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Tartrate stabilisation of rosé wine using ion exchange resins: Impact on wine sensory characteristics

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ABSTRACT

Tartaric precipitation in bottled wine is an important problem for the wine industry by the undesirable aspect. Addition of certain stabilisers, such as metatartaric acid and carboxymethylcellulose (CMC), or treatment of wine with ion exchange resins, are accepted by the OIV and have been successfully used to prevent tartaric precipitation. However, there are few studies regarding rosé wine. So, the aim of this study was to evaluate the effect of cation exchange resins on rosé wine tartaric stabilisation efficiency and wine sensory quality, compared to the effect of oenological stabilisers. In this study a rosé wine from the Douro Valley Demarcated Region, 2015 vintage, was used and ion exchange resin *versus* CMC's, with different structural features, as well as metatartaric acid, were tested. The cation exchange resins process could be a useful tool to stabilise wine, as the sensory analysis data showed, since wine treatment with cation exchange resin are lesser scored for colour intensity attribute and significantly more scored for the limpidity attribute. These results show that ion exchange resins could be an interesting process for rosé wine tartaric stabilisation.

1. INTRODUCTION

Tartaric precipitation in bottled wine is an important problem considering that it is essential to satisfy the wine quality criteria, and consequently the wine consumer's acceptance. So, wineries employed several treatments to prevent this precipitation. For instance, according to Resolution 43/2000 [1], the addition of stabilisers, such as metatartaric acid and carboxymethylcellulose, or the treatment with ion exchange resins, are accepted and have been successfully used to prevent tartaric precipitation in white and red wine [2,3]. The main difference concerning these two stabilisation processes is that the ion exchange resins removes the compounds that contribute to tartrate instability. Anion exchangers are not allowed by the OIV [1] due to the negative effects on the wine physiochemical and sensory quality [4,5]. Rosé wine consumption shows an increase in the last years (between 2008 and 2014), representing nowadays near 10% of the world wine production. However, according to our knowledge, there are no studies in rosé wine concerning cation exchange resins application for tartaric stabilisation. So, the aim of this study was to evaluate effect of cation exchange resins on tartaric stabilisation efficiency and their impact on rosé wine sensory quality, compared to addition of conventional oenological additives.

2. MATERIAL AND METHODS

Wine characteristics: A young rosé wine from Douro Valley Demarcated Region, vintage 2015, with tartaric instability was used. Chemical characteristics of wine were as follow: Alcohol content 11.1%, titratable acidity 6.6 g/L (expressed as tartaric acid), volatile acidity 0.18 g/L (expressed as acetic acid) and pH 3.22.

Stability treatments: Treatments were performed with three kinds of CMC's, two in liquid form, CMC1 5% (w/v) and CMC2 20% (w/v), and the CMC3 in powder, all with different structural characteristics [2], and metatartaric acid (Meta. A) all of them applied at 100 mg/L, according to the maximum allowed by OIV [6]. Each additive was prepared according to the manufacturer's specifications. Wine without treatment was used as a control. All treatments were conducted in 250 mL flasks, additives were thoroughly mixed, added to each treatment and allowed to remain in contact with the wines for 7 days at 20 °C. The rosé wine was also stabilised by cation exchange resins, that was performed in a winery at semi-industrial scale, that treated almost 30% from the total volume of the wine. Samples were then centrifuged at 537.6 g for 15 min before analysis. All experiments were run in duplicate.

Mini contact test: Wine tartaric stability was measured by mini contact test and was carried out by a Tartar Check (Ing.C.Bullio, San Prospero, Italy).

Colour and chromatic characteristics: Wine colour (absorbance at 420 nm) and chromatic characteristics [scanned from a range of 380–770 nm to collect data to determine L^* (lightness), a^* (redness), and b^* (yellowness) coordinates using the CIELab method] were determined according OIV [6]. To distinguish the colour more accurately, the differences were calculated using the following equation: $\Delta E^* = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]^{1/2}$.

