Lesković, M., Bekker, M. Z., Shoba, S., Brand, J., & Du Toit, W. (2026). Effect of glass swirling on the removal of 'reductive' off-odours caused by H_2S in wine. *OENO One*, *60*(1).
https://doi.org/10.20870/oeno-one.2026.60.1.9616

SUPPLEMENTARY DATA



Figure S1. Custom-made anoxic chamber connected to the argon (Ar) gas bottle. The chamber was used for the additions hydrogen sulfide (H_2S) to the wine, in the atmosphere with less than 1 % of oxygen.



Figure S2. A 300 mL Schott bottles used in the experiment for the free hydrogen sulfide (H_2S) analysis. The analysis was done by using the 4LL gas-detection tubes (GDT). The repurposed fermentation barrel bung was used as a closure for the Schott bottle. The central hole of the bung served as the nitrogen inlet, while the H_2S GDT was inserted in the additional hole drilled on the side of the bung to serve as the outlet for the sparged gas. The bung was secured on the top of Schott bottles with firm rubber bands so as not to allow any gas leakages.

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Figure S3. The Schott bottles (Figure S2) used PVC tubing connected to a manifold containing 12 outlets which could be added or removed from the system. This allowed for the multiple treatments to be analysed simultaneously.

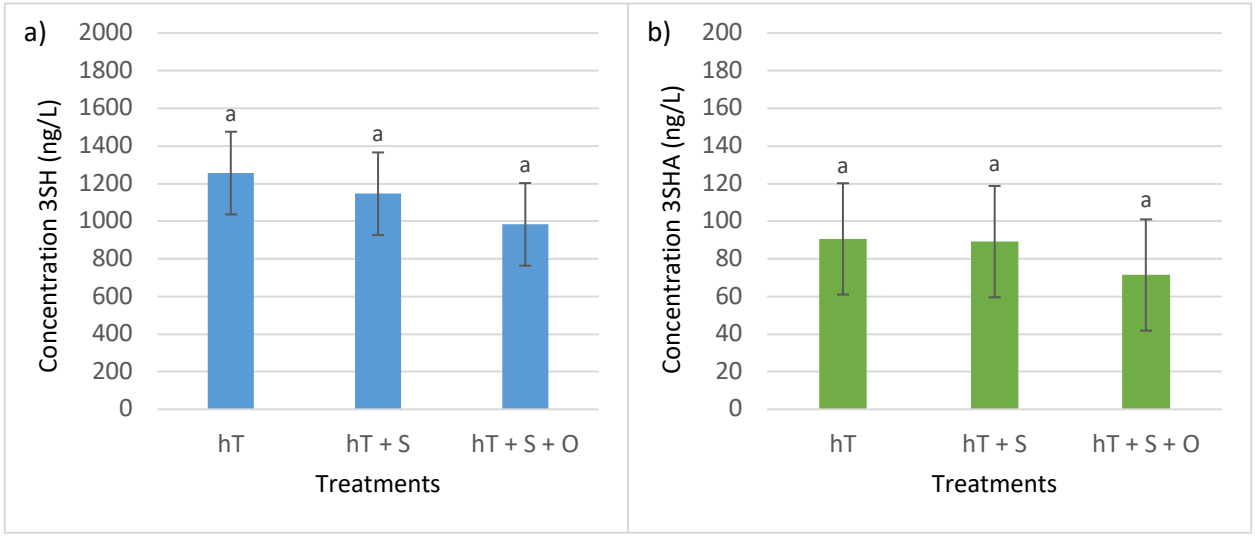


Figure S4. Concentrations (ng/L) of 3-sulfanylhexan-1-ol (3SH) (a) and 3-sulfanylhexyl acetate (3SHA) (b) added to the model wine (hT) and treated with 30-second wine glass swirling and covering for 15 minutes (hT + S); or treated with 30-second wine glass swirling and left uncovered for 15 minutes (hT + S + O). The treatments were performed in ambient air. Different letters indicate significant differences at $p < 0.05$.

