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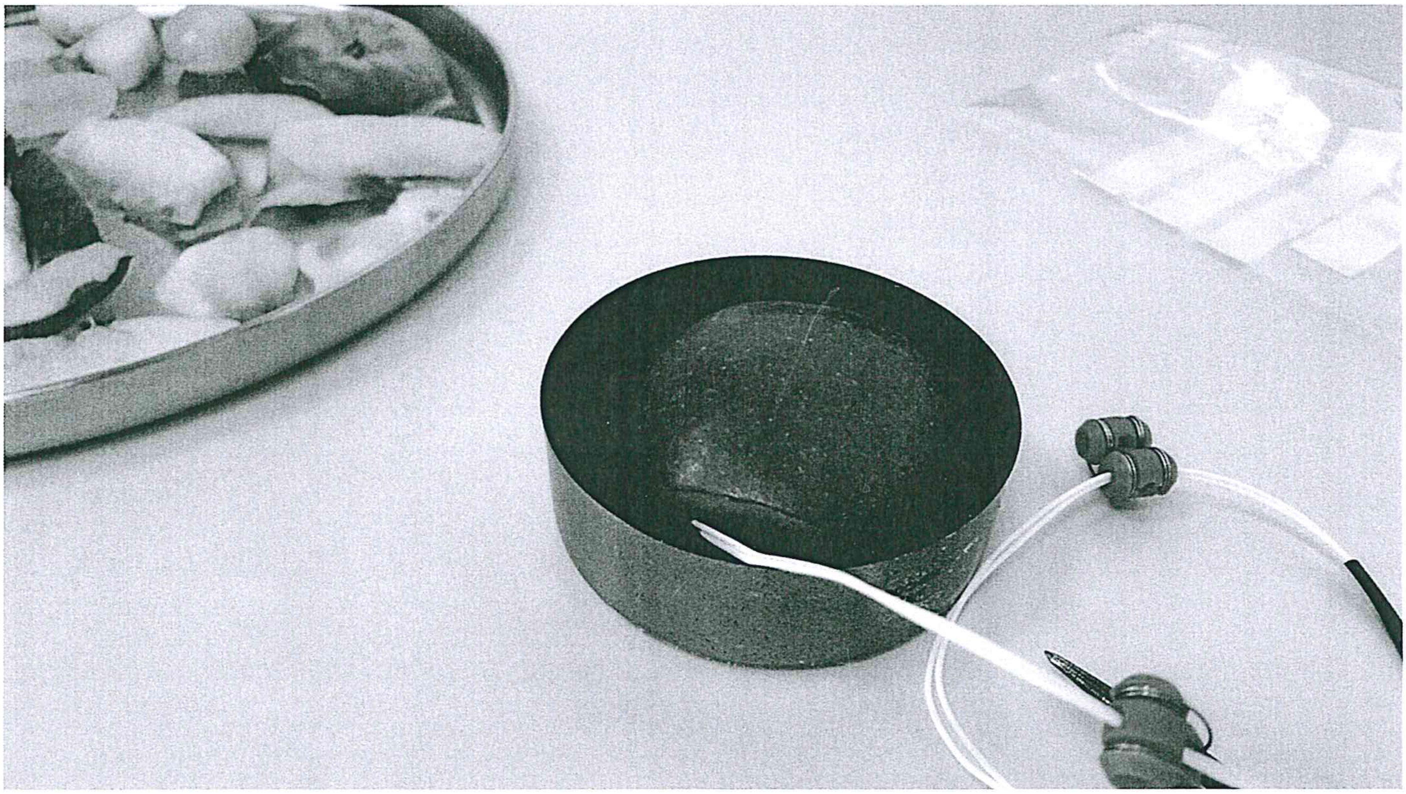

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Effect of Short and Continuous Post-Harvest Ozone Treatment on Skin Phenolic Compounds of Fresh and Withered Red Winegrapes

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Recently, the use of gaseous ozone has been proposed as sanitizing agent on winegrapes in order to control mycobiota after harvest or during grapes withering. This work shows results of the effects of continuous gaseous ozone treatment on phenolic compounds composition and extractabilities of fresh and withered grapes, in order to understand if ozone affect the phenolic quality of grapes, and as consequence, of the produced wines.