Sensory analysis: A trained panel was used for sensory analysis. Samples were stored at appropriate light and temperature conditions, and were presented to panellists in tasting glasses, marked with three-digit numbers, in a randomised order. Twenty attributes were selected: visual (*limpidity, colour intensity, rose colour*), aroma (*aroma intensity, wild fruits, brandy plums, fruity, floral, vegetable, aroma persistence*), taste (*sweet, bitter, taste persistence, acidity, astringency*) and flavour (*dried fruits, fruity flavour, vegetable flavour, caramel*). The attributes were quantified using a five-point intensity scale where the minimum value was 1 and the maximum 5, integer values [7], in an individual booth [8] and according to standardised procedures [9].

Statistical analysis: Data are presented as means \pm standard deviation. Physicochemical data was statistically tested by analysis of variance (ANOVA) using the Statistica 7 software (Statsoft, Tulsa, Oklahoma, USA). Tukey honestly significant differences test was applied ($p < 5\%$). The wine's sensory attributes were submitted to a Principal Components Analysis based in a covariance matrix (Cov-PCA) performed by the Statistica 2010 software (Statsoft Inc., 2012).

3. RESULTS AND DISCUSSION

3.1 Effect of treatments on rosé wine tartaric stability, colour and chromatic characteristics

As expected all treatments stabilised rosé wine. Wine treated with cation exchange resins showed a significant decrease in colour intensity, that is in line with the significant decrease observed in the a^* - redness coordinate obtained with the CIELab method (Table 1). However, total colour difference (ΔE) do not showed significant difference, and it is lower than 2 units, which means that the differences were not detected by the Human eyes.

Table 1. Rosé wine chromatic characteristics and colour intensity of the control wine and wine after stability treatment (mean \pm SD).

| | <i>L</i> * | <i>a</i> * | <i>b</i> * | ΔE | Colour intensity (a.u.) |
|---------|-----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Control | 99.2 \pm 0.2 ^a | 2.22 \pm 0.19 ^a | 0.95 \pm 0.02 ^a | - | 0.45 \pm 0.02 ^a |
| Meta. A | 99.1 \pm 0.6 ^a | 2.36 \pm 0.04 ^a | 1.04 \pm 0.03 ^a | 0.55 \pm 0.12 ^a | 0.44 \pm 0.02 ^a |
| CMC 1 | 98.9 \pm 0.9 ^a | 2.33 \pm 0.07 ^a | 1.05 \pm 0.11 ^a | 0.88 \pm 0.47 ^a | 0.42 \pm 0.00 ^a |
| CMC 2 | 98.9 \pm 1.1 ^a | 2.30 \pm 0.11 ^a | 1.06 \pm 0.09 ^a | 0.67 \pm 0.40 ^a | 0.38 \pm 0.01 ^a |
| CMC 3 | 99.6 \pm 0.1 ^a | 2.30 \pm 0.03 ^a | 1.01 \pm 0.01 ^a | 0.40 \pm 0.37 ^a | 0.39 \pm 0.01 ^a |
| Resins | 99.9 \pm 0.1 ^a | 1.39 \pm 0.10 ^b | 1.02 \pm 0.10 ^a | 1.06 \pm 0.00 ^a | 0.25 \pm 0.02 ^b |

*L** – lightness, *a** – redness, *b** – yellowness, ΔE – total colour difference- obtained taking as a reference the control wine; Means within a column followed by different letter are significantly different ($p < 0.05$).

3.2 Effect on rosé wine sensory characteristics

The PCA (Figure 1) resulting for the wine's sensory attributes projected onto the first two PCs, as well as the treatments (CMC, resins and metatartaric acid). The PC1 explained 57.80 % of the total variance and the attribute “limpidity” is the value with largest contribution in PC1. The attributes that best correlated with PC2 (that accounted for 20.26 % of total variation) were the “bitter taste” and the “rosé colour”. Resin and CMC2 imprinted the wines with “fruity” and “sweet” characteristics, while the CMC1 and CMC3 imprinted the wines with a “floral aroma”. Wine treated with metatartaric acid is essentially more “acid” and “bitter” in terms of mouth-feel and more intense in terms of “colour”. It is interesting to note that the control wine (wine without any stabilisation treatment), positioned, alone, in the lower right PCA quadrants characterised with almost all the aroma and flavour attributes.