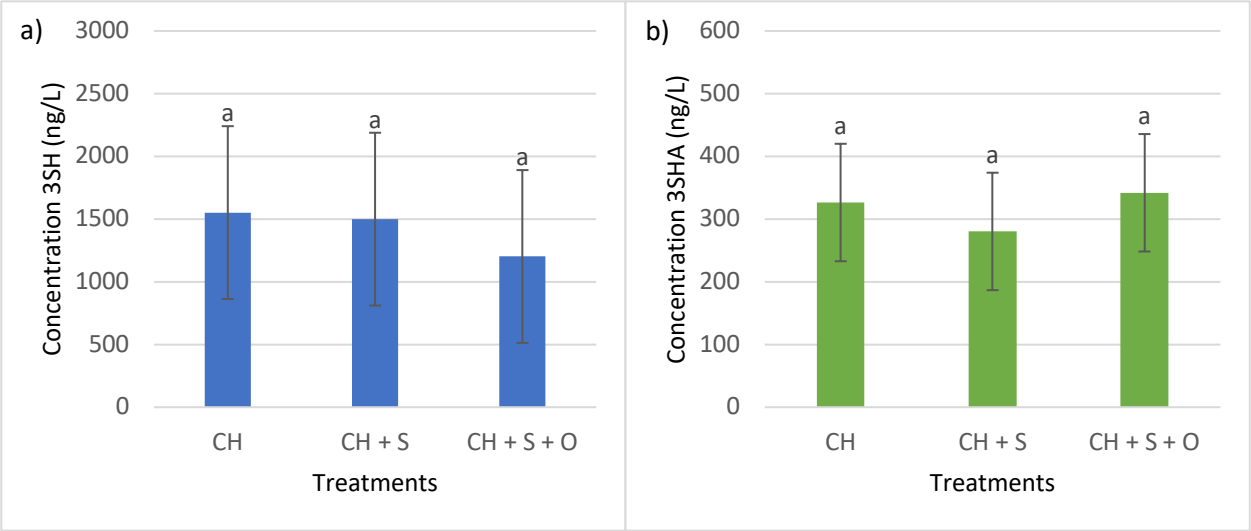


Figure S5. Concentrations (ng/L) of 3-sulfanylhexan-1-ol (3SH) (a) and 3-sulfanylhexyl acetate (3SHA) (b) naturally present in the Chenin blanc wine (CH) and treated with 30-second wine glass swirling and covered for 15 minutes (CH + S); or treated with 30-second wine glass swirling and left uncovered for 15 minutes (CH + S + O). The treatments were performed in ambient air. Different letters indicate significant differences at $p < 0.05$.

Table S1. Experimental design for model wine aroma evaluation.

	No H_2S addition, no swirling and glass closed	**H_2S addition, no swirling and glass closed**	**H_2S addition, swirled + glass closed**	**H_2S addition, swirled + glass uncovered**
Treatment 1	Low varietal thiols (T)	Low H_2S (T + H_2S)	T + H_2S + S	T + H_2S + S + O
Treatment 2	Low varietal thiols (T)	High H_2S (T + hH_2S)	T + hH_2S + S	T + hH_2S + S + O
Treatment 3	High varietal thiols (hT)	Low H_2S (hT + H_2S)	hT + H_2S + S	hT + H_2S + S + O
Treatment 4	High varietal thiols (hT)	High H_2S (hT + hH_2S)	hT + hH_2S + S	hT + hH_2S + S + O

Note: Model wines were treated with different concentrations of varietal thiols (low: T, high: hT) and hydrogen sulfide (low: H_2S, high: hH_2S). Wines were either covered after swirling (S) or left open after swirling (S + O).

Table S2. Experimental design for Chenin blanc wine aroma evaluation.

	No H_2S addition, no swirling and glass closed	**H_2S addition, no swirling and glass closed**	**H_2S addition, swirled + closed**	**H_2S addition, swirled + uncovered**
Treatment 1	CH	Low H_2S (CH + H_2S)	CH + H_2S + S	CH + H_2S + S + O
Treatment 2	CH	High H_2S (CH + hH_2S)	CH + hH_2S + S	CH + hH_2S + S + O

Note: Chenin blanc wines with naturally higher varietal thiol concentrations were treated with low (H_2S) and high (hH_2S) hydrogen sulfide levels. Wines were either covered after swirling (S) or left open after swirling (S + O).

Table S3. Reference standards used for training of the sensory panel.

Sensory attribute	**Reference standard**	**Concentration/quantity**	**Manufacturer**
Sweaty	3SH	5 mL of 2,000 ng/L 3SH	Sigma-Aldrich
Passion fruit	Passion fruit pulp	4 pips, 3 g of pulp	Local grocery store (Spar)
Guava	Fresh guava	5 g	Local grocery store (Checkers)
Pineapple	Canned pineapple pieces	20 mL of canned pineapple syrup	Rhodes
Peach/apricot	Fresh peach and apricot juice	15 mL of each juice	Liqui Fruit
Grapefruit	Fresh ruby grapefruit	10 g of flesh and 5 g of grapefruit peel	Local grocery store (Checkers)
Lemon	Fresh lemon	12 g of flesh and 5 g of lemon peel	Local grocery store (Checkers)
Apple	Fresh Golden Delicious apple	15 g	Local grocery store (Checkers)
Baked apple	Golden Delicious apple baked in an oven at 180 °C	10 mL baked apple puree	Local grocery store (Checkers)
Honey/syrup	Natural honey and golden syrup	10 mL of each	Little Bee honey, Illovo syrup
Floral	Elderflower cordial	15 mL	Gudgu
Grass/fresh green	Freshly cut grass	15 g	Local garden
Fermented/cider	Cider	10 mL	Hunter's Dry Cider
Boiled egg	Freshly boiled egg – boiled for 5 min	5 g	Nulaid
Cabbage	Cooked cabbage water	10 mL	Local grocery store (Checkers)
Sulfur/reductive	Verbal descriptor	The smell of household gas, H_2S	
Dusty	Verbal descriptor	The smell of dust driving on a dirt road	

All reference standards were presented in 50 mL amber glass bottles covered with foil.

Table S4. Removal of 40 mg/L sulfur dioxide (SO_2) in a model wine with precise acetaldehyde 0.75 % (AA) additions, to prevent free SO_2 interference during hydrogen sulfide (H_2S) analysis with 4LL gas detection tubes (GDT). The calculated added concentration of H_2S was 30 µg/L. The recovery rates are presented below.

	H_2S (µg/L)			**H_2S (µg/L)**		**H_2S**
Treatments	Rep 1	Rep 2	Rep 3	Average	Std	Recovery (%)
H_2S	22	21	20	21	0.61	70
H_2S + AA	22	20	21	21	0.45	70
H_2S + SO_2 + AA	21	22	22	21	0.34	71