will summarize results obtained from [a study by Walther and co-authors investigating the impact of temperature during bulk wine shipping](#)¹ while Part 2 will look at the impact of simulated shipping temperatures on South African Sauvignon Blanc sensory composition².

CONTAINERS AND SHIPPING

Bulk shipping is typically performed in 24 000 L **flexitanks which consists of disposable plastic bladders fitted inside the standard, non-refrigerated 6.10 m (20-foot) containers**, while insulated steel tanks (26 000 L) are used less often¹. The transportation of bottled wines is limited by the container capacity as they can usually carry a maximum of 12 000 - 13 000 x 750 mL bottles (corresponding to 9 000 L – 9 750 L of wine)³.

In the study by Walther, the temperature of the containers on a cargo vessel travelling from Australia to Europe were monitored. Six containers (duplicate), each holding 24 000 L of wine in a flexitank were placed in **three positions on the vessel**:

- On deck
- Under the deck near the bow
- Under the deck further towards the stern

The temperature probes were installed in all the containers at **two different positions**:

- Submerged 1 m into the wine
- On the inner wall of the container (air)

The shipping process was repeated in **three different seasons**, covering a range of temperatures and conditions:

- November – January
Warm in the southern hemisphere, cool in the northern hemisphere
- August – October
Cool in the southern hemisphere, warm in the northern hemisphere
- April – June (results not shown)

Route:

Adelaide – Singapore – Malaysia – India – Sri Lanka – India – Oman – Egypt – Malta – Italy – Great Britain - Netherlands

RESULTS: TEMPERATURE FLUCTUATIONS DURING SHIPPING FROM NOVEMBER – JANUARY

ON DECK CONTAINERS

Temperature probe: On the inner wall of each container (air)

- » From flexitank filling to loading onto the vessel (7 days): diurnal temperature fluctuated from 9°C to 47°C.
- » During the ocean crossing: diurnal temperature fluctuated with $\pm 2^\circ\text{C}$. The air temperature increased to 27°C and remained around this temperature for several days. Every time the vessel approached a port, the container air temperature increased.
- » Approaching Europe: the air temperature started to decrease due to changing weather conditions.

Temperature probe: In the wine

- » From flexitank filling (15°C) to loading onto the vessel (7 days): the wine only experienced a $\pm 2^\circ\text{C}$ diurnal variation. This limited variation (compared to the temperature measured by the probe on the inner wall of the container) can be due to the thermal buffering effect of the bulk wine¹. Even though the variation was low, the temperature of the wine still increased from 15°C to 23°C during this period with the average daytime temperature being 25.3°C.
- » After leaving the port: The wine experienced an initial decrease of 2°C. This initial decrease is probably due to the air-cooling effect above deck after leaving the port.
- » During ocean crossing: The temperature of the wine increased by 7°C due to the increased temperatures as the vessel turned north. On average, the number of days the wine temperature was above 25°C was around 20 days.
- » Arriving in Europe: the wine temperature decreased by 20°C to a final temperature of 8°C.

UNDER-DECK CONTAINERS

Temperature probe: In the wine

- » From loading onto the vessel to after leaving the port: After loading the vessel, the under-deck container wine temperature was 23°C. Under-deck containers did not experience an initial 2°C decrease after leaving the port like the above-deck containers and the temperature remained relatively constant.
- » During ocean crossing: The temperature of all three the containers changed similarly, however, in general, the temperature of the on-deck container was about 3°C lower than the

under-deck containers. When shielded under-deck and surrounded by other containers, outside temperatures did not have a major influence on the temperature of the wine under-deck. Maximum temperatures were around 31°C and on average, the number of days the wine temperature was above 25°C was around 28 days. There were no differences in the temperatures of the two containers under-deck (bow vs towards the stern).

- » Arriving in Europe (January): the wine temperature decreased by 20°C to a final temperature of 8°C, however, the on-deck containers cooled much faster resulting in a 7°C difference at one point. The under-deck containers' temperatures were significantly higher than the above-deck containers for 30 days.

TEMPERATURE FLUCTUATIONS DURING SHIPPING FROM AUGUST – OCTOBER

Temperature probe: In the wine

- » From filling (15°C), through truck transport to after leaving the port (14 days): the wine temperature remained constant (average daytime temperature 16.7°C in the harbour) with a $\pm 2^\circ\text{C}$ diurnal variation in the wine
- » After leaving the port: Wine temperature increased for all three containers. The wine temperature for the on-deck container increased (to 29°C) much faster compared to below deck with an average temperature difference of 7°C between above-deck and below-deck.
- » Approaching and arriving in Europe (October): All three containers reached 28°C. Thereafter the temperature of the above-deck containers decreased by 8°C, while the temperature of under-deck near the bow decreased by 2°C.

Shipping during these months showed differences between the two containers below deck. The wine containers under-deck near the bow warmed faster compared to under-deck further towards the stern. However, this increased rate was still not as fast as the container placed above deck. It seems that the surrounding containers thus served as insulation for the under-deck containers.

Conclusion

Irrespective of the shipping season and the container position on the vessel, the 2-month journey still resulted in the wine temperature increasing to above 25°C for about three weeks with the maximum wine temperature reaching 31°C. Shipping in the November-January time window resulted in more extreme temperatures and appropriate positioning on the vessel during these fluctuations is

important. Linking container positioning on the ship with seasonal weather patterns can be used to minimise the effect of shipping temperatures. Idle times in ports can also be detrimental especially in summer and in equatorial regions, leading to significant increases in temperature.

Part 2 of this blog series will discuss the effect of fluctuating temperatures on South African Sauvignon Blanc wine.

For more information, contact Carien at carien@basicwine.co.za

REFERENCES

- (1) Walther, A. K.; Durner, D.; Fischer, U. Impact of Temperature during Bulk Shipping on the Chemical Composition and Sensory Profile of a Chardonnay Wine. *Am. J. Enol. Vitic.* **2018**, *69* (3), 247–257. <https://doi.org/10.5344/ajev.2018.17089>.
- (2) Du Toit, W. J.; Piquet, C. Research Note: Effect of Simulated Shipping Temperatures on the Sensory Composition of South African Chenin Blanc and Sauvignon Blanc Wines. *South African J. Enol. Vitic.* **2014**, *35* (2), 278–282. <https://doi.org/10.21548/35-2-1016>.
- (3) Hartley, A. Bulk Shipping of Wine and Its Implications for Product Quality. *WRAP Rep.* **2008**, No. ISBN 1-84405-389-X.

Photo by Vidar Nordli-Mathisen on Unsplash (Image adjusted)