



## Chemical and sensory characterisation of Sangiovese red wines: Comparison between biodynamic and organic management



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### ABSTRACT

The effects of biodynamic production practices on composition and sensory attributes of Sangiovese wines were examined for 2 years (2009 and 2010) in a vineyard that was converted from organic (ORG) to biodynamic (BDN) viticulture. During the first year (2009), the BDN wines were characterised by low alcohol strength, colour intensity, total polyphenols, monomeric anthocyanins and catechin. Conversely, the second year BDN wines differed from the organic wines in terms of total polyphenols and phenolic compounds, including polymeric pigments, co-pigmentation, tannins and iron-reactive polyphenols. The effect of management practices, harvest and their interaction was analysed for each compound. Positive interaction was observed for total acidity, volatile acidity, cyanidin-3-glucoside, protocatechuic acid, (+)-catechin, quercetin and *trans*-resveratrol.

ORG wine initially showed a more complex aroma profile; however, the differences were almost indistinguishable during the second year. Trained panellists highlighted differences in colour intensity between ORG and BDN wines although no preference was found by consumers. The concentrations of ochratoxin A and biogenic amines were far below the health-hazardous threshold.

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### 1. Introduction

Wines produced using an environmentally sustainable approach, such as organic (Mann, Ferjani, & Reissig, 2012) and biodynamic practices (Meunier, 2001; Preston, 2008; Zucca, Smith, & Mitry, 2009) have enjoyed increasing popularity due to growing demands for healthy products.

In particular, biodynamic agriculture differs from traditional organic management, primarily in the use of specific fermented preparations proposed by Rudolf Steiner (1861–1925) which are claimed to stimulate the soil nutrient cycle, and enforce photosynthesis and optimal evolution of compost, enhancing both soil and crop quality (Koepf, Schaumann, & Haccius, 2001). Biodynamic management is considered to induce beneficial environmental effects on the energetic efficiency of sustainable agro-ecosystems (Turinek, Grobelnik-Mlakar, Bavec, & Bavec, 2009).

The Steiner preparations can improve the vegetative-reproductive balance of plants, increasing sugar, total polyphenol and

anthocyanin concentrations of grapes (Reeve et al., 2005). Although a recent study demonstrated that <sup>1</sup>H-NMR was able to discriminate between red wines from organic and biodynamic grapes (Laghi, Versari, Marcolini, & Parpinello, 2014), very little information is available on the characteristics of biodynamic grape and wine (Plahuta & Raspor, 2007; Ross, Weller, Blue, & Reganold, 2009; Tassoni, Tango, & Ferri, 2013).

The satisfactory discrimination of organic wines from conventional wines (>73%), based on multiparametric mid-infrared signals related to wine composition (Cozzolino, Holdstock, Damberg, Cynkar, & Smith, 2009), highest amounts of polyphenolic compounds, antioxidant activity (Miceli, Negro, Tommasi, & De Leo, 2003) and *trans*-resveratrol (Tintunen & Lehtonen, 2001), has been reported. However, the difference between organic and conventional grape, must and wine was not always significant in terms of physicochemical and sensory characteristics (Mulero, Pardo, & Zafrilla, 2009; Mulero, Zafrilla, Cayuela, Martínez-Cacha, & Pardo, 2011) and controversial results were found between conventional and organic wines in terms of microbial metabolites, such as biogenic amines (Kalkan Yildirim, Üren, & Yücel, 2007; Yañez, Saavedra, Martínez, Córdova, & Ganga, 2012) and ochratoxin A (Miceli et al., 2003; Plahuta & Raspor, 2007; Ponsone, Combina, Dalcerro, & Chulze, 2007). Trained panellists found that the use of

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