

Aim

This research investigates the impact of early oxygen exposure, also during malolactic fermentation (MLF), on pigments and color of a red wine from Sangiovese grapes.

Methods

In order to tune up the oxidation-reduction potential right after maceration, a Sangiovese wine (ethanol: 13.5% v/v; pH: 3.73; total acidity: 7.4 g/L; volatile acidity: 0.38 g/L) was exposed to dose-controlled additions of oxygen (V1_O_x) beginning at the draining off, during MLF, as long as 3 months over lees in a stainless steel tank. A control wine (V2_no O_x) received no gas addition at all. Both wines were stored into the multifunctional tank Onda® (10 hL, Ghidi Metalli Srl, Fig. 1) with automatic gas injection system. The main oenological parameters, phenolic compounds, and chromatic properties were investigated at: draining off, MLF, and 12 months of ageing (3 months over lees, 9 months in bottle).



Fig. 1 Multifunctional tank Onda® (Ghidi Metalli Srl).

Results

As expected¹⁻³, the decrease of total and monomeric anthocyanins occurred faster throughout the MLF and slowly during the further 12 months of ageing (Fig. 2). The effect of oxygen exposure on both classes appeared significant only at the end of 3 months over lees, with lower anthocyanin levels in V1_O_x wine (-10 mg/L).

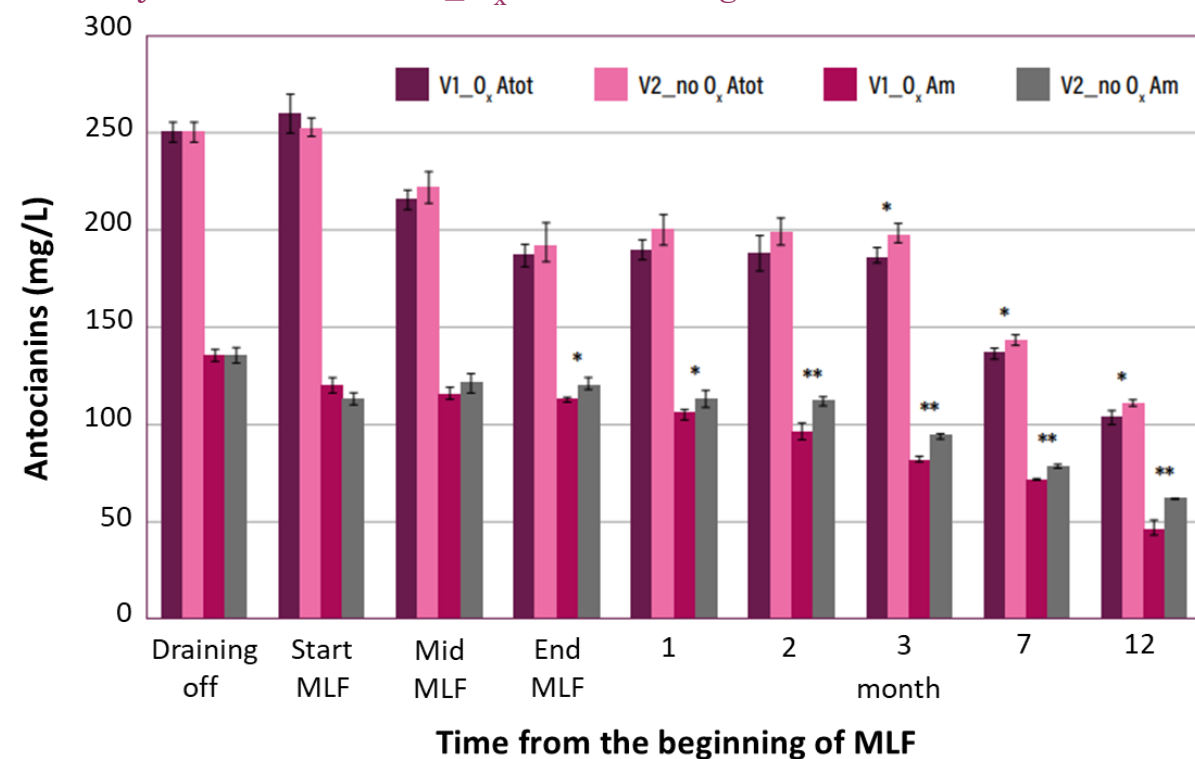


Fig. 2 Total (Atot) and Monomeric (Am) anthocyanins in wines V1_O_x and V2_no O_x during ageing. Significance level: *p<.05; **p<.01; ***p<.001.

The slight difference in CI values observed at the end of MLF (0.56 in V1_O_x vs 0.54 in V2_no O_x) became more evident over the subsequent ageing months (0.50 in V1_O_x vs 0.45 in V2_no O_x at 12th month) (Table 1). A similar beneficial trend for the quality of color was observed for H values (0.92 in V1_O_x vs 0.96 in V2_no O_x at 12th month). Regarding the contribution to the red color of wine, at the draining off it was mainly ascribable to the oligomeric (dAT 84%) and polymeric pigments (dTAT 10%). Thereafter, the molecular complexation of pigments increased the percentage of polymeric forms (35% at the end of MLF). However, only after 12 months of ageing, the positive effect of the early oxygen exposure on red color stabilization became significant in terms of dTAT (65% in V1_O_x vs 58% in V2_no O_x) and dAT (30% in V1_O_x vs 36% in V2_no O_x).

Table 1 Chromatic properties of wines V1_O_x and V2_no O_x.

		Draining off	Start MLF	Mid MLF	End MLF	1	2	3	7	12
		month								
CI	V1_O _x	0,561	0,537	0,532	0,559	0,520	0,541	0,526	0,519	0,500
	V2_no O _x	0,561	0,528	0,546	0,540	0,447	0,469	0,463	0,460	0,452
H	V1_O _x	0,630	0,640	0,704	0,828	0,885	0,910	0,944	0,919	0,923
	V2_no O _x	0,630	0,680	0,699	0,838	0,846	0,867	0,903	0,936	0,959
CEI	V1_O _x	-0,58	-0,563	-0,423	-0,208	-0,130	-0,099	-0,055	-0,084	-0,083
	V2_no O _x	-0,58	-0,540	-0,430	-0,193	-0,182	-0,154	-0,107	-0,085	-0,043
% dTAT	V1_O _x	10	10	24	35	37	52	47	48	65
	V2_no O _x	10	10	21	34	37	52	47	48	58
% dAT	V1_O _x	84	84	71	54	54	38	44	45	30
	V2_no O _x	84	87	73	55	54	38	44	45	36
% dAL	V1_O _x	6	6	5	11	9	10	9	7	5
	V2_no O _x	6	5	6	11	9	10	9	7	6

CI color intensity; H hue; CEI color evolution index; %dTAT percentage of absorbance at 520 nm due to polymeric pigments not decolorized by SO₂; %dAT percentage of absorbance at 520 nm due to polymeric pigments decolorized by SO₂; %dAL percentage of absorbance at 520 nm due to monomeric anthocyanins.

Conclusions

Early oxygen exposure, useful for tuning up the oxidation-reduction potential right after maceration and during MLF, significantly improved the stability of pigments and color properties of Sangiovese red wine, from 12 months of ageing on.

References

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- Martínez-Pinilla O, Martínez-Lapuente L, Guadalupe Z, & Ayestarán B (2012) Sensory profiling and changes in colour and phenolic composition produced by malolactic fermentation in red minority varieties. Food Research International, 46: 286-293.