

THE USE OF COMMERCIAL GRAPE TANNINS CAN INCREASE THE 3-MERCAPTOHEXANOL PRECURSORS IN JUICE AND AFFECT THE TROPICAL FRUITY CHARACTERISTICS OF WINE

Tomás Román Villegas¹, Roberto Larcher¹, Mario Malacarne¹, Loris Tonidandel¹, Daniele Zatelli¹ and Giorgio Nicolini^{1*}

¹ FEM Fondazione Edmund Mach, via E. Mach 1, 38010 San Michele all'Adige, TN, Italy

*Email: giorgio.nicolini@fmach.it

INTRODUCTION

So-called varietal thiol precursors 3-S-cysteinylo- and 3-S-glutathionyl-hexan-1-ol (Cys-3MH and GSH-3MH, respectively) were recently found for the first time in some commercial tannins, mainly derived from grape skin [1-2]. The maximum measured concentrations are rather high - about 300 and 200 mg/kg powder, respectively - thus suggesting several new potential applications for grape tannin. The ability of some commercial samples of this additive or clarifying agent to increase the wine free thiols - responsible for tropical and grapefruit-like notes - has already been observed on the laboratory scale [3]. Here, we give evidence of the possibility to enhance these such interesting sensory notes, and hence wine appreciation, using thiol precursors-rich tannins in semi-industrial Sauvignon Blanc and Aromatic Traminer vinifications.

MATERIALS & METHODS

The following effects were investigated:

- the **type of the grape tannin** supplemented (High thiol precursors vs Low precursors vs unspiked Control)
- the **yeast strain** used (VIN13 vs VL3)
- the **timing of tannin supplementation** (fermentation onset vs fermentation completion)

Effect of the type of tannin and yeast strain.

Sauvignon Blanc (SB; n=3) and Aromatic Traminer (TR; n=3) very clear juices were spiked with a grape tannin rich in precursors (H; Cys-3MH, 125 mg/kg; GSH-3MH, 162 mg/kg) and fermented. These were compared with the same juices spiked with a grape tannin poor in precursors (L; Cys-3MH, 0.1 mg/kg; GSH-3MH, 0.3 mg/kg) and with unspiked control juices (C). Neither H nor L contained 4MMP precursors. Taking account of the role of fermentation temperature on free thiol derivatives' liberation/formation [4], fermentations were carried out at 18-20°C using 2 yeast strains with lyase activity on thiol precursors. Argon blanketing was used to prevent oxidation (Figure 1).

Effect of the timing of the tannin supplementation

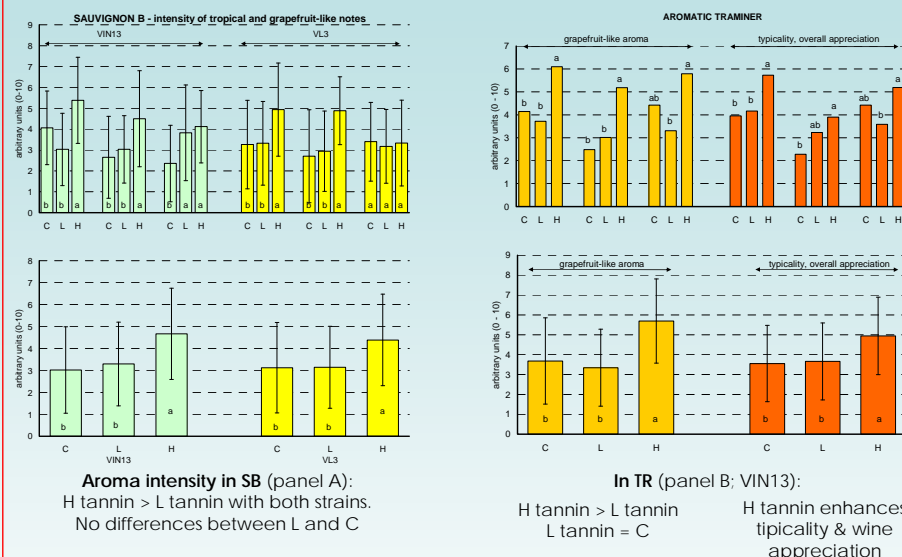
When the 3 Sauvignon Blanc control wines produced with the strain VIN13 had about 3 g/L of residual sugar, an aliquot was separated and supplemented with the precursor rich grape tannin (H; 500 mg/L). At the end of the fermentation spiked wines were processed as in Figure 1.

