“ACE” your Shiraz or Sauvignon blanc wine aroma

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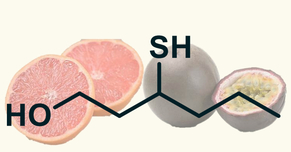
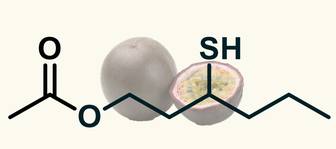
INTRODUCTION & AIMS

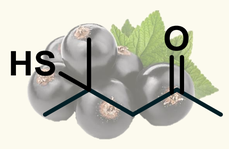
Varietal thiols such as 3-SH, 3-SHA, and 4-MSP are well-known for characterising Sauvignon blanc wine aroma by imparting sensory attributes such as ‘passion fruit’, ‘box-tree’, and ‘guava’.[1] Intriguingly, these potent aroma compounds are released during fermentation from the non-volatile L-glutathione (GSH) or L-cysteine (Cys) conjugated precursors, such as GSH-3-SH and Cys-3-SH, which more localised in grape skin. Thus, increasing the extraction of precursors from grape skin could improve the concentration of varietal thiols formed in wine and potentially enhance distinctive sensory attributes. It was hypothesised that this could be achieved using accentuated cut edges (ACE), a processing technique designed to break grape skin into smaller pieces and enhance extraction of grape skin contents.[2]



3-Sulfanylhexan-1-ol (3-SH)



3-Sulfanylhexyl acetate (3-SHA)

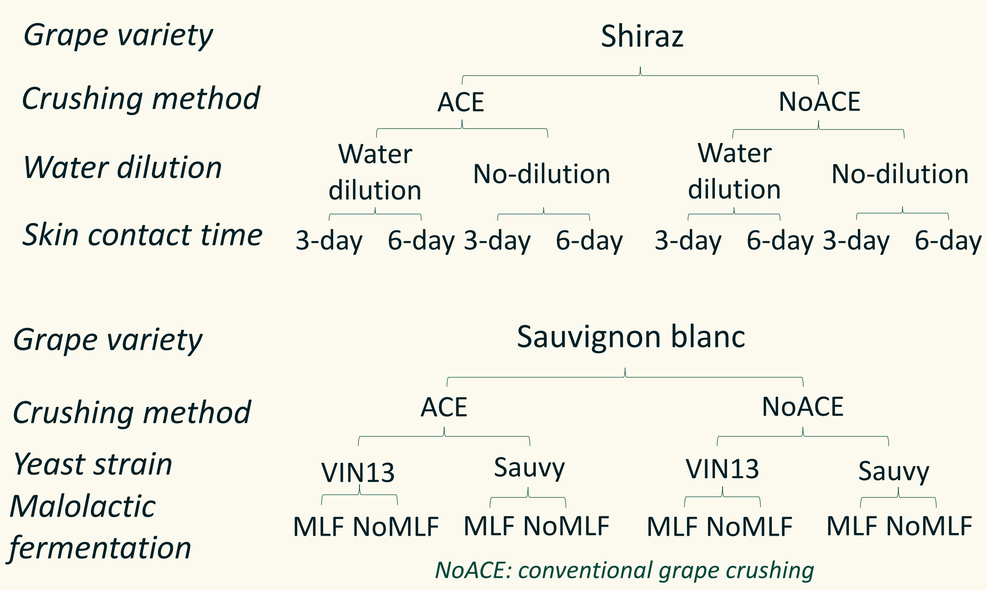


4-Methyl-4-sulfanylpentan-2-one (4-MSP)

The study aimed to evaluate:

- The release of varietal thiol precursors in grape must/juice due to ACE treatment.
- The concentrations of varietal thiols in the resultant wines due to ACE treatment.

