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Tartaric stabilisation of Rosé wine by ion exchange resins: impact on phenolic and sensory profile

Fernanda Cosme[1]*, Rita Borges[2], Celeste Marques[3], Carlos Matos[1], Alice Vilela[1], Filipe-Ribeiro, L.[1], Fernando M. Nunes[1], Conceição Fernandes[2]

[1]CQ-VR, Chemical Research Center, Food and Wine Chemistry Lab, UTAD, ECVA, 5000-801 Vila Real, Portugal.
[2]Mountain Research Centre (CIMO), ESA-Polytechnic Institute of Bragança. Apartado 1172, 5301-855 Bragança, Portugal
[3]AEB Bioquímica Portuguesa SA, Zona Industrial de Coimbrões Lt 123, 3500 Viseu, Portugal

* fcosme@utad,pt

Introduction

Wine tartaric stabilisation is essential to satisfy the wine quality criteria, and consequently the consumer's acceptance. Several techniques are available to prevent tartaric precipitation (potassium hydrogen tartrate and calcium tartrate) in wine. Beside the addition of oenological products, the use of ion exchange resins is also an acceptable technique for wine tartaric stabilisation by the OIV [1]. However, according to our knowledge, there are no studies in Rosé wine concerning ion-exchange resins application for tartaric stabilisation. Furthermore, Rosé wine consumption shows an increase in the last years (between 2008 and 2014), representing nowadays near 10% of the world wine production. .

Aims

Therefore, the aim of this study was to evaluate the effect of ion exchange resins on wine tartaric stabilisation efficiency and the impact on rosé wine quality, compared to the effect of the addition of conventional oenological additives. For this objective, an unstable Rosé wine from the Douro Valley, vintage 2015, was used and the experiment was developed in a winery at semi-industrial scale.

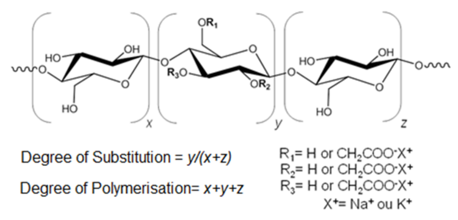
Material and Methods

Wine conventional oenological parameters	Rosé wine (Douro 2015)
Alcohol content (% v/v)	11.13
Specific gravity (g/cm^3)	0.9897
Titratable acidity (g/L tartaric acid)	6.6
pH	3.22
Volatile acidity (g/L de acetic acid)	0.18

Parameters analysed
Conventional oenological parameters [2]
Conductivity [3]
Chromatic characteristics [2]
Colour intensity [2]
Total phenols, flavonoids and non-flavonoids [4]
Total anthocyanins and anthocyanins profile [5,6]
Sensory analysis [7]

CMC structural characteristics.
Adapted from Guise et al. (2014)

CMC	Viscosity (mPas^{-1}) Solution 0.1%	Degree of substitution (DS)	Degree of polymerization kDa
CMC1 5 %	1.21±0.02^{a}	0,96±0.03^{b}	441±5^{a}
CMC2 20%	1.15±0.04^{a}	1.12±0.05^{c}	441±7^{a,b}
CMC3 solid	1.35±0.02^{b}	0.63±0.04^{a}	512±27^{b}



Oenological stabilisers

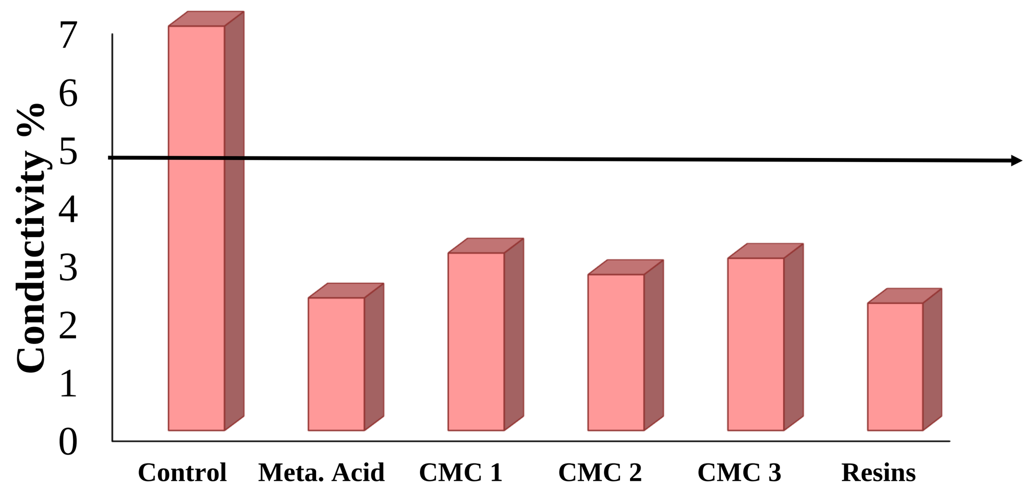
- CMC1- 5% solution
- CMC2- 20% solution
- CMC3- solid
- Metatartaric acid

Ion exchange resins:
pH-Stab/AEB laboratory

Experiments were carried out at Gran Cruz winery. Treated wine was almost 30% from the total wine volume.

