

High thiol Pinot gris and Chardonnay wines based upon antioxidant additions at harvest

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INTRODUCTION

Are 3MH and 3MHA truly "varietal thiols"??

The effects of harvesting conditions upon levels of 3-mercaptohexanol (3MH) and its acetate ester (3MHA) in Sauvignon blanc wines has been well established. This includes positive effects of antioxidants, such as sulfite and ascorbic acid, applied at harvest to well macerated fruit (1,2), and the inclusion of elemental sulfur (3) as a source of H₂S early in ferment leading to higher thiol wines (4). However, much less is known about Pinot Gris and Chardonnay, despite the popularity of these wines and interest in the range of styles that can be produced.

¹ O. Makhotkina, M. Herbst-Johnstone, G. Logan, W. Du Toit and P.A. Kilmartin, (2104) *Am. J. Enol. Vitic.*, 65, 388-393.

² O. Makhotkina, L.D. Araujo, K. Olejar, M. Herbst-Johnstone, B. Fedrizzi, and P.A. Kilmartin, (2104) *Am. J. Enol. Vitic.*, 65, 388-393.

³ L. Dias Araujo, S. Vannevel, A. Buica, S. Callerot, B. Fedrizzi, P.A. Kilmartin and W. J. Du Toit, (2017) *Food Res. Int.*, 98, 79-86.

⁴ M.J. Harsch, F. Benkwitz, A. Frost, B. Colonna-Ceccaldi, R.C. Gardner and J.M. Salmon, (2013) *J. Agric. Food Chem.* 61, 3703-3713.

Wines

Sauvignon blanc, Pinot gris and Chardonnay grapes were hand-picked from three sites, and had additions immediately after crushing and destemming. Fermentation using EC1118 yeast in 1.5 L bottles at 15 °C.

Treatment one: No addition of antioxidants (AO)

Treatment two: 50 ppm SO₂ + 100 ppm ascorbic acid (HIGH AO)

Treatment three: SO₂, ascorbic acid + 100 ppm elemental sulfur (S)

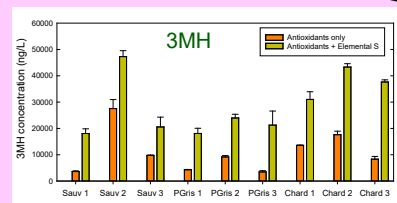
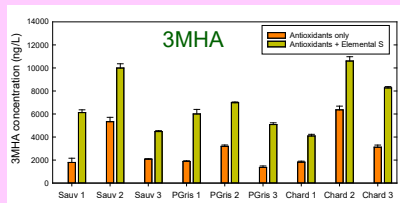
Chemical and Sensory Analysis

Wine Aromas

Concentrations of varietal thiols 3MH and 3MHA, and reductive sulfur compounds, were determined using established GC-MS methods (2,3).

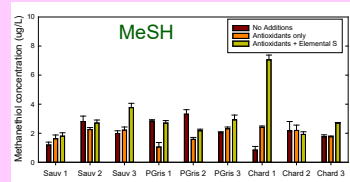
Sensory

Trained **Descriptive Analysis** sensory panel of 16 postgraduate Wine Science students. Three weeks training using established Sauvignon blanc descriptors with associated chemical references (150 point scale).



Antioxidants

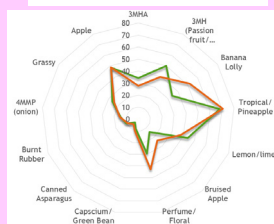
- No measurable 3MH or 3MHA across all nine wines when antioxidants were not applied at harvest.
- Similarly high 3MH and 3MHA in Pinot gris (PG) and Chardonnay wines as with Sauvignon blanc (SB).
- PG vs SB, and wines with no AO, higher in "perfume/floral" and "banana lolly" notes.
- Pinking can be a problem with Pinot gris, and classic Chardonnay styles should be lower in these thiols.



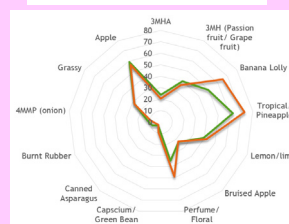
Elemental Sulfur (S)

- Considerable increase in 3MH and 3MHA across all three varieties with added elemental sulfur.
- Some wines (e.g. SB site 1), but not all, developed reductive aromas in sensory; when "burnt rubber" was low, wines with added S had higher 3MH/A characters.
- Some increase in methanethiol (MeSH) with added S (2x on average), and also in carbon disulfide (14x) and S-ethylthioacetate (280x).

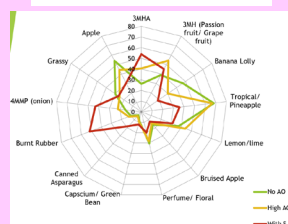
--SB No AO --SB HIGH AO



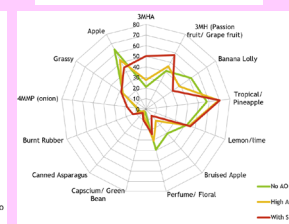
--PG No AO --PG HIGH AO



Sauvignon Blanc site 1



Sauvignon Blanc site 2



CONCLUSIONS

- **High levels of thiols** produced in Pinot Gris and Chardonnay wines when **high antioxidant protection** was provided at harvest.
- The thiols could **NOT be detected** in any wines **without added antioxidants**.
- Pinot Gris and Chardonnay wines **retained their own sensory characters**
- Even higher varietal thiol levels after inclusion of **elemental sulfur**, but reductive notes were a problem in some wines.
Consider oxygen additions during fermentation



AWITC 2019, Adelaide, Australia July 2019

Acknowledgments:
Dr Frank Benkwitz and Joanne Brady
Constellation Brands NZ

