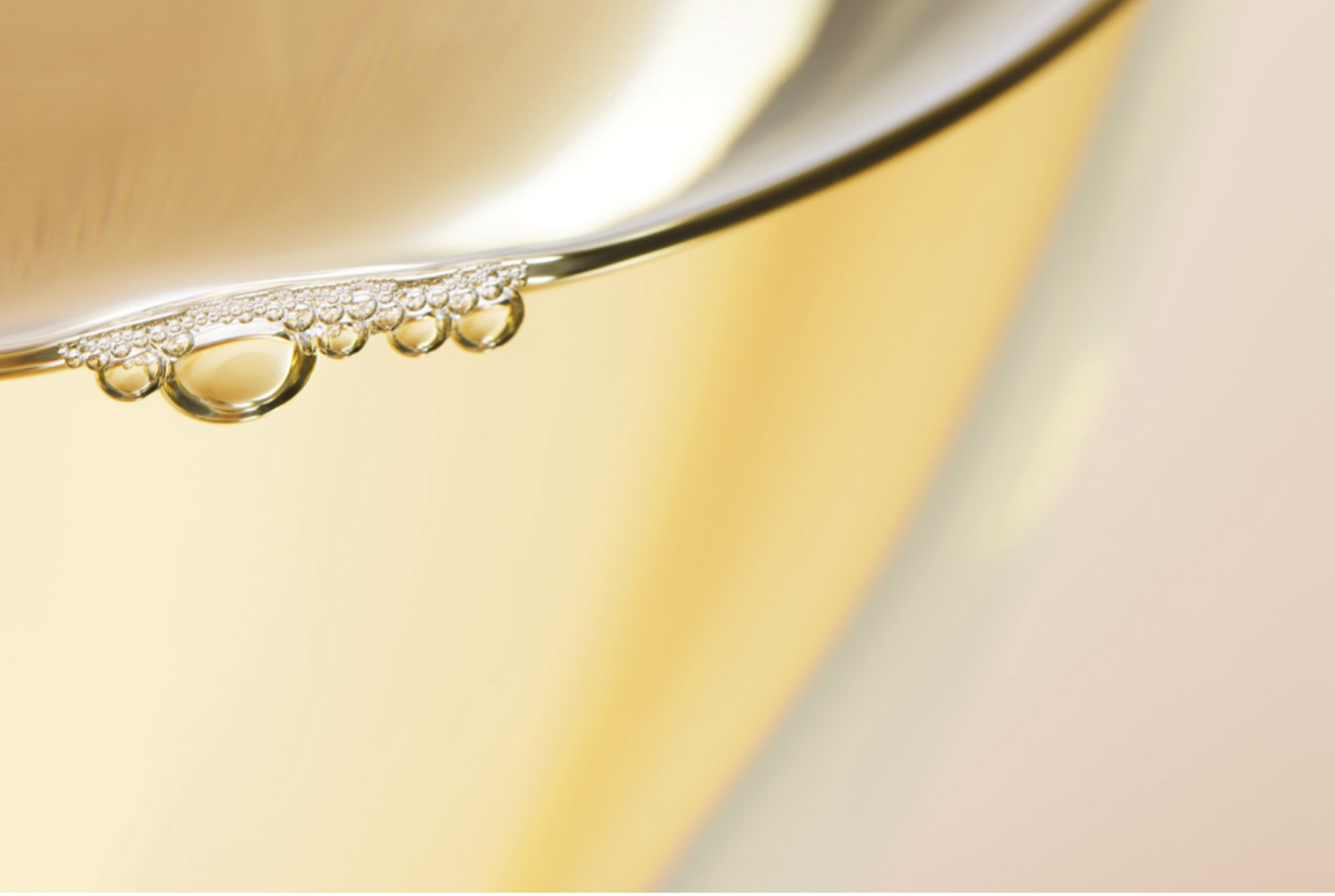

INCREASING VOLATILE THIOLS WITH SOURCES OF SULPHUR

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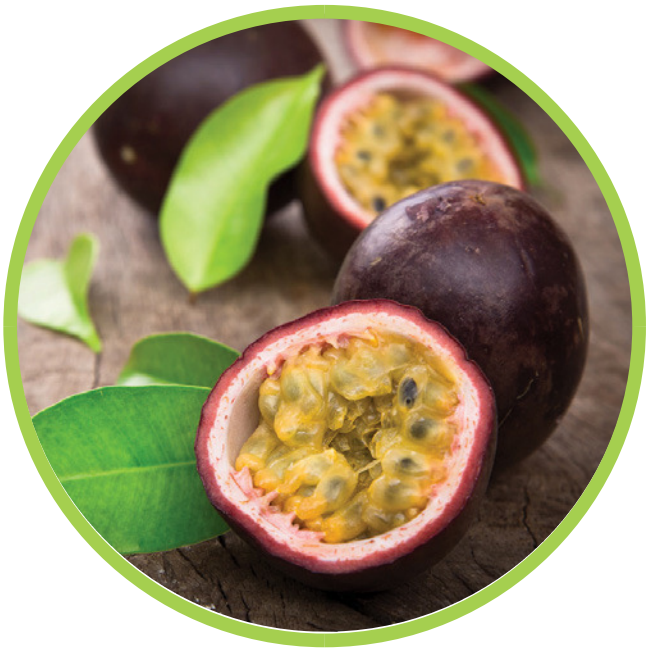
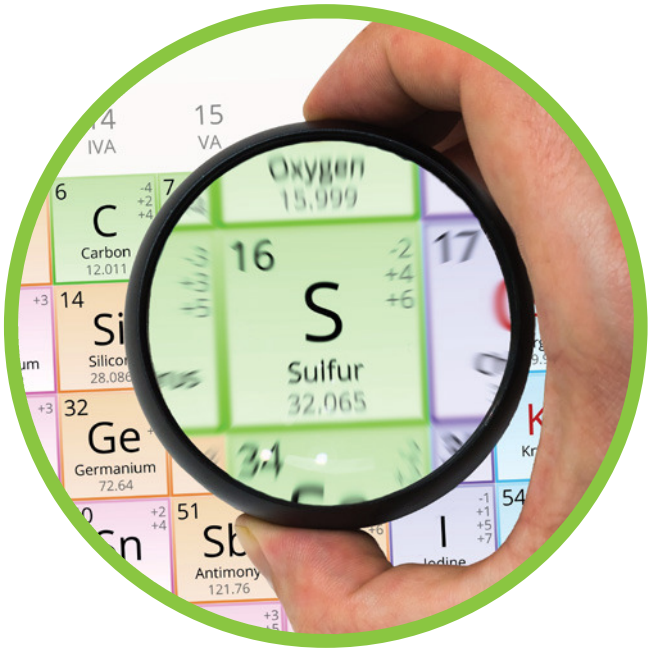
AIMS OF STUDY

The aim of the study was to determine the influence of different sulphur sources on the consumption of thiol precursors and the formation of volatile thiols.

EXPERIMENTAL LAYOUT

- All experiments were conducted in synthetic juice containing thiol precursors added in specific concentrations: 50 µg/L GLUMP and CYSMP (precursors for 4MMP) and 1000 µg/L GLUMH and 100 µg/L CYSMH (precursors for 3MH).
- Different sulphur containing compounds were added individually and in some cases in different concentrations to the synthetic juice.
- In experiment 1 elemental sulphur (1 mg/L), glutathione (50 and 70 mg/L), methionine (30 and 50 mg/L), cysteine (20 mg/L) and SO_2 (20 mg/L) were added individually to the juice.
- In experiment 2 the three amino acids that make up the glutathione molecule (cysteine, glycine and glutamic acid) were added to the synthetic juice individually and in different concentrations.
- In experiment 3 four concentrations of SO_2 (20, 30, 50 or 70 mg/L) were added to the synthetic juice.
- The synthetic juice was fermented with Zymaflore X5 (Laffort) at 20°C.
- Remaining concentrations of thiol precursors as well as released volatile thiols were measured after fermentation.





MAIN RESULTS

- Results confirmed GLUMH as the main precursor of 3MH and not CYSMH.
- The addition of glutathione (GSH) strongly inhibited the metabolisation of GLUMH. This result suggests that the yeast uses the precursor, GLUMH, as a source of glutathione. Yeast can use GSH for three reasons: to protect against oxidative stress, as a source of sulphur or as a source of the three amino acids that constitute the tripeptide (glutamic acid, cysteine and glycine).
- Glutathione addition increased 4MMP concentrations but decreased 3MH concentrations as a result of the inhibition of GLUMH metabolism. No effect was observed for 3MHA.