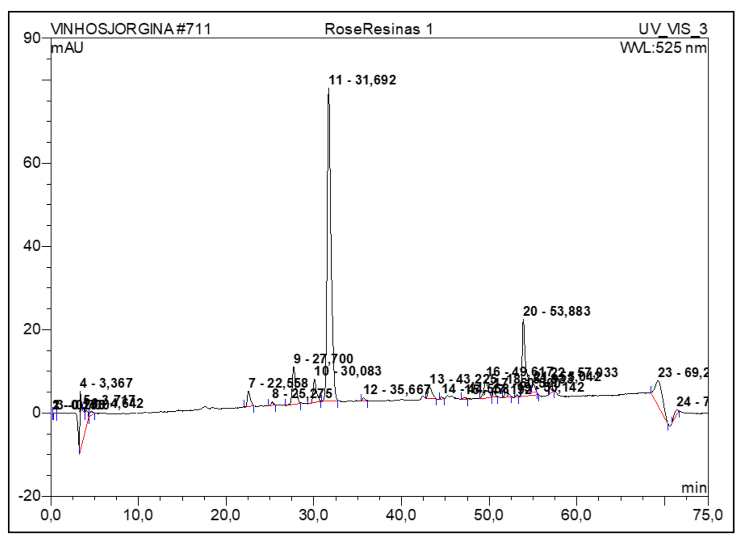
Results

Wine tartaric stability (mini-contact test)

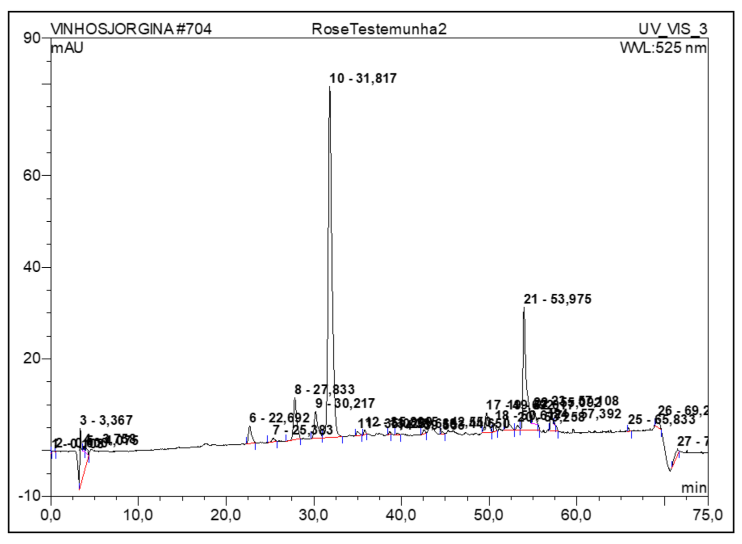


Anthocyanin profile (HPLC-DAD)

