Factors Influencing the Aroma Stability of Sauvignon blanc Wines

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The Sauvignon Blanc Programme THE SCIENCE BEHIND NEW ZEALAND WINE

Introduction

The passion fruit-type aroma of New Zealand Sauvignon blanc wines has been attributed to 3-mercaptohexan-1-ol (3-MH) and its acetate ester 3-mercaptohexan-1-ol acetate (3-MHA). Latest research has shown that these varietal thiols, particularly 3MHA, are unstable throughout storage. Their loss has been ascribed to polyphenol oxidation (Fig. 1), a process which can be inhibited by antioxidants such as sulfur dioxide (SO_2), ascorbic acid (AA) and glutathione (GSH).

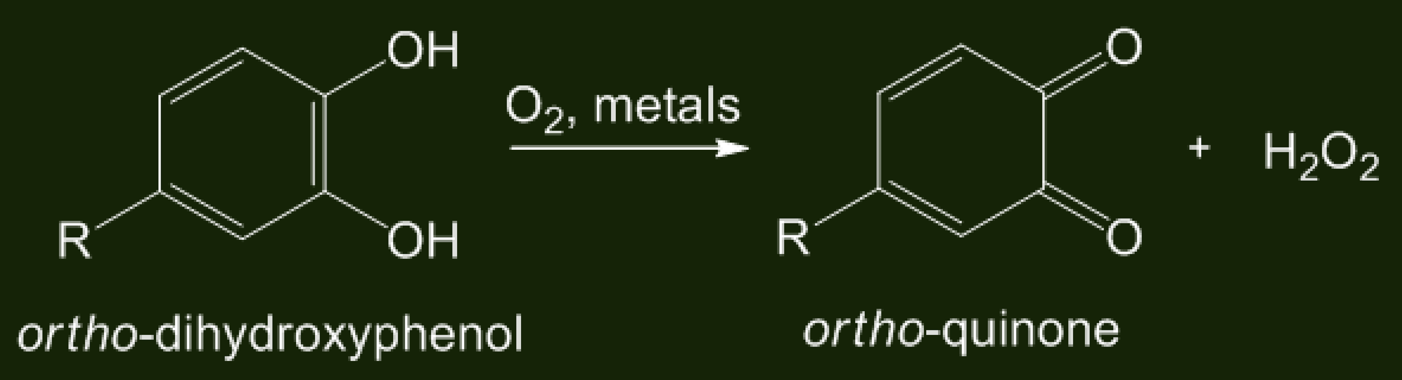


Figure 1: Polyphenol autoxidation

The goal of this study was to determine the impact of various factors (polyphenols, metals, antioxidants, temperature, and pH) on the 3-MH and 3-MHA stability, thus understanding the mechanism leading to the loss of these aroma compounds.

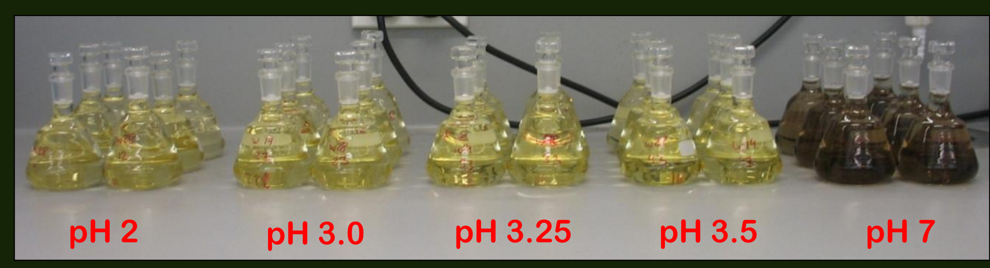
Experimental Set-Up

Accelerated Sauvignon blanc stability trial

Accelerated 3-MH and 3-MHA stability trial at different pH values

⇨ **Model wine matrix**
(ultrapure water/EtOH [88:12 v/v]; 5g/L tartaric acid)

⇨ **Wine matrix**
(Sauvignon blanc)



Method

Selective extraction of 3-MHA and 3-MH, followed by gas chromatography coupled to mass selective detection [1]

[1] Tominaga,T., Murat, M.L., Dubourdieu, D. (1998). *J. Agric. Food Chem.* **46**: 1044-1048.

