Impact of Grape Temperature at Pressing on Organic Acids and Oenological Characteristics of Méthode Cap Classique Wines

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Maintaining the chemical composition of a wine is essential for the wine industry. Although the sugar-acid balance of a wine is of primary sensory importance, individual acids and oenological variables are equally important. The main focus of this study was to investigate the impact of grape temperature at harvest on the volatile acidity (VA), titratable acidity (TA), pH and alcohol levels, and the organic acid (citric, malic, pyruvic and succinic) characteristics of Méthode Cap Classique (MCC) wines produced from grape cultivars obtained from two regions in South Africa. Chardonnay and Pinot noir grapes were obtained from the Robertson (warm) and Elgin (cool) regions and were subjected to different temperature treatments, *viz.* 0°C, 10°C, 25°C and 30°C, before further processing, including pressing, primary fermentation, blending, tirage, secondary fermentation, riddling and disgorging. The grape temperature was mostly responsible for the higher pH of the Robertson (0°C and 10°C) and lower pH (0°C) of the Elgin post-tirage wines. Chardonnay-base wines from both regions that were vinified from grapes at lower temperatures (0°C and 10°C) were richer in malic and succinic acid, while Pinot noir wines from both regions were characterised by higher malic, citric and pyruvic acid. Pyruvic acid was only detected after the secondary fermentations in wines from both regions. To our knowledge, this study is the first to investigate the influence of grape temperature on the oenological and organic acid characteristics of MCC wines in different regions and throughout different production stages.

INTRODUCTION

Méthode Cap Classique (MCC) wine is a sparkling wine produced using the traditional Champagne method in South Africa. The chemical composition of most wines is influenced by factors such as production area, grape variety, vintage, terroir and winemaking techniques (Jones *et al*., 2005; Coelho *et al*., 2009; Jones & Alves, 2012; Dobrowolska-Iwanek *et al*., 2014). Although these factors are critical for wine characterisation and differentiation, their role in South African MCC wines still remains unclear. To date, very few studies have been done to evaluate MCC wines during different production stages (Torresi *et al*., 2011; Martínez-Lapuente *et al*., 2013), and none on the impact of grape temperature on oenological and organic acid characteristics of South African MCC wines.

In general, wine quality is attributed to the sugar-acid balance, hence acidity adjustment is a prerequisite in many wine cellars (Tita *et al*., 2006). Although total acidity is crucial in wine, all individual organic acids, such as succinic, pyruvic, acetic, citric, lactic, tartaric and malic acid play a critical role in defining the organoleptic character of the wine. They are important elements of the wine because of their sensory attributes (e.g. sour, sharp, tart, vinegar aroma, metallic and fresh) and their overall contribution to wine acidity (Mato *et al*., 2005). These acids are also fundamental for monitoring aspects of spoilage, ageing, and alcoholic and malolactic fermentation (Bisson *et al*., 2015). Malic, citric and tartaric acids are the main acids derived from grapes, whereas acids such as pyruvic, succinic and acetic are derived from fermentation (Volschenk *et al*., 2006). The sensory impacts of grape- and fermentation-derived acids are well known, since higher concentrations of these acids are associated with too much acidity, while lower concentrations are associated with flat, unacceptable wines (Lambrechts & Pretorius, 2000; Shiraishi *et al*., 2010). There is limited knowledge of how changes in environmental/ fermentation conditions affect organic acid metabolism during fermentation, including the role of the tricarboxylic acid cycle (Fernie *et al*., 2004), glycolysis and the glyoxylate

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