Ion exchange resin treated wine



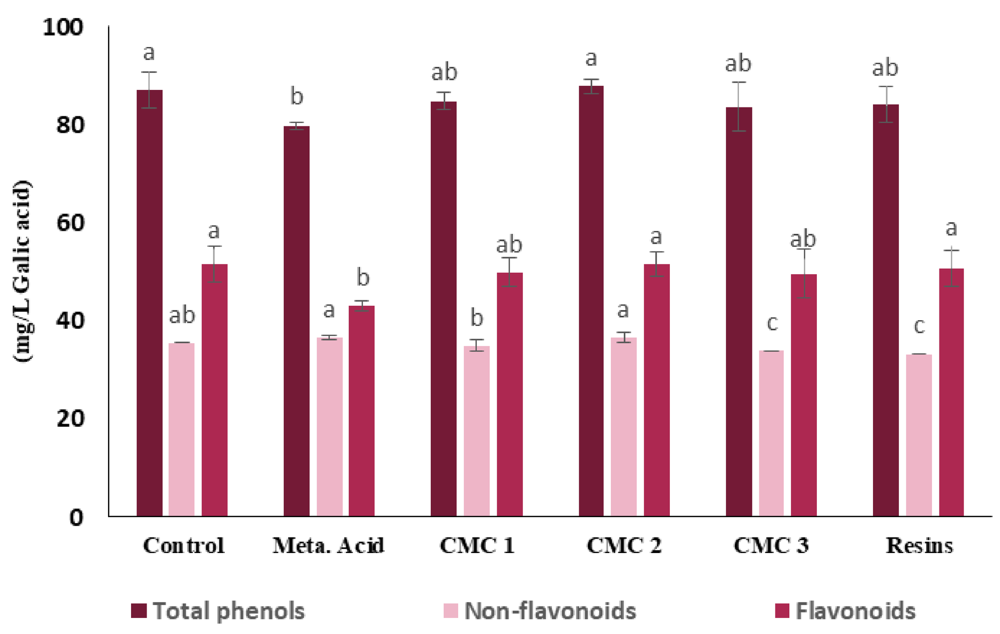
Control wine



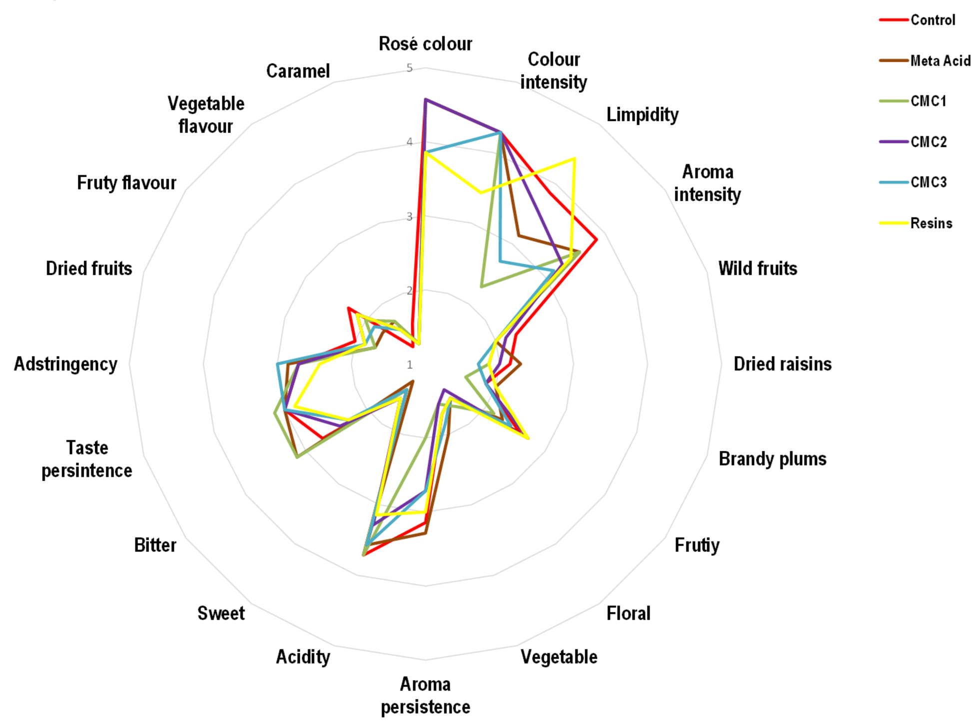
Rosé wine chromatic characteristics, colour intensity, total anthocyanins, pH and total acidity

	L*	a*	b*	ΔE	Colour intensity (a.u.)	Total anthocyanins (mg/L)	pH	Total acidity (g/L tartaric acid)
Control	99.2±0.2^{a}	2.22±0.19^{a}	0.95±0.02^{a}	-	0.45±0.02^{a}	12.69±0.62^{ab}	3.10 ± 0.01^{a}	5.85 ± 0.00^{a}
Meta. Acid	99.1±0.6^{a}	2.36±0.04^{a}	1.04±0.03^{a}	0.55±0.12^{a}	0.44±0.02^{a}	12.69±0.62^{ab}	3.10± 0.00^{a}	5.81 ± 0.05^{a}
CMC 1	98.9±0.9^{a}	2.33±0.07^{a}	1.05±0.11^{a}	0.88±0.47^{a}	0.42±0.00^{a}	12.50±0.00^{ab}	3.15± 0.02^{b}	5.74 ± 0.06^{a}
CMC 2	98.9±1.1^{a}	2.30±0.11^{a}	1.06±0.09^{a}	0.67±0.40^{a}	0.38±0.01^{a}	12.25±0.00^{a}	3.16 ± 0.00^{b}	5.78 ± 0.00^{a}
CMC 3	99.6±0.1^{a}	2.30±0.03^{a}	1.01±0.01^{a}	0.40±0.37^{a}	0.39±0.01^{a}	12.63±0.00^{ab}	3.17 ± 0.01^{b}	5.85 ± 0.11^{a}
Resins	99.9±0.1^{a}	1.39±0.10^{b}	1.02±0.10^{a}	1.06±0.00^{a}	0.25±0.02^{b}	14.00±0.00^{b}	2.93 ± 0.00^{c}	6.58 ± 0.08^{b}

Phenolic compounds composition



Sensory profile



Final remarks

- ✓ All treatments studied stabilised the Rosé wine
- ✓ Wine treated with ion exchange resins showed lower pH and higher acidity comparing to other treatments
- ✓ There are only slight differences between all treatments in total phenolic compounds, flavonoids and non-flavonoids and total anthocyanins
- ✓ A decrease in colour intensity was observed mostly after treatment with ion exchange resins, in line with the chromatic characteristics by CIELab method – a*
- ✓ Nevertheless, malvidin-3-*O*-monoglucoside show similar content by HPLC analysis: control wine = 23.93 mg/L; wine treated with ion resins = 23.52 mg/L
- ✓ Sensory analysis revealed that wine treatment with ion exchange resin are more scored for fruity aroma and limpidity attributes and lesser scored for astringency and colour attributes

Obtained data suggest that Rosé wines treated with ion exchange resins, maintained or improved their quality.

Acknowledgements

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[7] ISO 13299:2016 General guidance for establishing a sensory profile.