Results

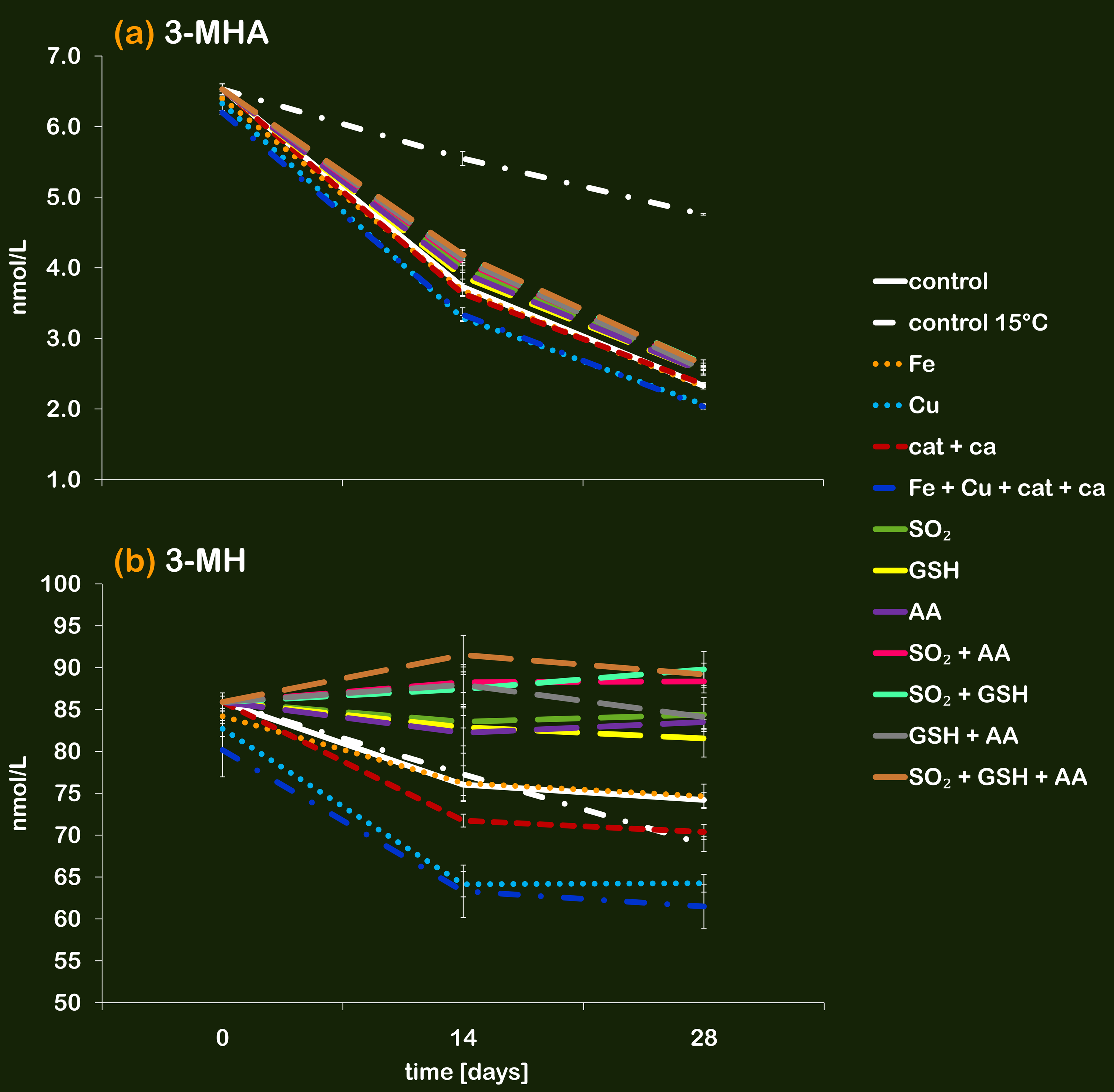


Figure 2: Evolution of (a) 3-MHA and (b) 3-MH in Sauvignon blanc at 45°C (excluding control 15°C) in the presence of metals [Fe - 8 mg/L; Cu - 0.1 mg/L], polyphenols [catechin (cat) - 