UNIVERSITÀ DEGLI STUDI DI MILANO

Formation and prevention of light-struck taste in white wine

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INTRODUCTION

- ✓ Light-struck taste is a defect that can occur in white wines bottled in clear glass and exposed to wavelengths in the range 370-450 nm [1-3] usually for a few hours or days.
- ✓ The wine spoilage has been mainly ascribed to the volatile sulfur compounds, methanethiol and dimethyldisulfide, responsible for the cooked cabbage-like aroma [4,5].
- ✓ Many white wines can develop the light-struck taste owing to the occurrence of riboflavin as photosensitizer [6,7].
- ✓ Amounts of RF below 100 μg/L are reported as effective in decreasing the spoilage risk, therefore the appearance of the light-struck flavor can be prevented or minimized by decreasing the level of RF in wine [6].
- ✓ The presence of RF in wine is mainly due to the metabolism of *Saccharomyces cerevisiae* for which RF synthesis is a strain-dependent property [8].
- ✓ Relatively low concentrations of charcoal (50 mg/L) was effective for removing RF [8], but the addition of this adjuvant should be limited due to the negative side effects on sensory attributes.

AIMS

To limit the appearance of the light-struck taste by the addition of:

- ✓ Antioxidants, as sulfur dioxide and glutathione;
- ✓ Wood tannins, as chestnut, galla and oak.

MATERIALS AND METHODS

Provoking the light-struck taste

Model wine solution (5 g/L tartaric acid, ethanol 12% (v/v), pH 3.2) was added with RF (200 μg/L) and methionine (Met) (3 mg/L) in presence of:

- •Wood tannins for enological use: 40 mg/L
- •Sulfur dioxide: 50 mg/L
- •Glutathione: 40 mg/L (in combination with galla tannin)

Samples were exposed to light for 2 hours into an illumination apparatus with and without oxygen removal before tightly close the bottles.

Determination of chemical parameterts

The appearance of the light-struck taste was monitored by means of:

- •Riboflavin (UPLC-UV)
- •Methionine (HPLC-FL)
- •Volatiles compounds (SPME-GC-MS)

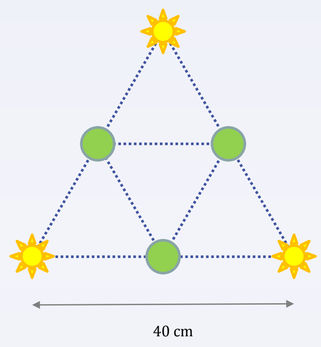

Figure 1: Illunkination scheme employed for the study.

RESULTS

- ✓ The RF was completely degraded by light independently to the presence of Met.
- ✓ On the contrary, this amino acid underwent to photodegradation only in presence of RF.

	O_2			no O_2		
	Decrease %		*Molar ratio*	*Dim%*		*Molar ratio*
	Met	*RF*		*Met*	*RF*	
No tannins	18	100	7.8	27	100	9.2
Chestnut tannins	18	100	5.5	30	100	9.8
Oak tannins	21	100	6.6	24	100	9.6
Galla tannins	11	100	3.9	20	100	8.2

Table 1: Decay of riboflavin (RF) and methionine (Met) after light exposure under saturation of oxygen and anoxic conditions in presence of wood tannins.

- ✓ The addition of sulfur dioxide limited the formation of the defect.
- ✓ No additional effect due to the addition of glutathione in comparison to galla tannins alone.
- ✓ Increasing concentrations of RF led to major levels of volatile sulfur compounds as well as higher amounts of Met.

- ✓ Wood tannins exerted a protective effect.
- ✓ Lowest levels of volatiles were found when the gallotannins were added.

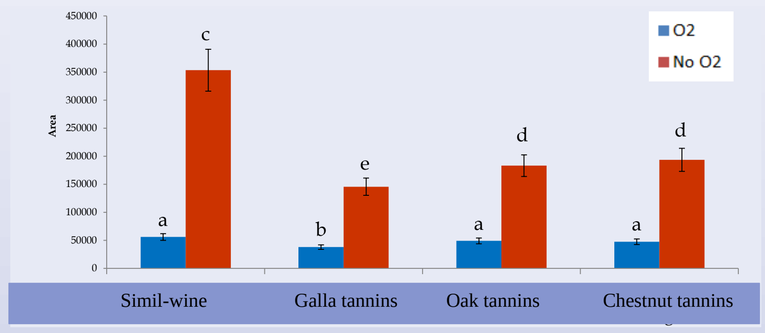

Figure 2: Formation of methanthiol after the light exposure.

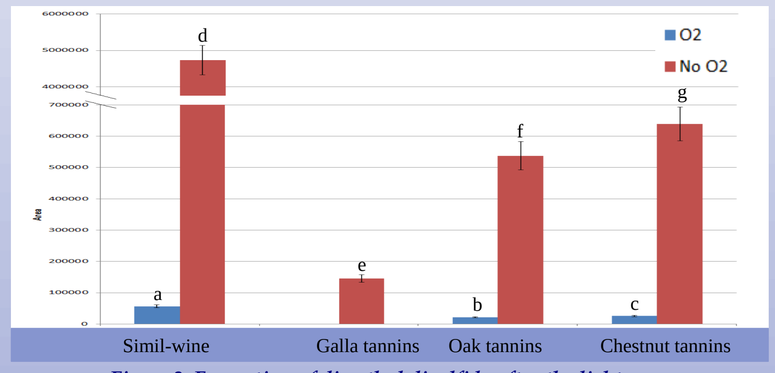

Figure 3: Formation of dimethyl disulfide after the light exposure.

- ✓ The volatiles were lower in presence of both chestnut and oak tannins in comparison to the model solution.
- ✓ Differences in the content of oxidized phenols were found: highest in galla tannins (89%) followed by chestnut tannins (69%) and oak tannins (59%).
- ✓ The addition of an oxidized phenol, namely *p*-benzoquinone, was carried out and negligible perception of the light-struck taste was found suggesting the protective effect of quinones.

CONCLUSIONS

- ✓ The molar ratio riboflavin: methionine reached 1:20 and also the level of methionine plays a noticeable role on the light-struck taste
- ✓ The anoxic condition favors the appearance of the light-struck taste
- ✓ The sulfur dioxide exerts a protective effect maybe due to the formation of a complex riboflavin-sulfur dioxide making the vitamin less susceptible to the photo-degradation
- ✓ The use of wood tannins can limit the formation of this defect probably due to their combined effects of shading the wine and scavenging the sulfur-containing compounds responsible for the appearance of the light-struck taste.

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