Analysis

Thiol precursors were analysed according to [1]. The orthonasal olfaction of wine - to avoid afteraromatic interferences [5-6] - was performed by 2 panels: A, made up of 17 judges expert in the evaluation of 3-mercaptohexanol and its acetate; B, 18 expert winemakers of Traminer. In Traminer, only the wines produced with VIN13 were subject to sensory analysis. Paired tests were evaluated according to [7]. STATISTICA v. 8.0 (StatSoft Inc.) was used in the other cases.

RESULTS

As expected, only the addition of the precursors' rich H tannin increased the thiol precursors in juice. The mean value of the control juices was lower in TR than in SB, particularly Cys-3MH (Figure 2).



CONCLUSION

- Only the addition of a grape tannin rich in thiol precursors significantly increases the perception of thiol-related aroma nuances, reasonably as a consequence of the release of 3-mercaptohexanol and subsequent formation of its acetate.
- This "additive" aroma does not prejudice the typicality of the Aromatic Traminer wine aroma.
- When applied near the completion of fermentation, the treatment is ineffective.
- No or very limited differences were perceived between VIN13 and VL3 as regards thiol-related aroma intensity.

REFERENCES

- 1) R. Larcher, L. Tonidandel, G. Nicolini, B. Fedrizzi, Food Chem., 141, 1196-1202 (2013a)
- 2) R. Larcher, L. Tonidandel, B. Fedrizzi, G. Nicolini, XIV Congreso Latinoamericano de Viticultura y Enología, Tarija (Bolivia) (2013b)
- 3) R. Larcher, L. Tonidandel, T. Román Villegas, T. Nardin, B. Fedrizzi, G. Nicolini, Food Chem. 166, 56-61 (2015)
- 4) I. Masneuf-Pomarède, C. Mansour, M.-L. Murat, T. Tominağa, D. Dubourdieu, Int. J. Food Microbiol., 108, 385-390 (2006)
- 5) C. Starckenmann, B. Le Calvé, Y. Niclass, I. Cayeux, S. Beccucci, M. Troccaz, J. Agric. Food Chem. 56, 9575-9580 (2008)
- 6) C. Starckenmann, Y. Niclass, J. Agric. Food Chem. 59, 3358-3365 (2011)
- 7) E.B. Roessler, R.M. Pangborn, J.L. Sidel, H. Stone, J. Food Sci. 43, 940-943, 947 (1978)
- 8) M. Subileau, J.-M. Salmon, R. Schneider, E. Degryse, Enoforum 2008 Innovation et Performance, Arezzo (I), poster n. 4, 58-59 (2008)

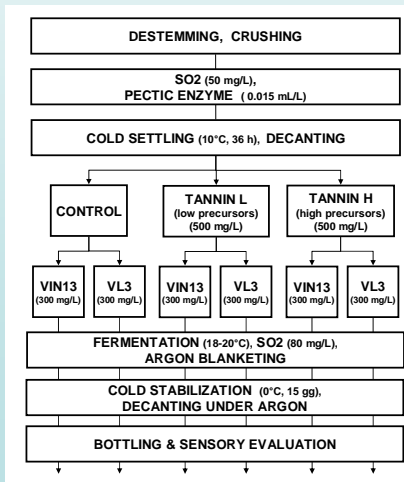


Figure 1. Experimental protocol applied to 3 Sauvignon B. and 3 Aromatic Traminer grapes.

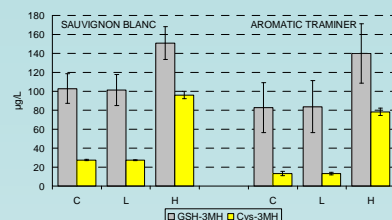


Figure 2. Content of thiol precursors in juice (mean ± st.dev.; n=3 juices).

Effect of the yeast

No differences were found as regards the thiol-related aroma intensity

variety	panel	grape lot	VIN13	VL3	sign.	VIN13	VL3	sign.	
SB	A	(n=17)	1	8	9	n.s.			
			2	9	8	n.s.	26	25	n.s.
			3	9	8	n.s.			
TR	B	(n=18)	1	13	5	0.05			
			2	10	8	n.s.	30	24	n.s.
			3	7	11	n.s.			

Comparison between the supplementation times

Thiol-related aroma intensity is higher with early tannin supplementation. Supplementation near the completion of fermentation is ineffective, confirming the early fermentative formation of the free varietal thiols [8] (Subileau et al. 2008).

SB grape lot; VIN13	fermentation onset	near fermentation completion	sign.	fermentation onset	near fermentation completion	sign.
1	16	1	0.01			
2	12	5	n.s.	40	11	0.001
3	12	5	n.s.			

(panel A)