Effetto di trattamenti di ozono post-raccolta sui composti fenolici delle bucce di uve rosse da vino a maturità fenolica e appassite

Di recente, l'utilizzo dell'ozono gassoso è stato proposto come agente sanificante sull'uva da vino, al fine di controllare lo sviluppo della flora microbica e fungina post raccolta e durante l'appassimento. Questo lavoro mostra i risultati dell'influenza di trattamenti di ozono gassoso sui composti fenolici e la loro estraibilità, al fine di comprendere se apportino cambiamenti sulla qualità fenolica delle uve e, di conseguenza, dei vini prodotti.

Key words: Ozone treatments, phenolic compounds, extractability, post-harvest treatment, withering.

1. Introduction

In accordance with the PhD thesis project previously described (Paissoni, 2016), this poster reports the main results of the first two activities concerning:

A1) Phenolic compounds extractability in different technological treatments such as ozone treatment on grapes at harvest and during withering carrying out simulated macerations (A1.1); phenolic compounds analytical determination (A1.2).

A2) Phenolic compounds chemical characterization on grape at phenolic maturity and after withering through spectrophotometric and liquid chromatography methods (A2.1)

2. Materials and Methods

Vitis vinifera L. cv Nebbiolo and Barbera, chosen for their different phenolic compounds features, were:

1) post-harvest treated for 24 and 72 hours with gaseous ozone (30 μL/L) compared to a control;
2) withered at 10% and 20% weight loss (WL) at 30 μL/L and compared to air exposed samples.

Grape phenolic composition at harvest and after withering were assessed, and simulated maceration were carried out. Skin anthocyanins (TA), oligomeric (FRV, as flavanols reactive to vanillin) and polymeric flavanols (as PRO, as Bate-Smith reaction) were assessed at different points of maceration (6, 24, 4, 96, 168 and 240 hours), and individual anthocyanins were analyzed in grapes and at the end of maceration. Cell wall (CW) composition was analyzed on grapes skins and related with phenolic compounds extactability through discriminant analysis.

3. Results and Discussion

3.1 Ozone post-harvest treatment on fresh grapes

Phenolic compounds extractability results are shown in Table 1. Ozone did not affect significantly the final extraction yield of TA, PRO and FRV in Barbera, although TA and FRV extractabilities were higher in control samples than in ozone-treated samples during the first stages of maceration (data not shown). In Nebbiolo, the final TA extraction yield was positively influenced by the ozone treatment. Final PRO and FRV extractability also increased in both ozone-treated samples compared to the control. No significant differences were found among treatments for individual anthocyanins in both cultivars. Therefore, the use of ozone in red varieties prior to winemaking can be considered since it did not negatively affect the extractability of skin TA, PRO and FRV.

3.2 Ozone treatment during withering

At the end of maceration, FRV, TA and PRO extractability was not affected by the treatment in Barbera, whereas ozone-treated Nebbiolo samples showed a significantly lower TA extraction (Table 1). At the end of maceration, lower di-substituted anthocyanins relative percentages were found (data not shown), which can explain the higher Nebbiolo sensitivity to ozone treatment. Considering Nebbiolo FRV, lower extraction were found in ozone-treated samples at 20% WL. These results highlighted that ozone effects on TA and FRV extractabilities are variety dependent, but an opposite trend was found with respect to the post-harvest treatment, possibly due to the dehydration. PRO extraction was not influenced by the treatment.

