

# Microwave-assisted maceration and stems addition in Bonarda grapes: Effects on wine chemical composition over two vintages

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## Abstract

Bonarda, the second red grape variety in Argentina, produces high yields per hectare generating, in several cases, low quality wines. Microwave-assisted extraction (MW) is a novel extraction technique for winemaking, widely applied in other foods. Stems addition (S) during vinification can be a sustainable technology for phenolic and aroma contribution without additional cost. Therefore, this study aimed to evaluate the combined effect of MW application with stem additions in different conditions, before fermentation, on the chemical composition of Bonarda wines. During two consecutive vintages (2018 and 2019), the experimental design consisted of ten treatments (two factors) by triplicate. Two maceration strategies (Factor 1) were applied [control (C), and microwaved-assisted extraction after grape crushing (MW; 2450 MHz, 7600 W, 45–50 °C)], combined with five stem-contact conditions (Factor 2) [control without stems (WS), 50% stems addition (S50), 50% stems addition + MW of the stems (S50MW; 2450 MHz, 7600 W, 60 °C), 100% stems addition (S100), 100% stems addition + MW (S100MW)]. Wines were analyzed for basic chemistry, phenolic composition and color parameters, polysaccharides, and aroma profiles. The 2018 wines showed higher pH and lower volatile acidity with stem additions and MW application in both matrices (grapes and stems). Stem additions increased tannin content by >55% (S100) and by >25% for the other treatments; while MW, mostly in the 2018 season, consistently improved phenolic extraction and polymeric pigments formation, enhancing wine color (greater saturation) and intensifying violet hue. The behavior observed in 2019 was similar, with a more marked effect of MW on wine color ( $C^*_{ab}$  and polymeric pigments). Likewise, combined strategies increased polysaccharides extraction and modified the volatile profile of wines. The reported results are promising and are considered the first advance in the knowledge of the impact of the proposed combined strategies on the chemical composition of red wines. © 2022 Elsevier Ltd

## Author keywords

Bonarda; Microwave-assisted extraction; Phenolics; Polysaccharides; Stems; Volatiles