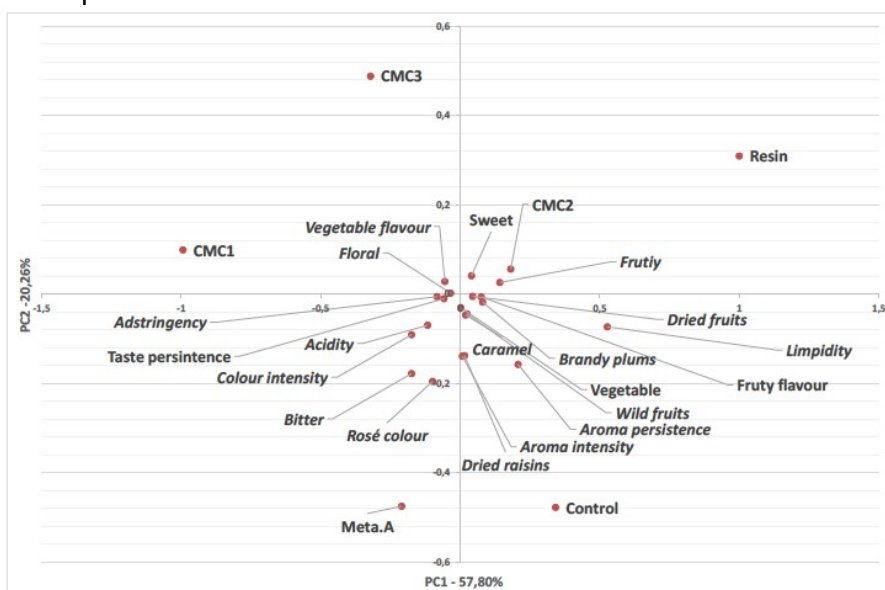


Figure 1. Principal Components Analysis (PCA) based on covariance (Cov-PCA) projection of the sensory attributes evaluated in the wines treated with CMC (1, 2 and 3), resins or metatartaric acid, and control wine.

4. CONCLUSIONS

Results showed that all treatments studied stabilised the rosé wine. Colour intensity showed a significant decrease after treatment with ion exchange resins, which is in line with the chromatic characteristics obtained by CIELab method – *a**. Sensory analysis revealed that wine treatment with cation exchange resin are significantly lesser scored in the colour intensity attribute and significantly more scored for the limpidity attribute.

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References

- [1] O.I.V. Resolution OENO 43/2000
- [2] R Guise, L Filipe-Ribeiro, D Nascimento, O Bessa, F M Nunes, F Cosme, Food Chem, 2014, 156, 250-257.
- [3] V Ibeas, A Correia, A Jordão, Food Res Int.,2015, 69, 364-372.
- [4] H Mira, P Leite, J M Ricardo-da-Silva, A S Curvelo-Garcia, J Int Sci Vigne Vin, 2006, 40, 223–246.
- [5] C Lasanta, I.Caro, L Pérez, Food Chem 2013, 138, 1072–1078.
- [6] OIV. Paris: Edition Officielle, 2012.
- [7] ISO 4121, 2003. Guidelines for the use of quantitative response scales. Retrieved from. <https://www.iso.org/standard/33817.html>
- [8] ISO 8589, 2007. General guidance for the design of test rooms. Retrieved from. <https://www.iso.org/standard/36385.html>
- [9] ISO 3591, 1977. Sensory analysis -- Apparatus -- Wine-tasting glass. Retrieved from <https://www.iso.org/standard/9002.html>