Optimization of *Vidal* Table Wine Fermentation for Increased Volatile Thiol Production and Aromatic Profile Improvement

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Background

- Vidal blanc is a grape variety of major significance to the Canadian wine industry, especially within Ontario, where it accounts for ~25% of the annual grape tonnage (~21,191 tonnes) (GGO, 2024).
- Vidal is primarily used in Icewine, a specialty wine, for which the top global producer is Canada (Jing et al., 2018), however recent market trend show declining interest in Icewine (Van Sickle, 2022) .
- As a "sustainable" variety, it possesses several desirable growing properties for growers, including consistent ripening in cool climates, winter hardiness, high yields, thick skins, and disease resistance (Jing et al., 2018).
- Preliminary research found present in Vidal table wines, several of the same volatile thiol's characteristic of Sauvignon Blanc wines from New Zealand (Inglis , 2022).
- Volatile thiols are a group of aromatic compounds associated with consumer desirable fruity aromas of Sauvignon Blanc, such as black currant, citrus, passionfruit, and grapefruit (Coetzee & du Toit, 2012; Inglis et al., 2021).
- Reported methods of increasing volatile thiol content in Sauvignon Blanc wines include alternative yeast strains (*S. cerevisiae* Sauvy), yeast micronutrients (Sauvignon Blanc Stimula™), and increased temperatures (up to 26 °C) (Deed et al, 2017; Inglis, 2022).
  - However, white wines are typically fermented at ~14°C to preserve volatile organic compounds (VOCs), which also contribute to the overall aromatic profile of the wine.
- Should the reported methods for increasing volatile thiols in Sauvignon Blanc wines apply to Vidal wines, it would provide the local industry with a method to create competitive and marketable wines with the grape, diversifying its use beyond Icewine.

Objectives

- Determine if the established methods of increasing volatile thiols in Sauvignon Blanc wines yield similar results in Vidal fermentations.
- Evaluate if the use of temperature regimen can increase volatile thiol content while preserving the VOC profile.
- Establish a fermentation regimen which allows for maximized volatile thiol content while preserving VOCs.

Methods

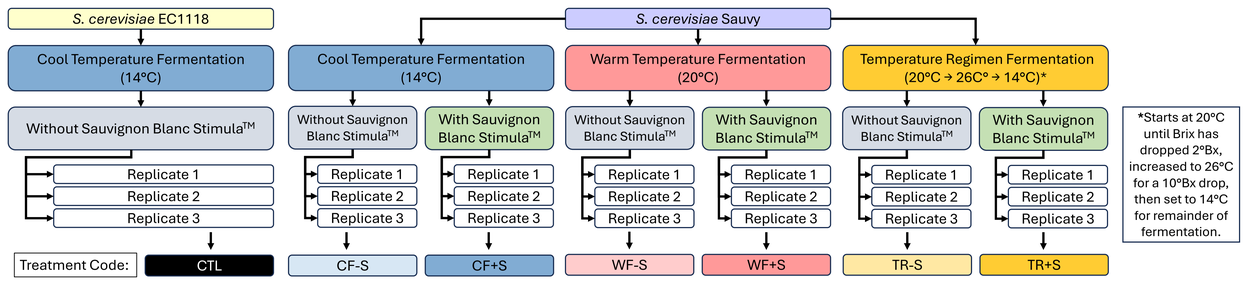

Figure 1. Visual representation of the differences between the 7 treatment groups used to investigate the effects of temperature, yeast, and micronutrients .

- Treatments were done in triplicate 42L fermentations using temperature controlled stainless-steel (67L capacity).
- Tanks were inoculated using 0.2 g/L of dry yeast (2 X 10^6 cell/mL).
- Sauvignon Blanc Stimula™ was added the respective treatments at 0.4 g/L following inoculation.
- Temperature and soluble solids were monitored daily until fermentation completed (≤0°Bx for 3 days).

Table 1. Analyses to be performed during each stage of the project.

Pre-Fermentation	During Fermentation	Post-Fermentation
-Soluble Solids (°Brix) -Total Fructose + Glucose Content -Titratable Acidity -Volatile Acidity -pH -Yeast Assimilable Nitrogen -Ethanol	-Soluble Solids (°Brix) -Temperature	-Total Fructose + Glucose Content (Residual Sugar) -Titratable Acidity (TA) -Volatile Acidity -pH -Ethanol -Free and Total SO_2 -Volatile Organic Compounds -Volatile thiols

Preliminary Results

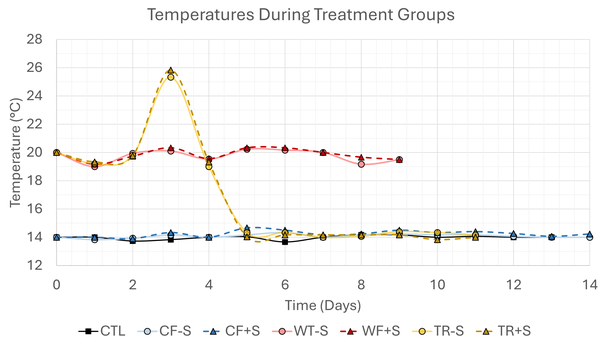

Figure 2. Results of daily temperature measurements for each treatment through the course of fermentation.