MATERIALS & METHODS



NoACE: conventional grape crushing

HPLC-MS/MS: quantitation of varietal thiols and precursors

RESULTS

Shiraz[3]

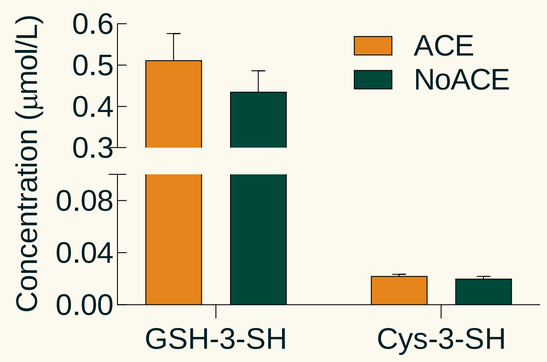


Fig. 1 *Concentrations of thiol precursors in Shiraz grape must.*

- Concentrations of varietal thiol precursors in Shiraz grape must were not significantly different between grape crushing method (**Fig. 1**).

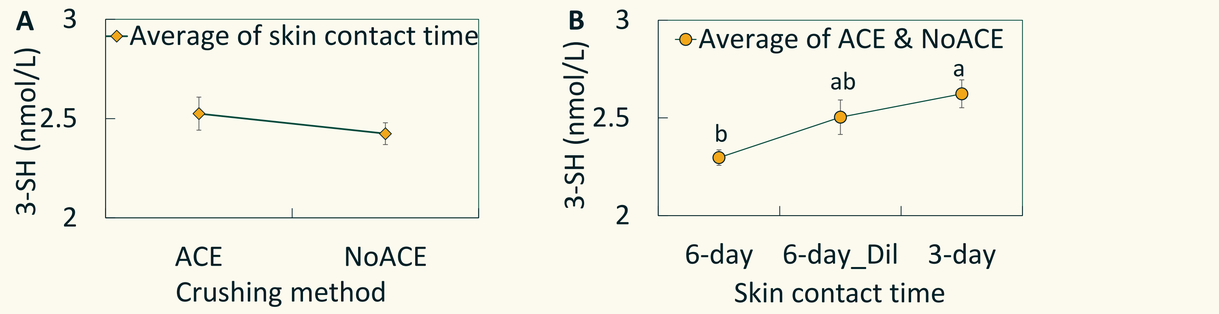


Fig. 2 *Concentrations of 3-SH in Shiraz wine showing impact of (A) crushing method and (B) skin contact time.*
“Dil” is abbreviated for water dilution that was applied to dilute Shiraz grape must (14 Bé → 13.5 Bé).

- Concentrations of 3-SH were above its odour detection threshold (60 ng/L, equivalent to 0.45 nmol/L) and ACE did not increase 3-SH (**Fig. 2A**).
- Treatment of 3-day skin contact time had significantly higher concentration of 3-SH than the 6-day skin contact time treatment ($p < 0.05$, **Fig. 2B**).

Sauvignon blanc

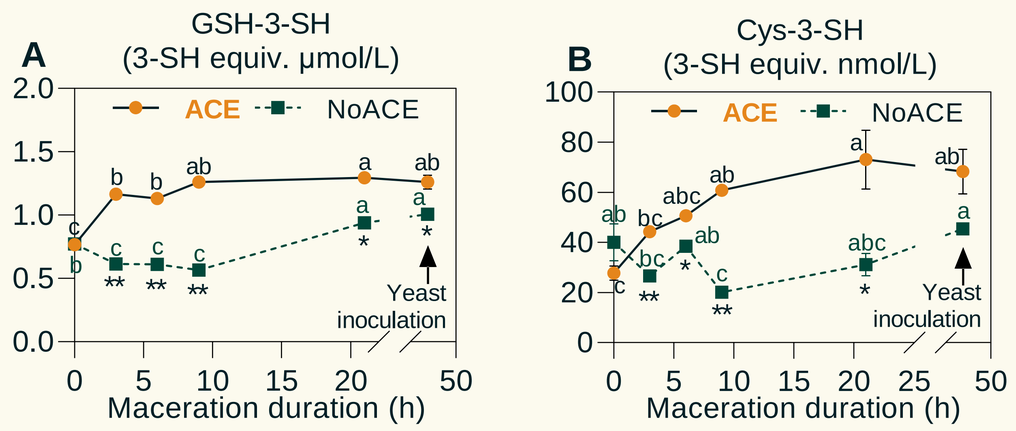


Fig. 3 *Evolution of thiol precursors in Sauvignon blanc juice during maceration.*
*Significant differences between ACE and NoACE treatments were revealed by repeated measures analysis of variance (ANOVA) at α = 0.05. * p < 0.05; ** p < 0.01.*
Different letters indicate significant differences in ACE or NoACE treatment along maceration duration assessed by one-way ANOVA at α = 0.05.