20 mg/L; caffeic acid (ca) - 100 mg/L], and antioxidants [at 100 mg/L each]

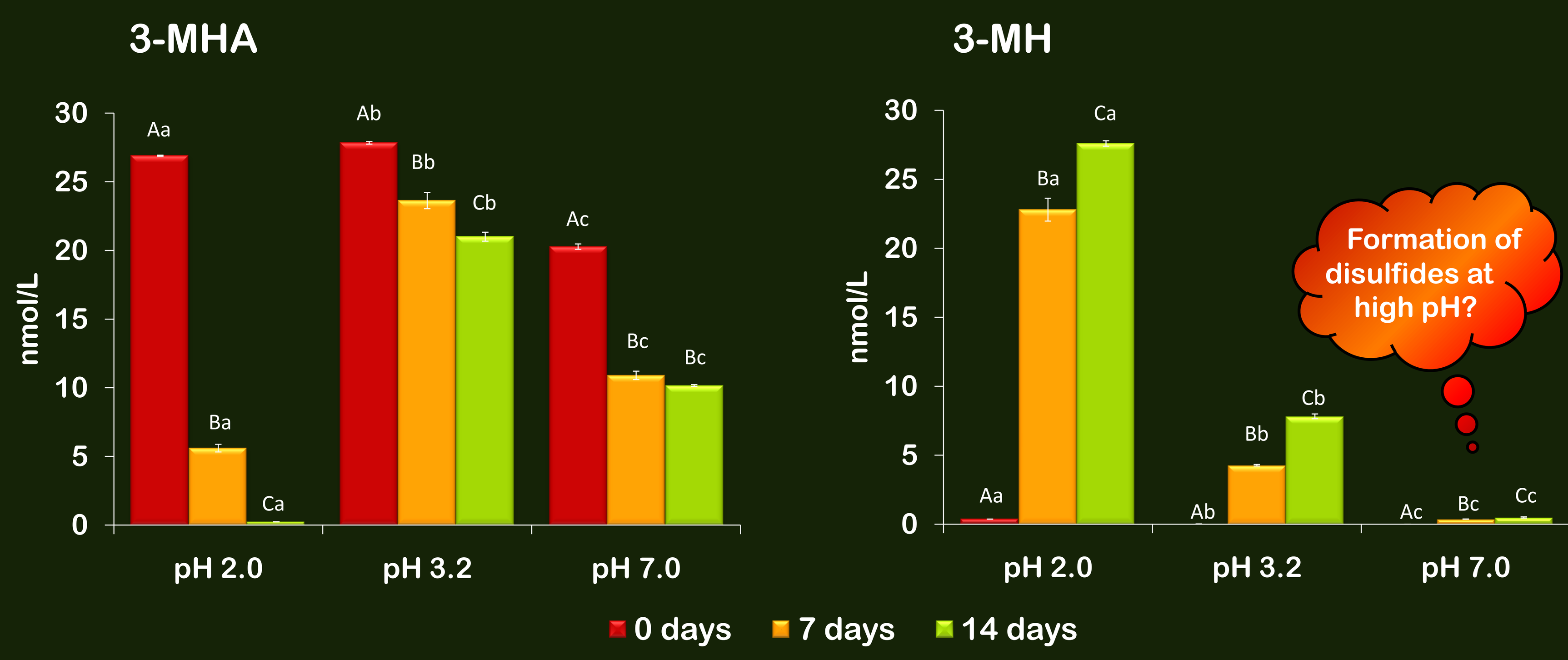


Figure 3: Effect of pH on varietal thiol stability in model wine (containing 5000 ng/L 3MHA only) stored at 45°C*