- The biggest increase effect was seen with the addition of 20 mg/L SO_2. Although an increase can be the result of SO_2 protecting volatile thiols from oxidation, it was also noted that there was higher precursor disappearance in the case of SO_2 addition.
- When 30 and 50 mg/L SO_2 were added only 3MH concentrations increased compared to the control, but the levels were lower than observed for the 20 mg/L SO_2 addition.
- 30, 50 and 70 mg/L SO_2 additions suppressed 3MHA formation.
- The addition of the amino acid cysteine at 20 mg/L led to an increase in 4MMP and 3MH. 30 mg/L addition decreased all three volatile thiols.
- The addition of the amino acid methionine increased 4MMP production at 30 mg/L addition but decreased it at the 50 mg/L addition.

Methionine at both addition concentrations either had no effect or inhibited production of 3MH. The inhibitory effect can be as a result of high concentrations of methionine being inhibitory to yeasts.

SIGNIFICANCE OF THE STUDY

This study indicated that the presence of sulphur containing compounds in the medium affects how the fermenting yeast will metabolise the thiol precursors. Yeast metabolises compounds for its survival, either because it needs it for food or structure building, or because it wants to detoxify it to protect itself. The limitations of this study include the fact that only one yeast was used in the trial and different yeasts might behave differently. The fermentations were also conducted in synthetic media, which had the result that very low levels of 3MH and 3MHA, not typical of real wines, were formed. It would be interesting to repeat the study in real grape must to observe the matrix effect.

REFERENCE

Yohanna Alegre, Vicente Ferreira, Purificación Hernández-Orte (2019). How does the addition of antioxidants and other sulfur compounds affect the metabolism of polyfunctional mercaptan precursors in model fermentation? *Food Research International* 122: 1-9.