- ACE significantly increased extraction rate of GSH and Cys thiol precursors during cold maceration (**Fig. 3A & 3B**).
- The concentration of both precursors were significantly increased by the ACE treatment at the end of maceration (**Fig. 3A & 3B**) and at yeast inoculation for GSH-3-SH (**Fig. 3A**).

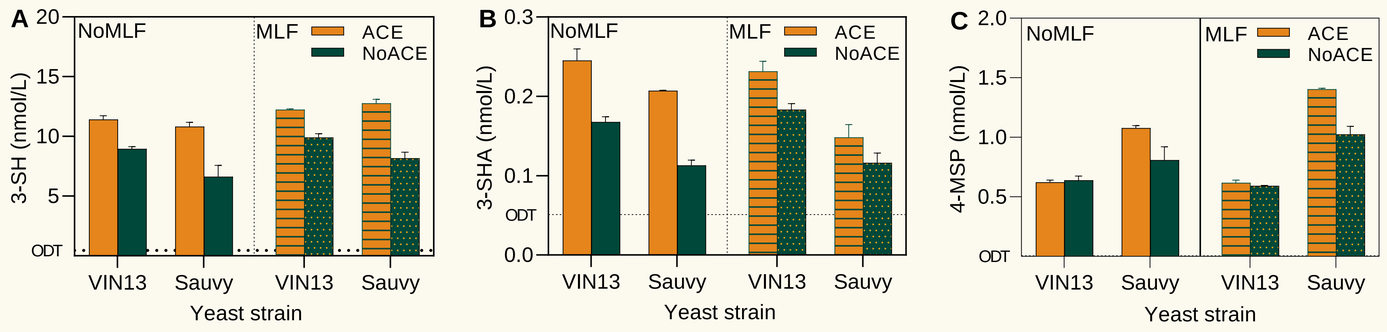


Fig. 4 *Concentrations (nmol/L) of (A) sum of 3-SH enantiomers, (B) sum of 3-SHA enantiomers, and (C) 4-MSP in Sauvignon blanc wines at bottling.*

- ACE and MLF significantly increased 3-SH concentration; VIN13 had higher 3-SH than Sauvy only in NoACE and NoMLF treatments (**Fig. 4A**).
- ACE and VIN13 significantly increased 3-SHA concentration; MLF generally led to a decrease in 3-SHA enantiomers (**Fig. 4B**).
- ACE, Sauvy, and MLF significantly increased 4-MSP concentration compared to NoACE, VIN13, and NoMLF, respectively (**Fig. 4C**).

CONCLUSIONS

- In Shiraz must/wine, ACE did not significantly increase thiol precursors and varietal thiols, but 3-day skin contact time had significantly higher concentrations of 3-SH than the 6-day treatment.
- In Sauvignon blanc wines, ACE significantly increased extraction rate and concentrations of thiol precursors.
- In Sauvignon blanc wines, varietal thiols were significantly affected by crushing methods, yeast strains, and malolactic fermentation, with ACE had higher 3-SH, 3-SHA, and 4-MSP than NoACE; VIN13 had more 3-SH and 3-SHA, but less 4-MSP than Sauvy; and MLF had higher 3-SH and 4-MSP, but lower 3-SHA than NoMLF.

(1) Coetzee, C. & Du Toit, W.J. *Food Res Int.* **2012**, 45 (1), 287-298.
(2) Sparrow, A.M.; Smart, R.E.; Dambergs, R.G.; Close, D.C.; *Am. J. Enol. Vitic.* **2016**, 67(1), 29-37.
(3) Wang, X.; Capone, D.L.; Kang, W.; Roland, A.; Jeffery, D.W. *Food Chem.* **2022**, 372, 131222.

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