Table 1 *Phenolic compounds extractability (%) at the end of simulated maceration.*

Variety		Nebbiolo			Barbera		
Treatment	**Samples**	**TA**	**FRV**	**PRO**	**TA**	**FRV**	**PRO**
Post-harvest	Control	59.9±3.4a	78.8±3.6°	80.5±4.6°	63.4±0.4	66.1±6.0	36.5±8.4
	24OZ	68.6±2.0b	86.1±3.8ab	89.1±1.9b	59.9±2.6	59.4±9.4	31.4±4.2
	72OZ	64.2±1.5c	90.5±3.7b	89.6±2.7b	59.7±0.8	50.0±4.6	29.2±1.8
	Sign	**	*	*	ns	ns	ns
Dehydration	10%WL Ar	65.8±2.6	82.9±0.7	70.87±3.2	47.3±6.5	55.5±4.9	54.7±3.9
	10%WL OZ	56.7±4.6	81.9±0.2	69.69±1.0	46.1±0.4	60.4±5.1	50.7±1.0
	Sign	*	ns	ns	ns	ns	Ns
	20%WL Ar	55.1±0.8	64.0±0.8	50.4±2.1	45.1±2.1	53.1±3.2	51.0±3.6
	20% WLOZ	47.4±1.2	58.4±1.7	52.5±2.0	49.2±3.8	54.2±5.8	53.5±5.4
	Sign	*	*	ns	Ns	ns	ns

Differences in CW composition were found for the content of non-cellulosic glucose, uronic acids and lignin in both the varieties, and cellulosic glucose only in Nebbiolo (Fig. 1). Different skin CW composition can influence the phenolic compounds extraction (Hernández-Hierro *et al.*, 2014; Quijada-Morín *et al.*, 2015). In ozone-treated Nebbiolo, CW with higher cellulosic glucose and lignin contents could justify the lower TA extractability (Hernández-Hierro *et al.*, 2014).

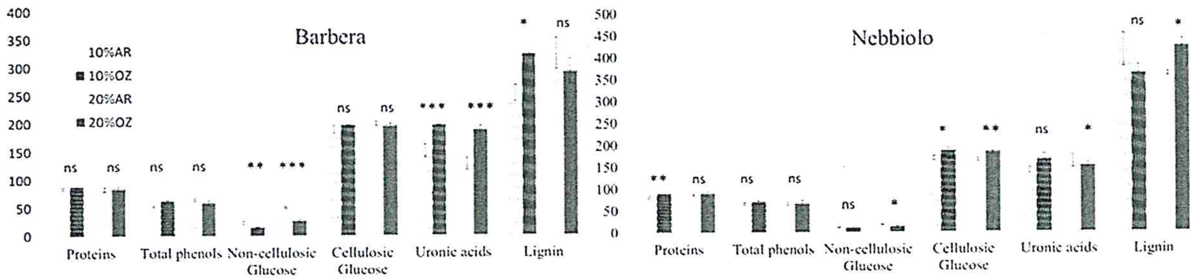

Figure 1 *Cell wall composition (mg/g cell wall material).*

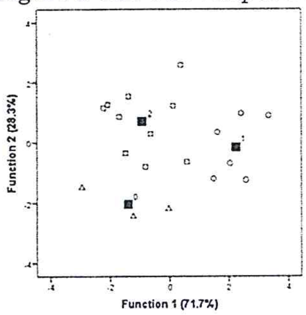

Figure 2 *0: fresh grape; 1: air-exposed; 2: ozone-treated.*

Quijada-Morín *et al.* (2015) found a positive correlation between cellulosic glucose content and FRV extraction, whereas in our case cellulosic glucose seems to reduce FRV extraction in Nebbiolo. Discriminant analysis allowed the correct classification of 89.5% of samples according to the treatment. Fig. 2 shows the two discriminant functions: F1, accounting for 71.7% of cumulative variance, was mainly related to non-cellulosic glucose (2.063), cellulosic glucose (-1.307), lignin (1.071), and total phenols (-1.031). The highest positive F1 values corresponded to air-exposed samples. F2 accounted for 28.3% of variance and was mainly associated with cellulosic glucose (1.063) and lignin (1.064), ozone-treated grapes showing the highest positive values. Considering these results, ozone treatment effects during withering can be variety-dependent and related to weight loss, because no influence was found in Barbera but lower TA extraction in Nebbiolo after ozone treatment.

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