Table 1: Effect of pH on varietal thiol stability in Sauvignon blanc stored at 45°C*

time [days]	0 μ	0 σ		14 μ	14 σ		28 μ	28 σ	
3-MHA									
pH 2.0	28.2	0.1	Aa	0.1	0.1	Ba	0.0	0.0	Ba
pH 3.0	30.6	0.2	Ab	15.4	0.1	Bb	4.5	0.3	Cb
pH 3.25	30.4	0.0	Ab	16.8	0.7	Bb	8.6	0.8	Cc
pH 3.5	30.5	0.2	Ab	19.3	1.4	Bc	12.1	0.8	Cd
pH 7.0	19.0	0.5	Ac	9.2	0.1	Bd	3.5	0.9	Cb
3-MH									
pH 2.0	20.8	0.1	Aa	37.3	1.9	Ba	32.3	9.2	Ba
pH 3.0	19.3	0.7	Aa	33.9	0.7	Ba	25.3	0.4	Ca
pH 3.25	20.5	0.2	Aa	24.6	0.1	Ab	23.2	2.9	Aa
pH 3.5	20.1	0.9	Aa	21.4	2.8	Ab	21.4	0.7	Aa
pH 7.0	16.9	0.3	Ab	8.6	0.0	Bc	5.9	0.8	Cb

* Data are presented as means of single measurements of duplicate or triplicate flasks ± SD. Means sharing the same letter do not differ significantly [$p < 0.05$] between treatments at a specific time point [lower case] or within the treatment across time [upper case] by TUKEY's HSD test.)

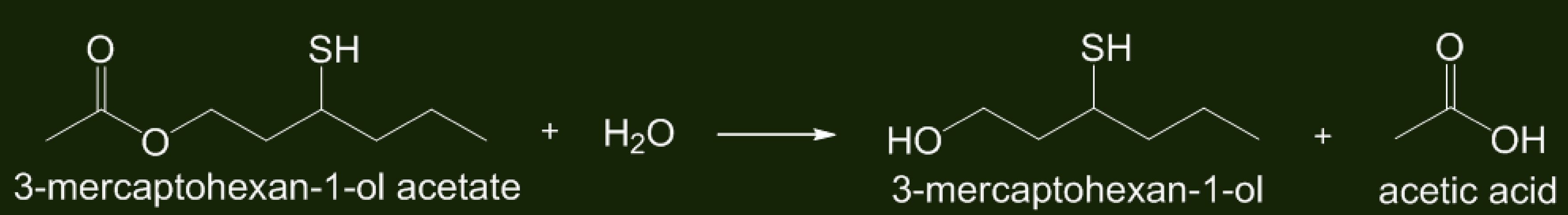
Conclusions

⇨ 3-MHA is the least stable varietal thiols, with an average loss of 63 % after 28 days of storage, largely unaffected by additions of antioxidants (Fig. 2a), suggesting a hydrolysis loss mechanism (Fig. 4)

⇨ Conversion of 3-MHA into 3-MH is indeed favoured at high temperature (Fig. 2) and low pH (Fig. 3, Tab. 1)

⇨ 3-MH stability is affected positively by antioxidants, and negatively by metals as well as polyphenols, resulting in a decline of 19 % (Fig. 2b), indicating an oxidative loss

Figure 4: 3-MHA hydrolysis



Loss of the passion fruit-type character in New Zealand Sauvignon blanc is mainly due to loss of 3-MHA via hydrolysis (perception threshold of 4 ng/L versus 60 ng/L for 3-MH)

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