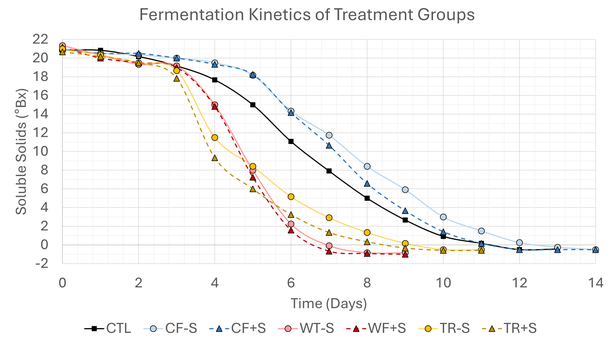

Figure 2. Results of daily soluble solids (°Brix) measurements for each treatment through the course of fermentation.

Interpretation:
Fermentations done at higher temperatures finished before those at cooler temperatures, including the samples which received a temperature spike (Figure 2 and 3).
The addition of Sauvignon Blanc Stimula™ may marginally shorten the length of fermentation (Figure 3).

Table 2. Results of the currently performed analyses (means determined from 2 measurements from each replicate (n = 6)).

Treatment	Total Glucose and Fructose (g/L)		pH		Titratable Acidity (g/L)		Ethanol (%v/v)
	Juice	Wine	Juice	Wine	Juice	Wine	Wine
CTL	198.90±3.80	0.19±0.02a	3.33±0.03	3.32±0.01c	7.83±0.10	7.50±0.22cd	11.76±0.52
CF-S	203.62±10.03	0.18±0.01b	3.33±0.02	3.36±0.01b	7.83±0.13	7.41±0.06de	12.07±0.26
CF+S	197.87±3.11	0.14±0.00d	3.32±0.02	3.38±0.01a	7.80±0.06	7.27±0.08e	12.07±0.30
WF-S	201.98±6.51	0.12±0.01e	3.33±0.03	3.38±0.01a	7.83±0.08	7.83±0.12a	12.03±0.14
WF+S	196.35±2.87	0.12±0.01e	3.32±0.02	3.37±0.02ab	7.82±0.07	7.90±0.10a	11.89±0.23
TR-S	202.37±2.59	0.16±0.00c	3.35±0.02	3.36±0.02b	7.77±0.11	7.61±0.11bc	12.14±0.28
TR+S	205.32±5.62	0.16±0.01c	3.32±0.03	3.36±0.02b	7.82±0.11	7.76±0.16ab	11.99±0.34

[a]Values in a column with the same letter are not significantly different from each other with $p < 0.05$ (determined by post-hoc analysis with Fisher's Least Significant Difference test of one-way ANOVA which showed a significant sample effect).

Interpretation:
Juice samples were not significantly different from each other for each analyte.
Significant differences were seen in each analyte for the finished wines, except for ethanol.
The pH increased in each treatment, except for the control.
Each treatment decreased in titratable acidity, except for the warm temperature fermentations.

Conclusions

- The lack of significant differences for the analytes between the juice measurements indicates any differences in the final wine can likely be associated with the treatment rather than possible differences in starting material.
- Regardless of temperature, yeast strain, or additions, each treatment was able to ferment to dryness.
- At cool temperatures, inclusion of Sauvignon Blanc Stimula™ may create differences in the analytes, but this trend does not seem to occur at higher temperatures.
- Informal benchtop trials by the researchers have suggested differences in sensory properties between treatments, thus it is anticipated differences will be observed during the nest stages of the research.

Next Steps

- The most valuable information for this project will come from quantifying the volatile thiol and VOC content in the treatments through gas chromatography-mass spectrometry analysis, which is the main focus for the next phase.
- The last phase of this project will involve performing sensory analysis trials with the wines and correlating sensorial differences in the wines to the data collected from the volatile thiol and VOC analysis.

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Acknowledgements

A special acknowledgement would like to be given to CGCN and OGWRI for providing the funding of this work.