

Poster Communication 27

## Vegan fining strategies in Port wine: implications for chemical composition and One Health sustainability

David Miranda<sup>1,2,\*</sup>, Mariana Carvalho<sup>3</sup>, Luís Sottomayor<sup>1</sup>, António Graça<sup>1</sup>, Vítor Freitas<sup>2</sup> and Diana Dias da Silva<sup>3</sup>

<sup>1</sup> Sogrape Vinhos, S.A., Avintes 4430-852, Vila Nova de Gaia, Portugal

<sup>2</sup> REQUIMTE, LAQV, Department of Chemistry and Biochemistry, Faculty of Sciences, University of Porto, 4169-007 Porto, Portugal

<sup>3</sup> REQUIMTE/LAQV, Escola Superior de Saúde, Instituto Politécnico do Porto, 4200-072 Porto, Portugal

\* Correspondence: david.miranda@sogrape.pt

### Abstract

**Background:** Wine fining is a critical step for stabilisation and clarification, traditionally relying on animal-derived agents such as gelatine. However, increasing regulatory, environmental and ethical concerns have driven the search for sustainable alternatives aligned with the One Health framework, integrating human, environmental and food system health [1-3]. **Objective:** This study aimed to evaluate the impact of vegan fining agents on the physicochemical, phenolic, volatile and elemental composition of different Port wine styles. **Methods:** Winery-scale fining trials were conducted using White, Tawny and Ruby Port wines. Two non-animal-based alternatives (pea protein and yeast-derived products) were compared with reference controls. Treatments were applied in triplicate (n=3) using 40 L stainless steel tanks. Wines were analysed according to official OIV methods, including basic physicochemical composition, colour and phenolic parameters, volatile compounds and elemental composition. Data were analysed by one-way ANOVA followed by Tukey's HSD post hoc test, with significance set at  $p < 0.05$ . **Results:** Fining effects were strongly matrix-dependent. In White wines, colour intensity and total phenolics were significantly reduced by gelatine, while vegan agents showed intermediate behaviour. In Tawny wines, most parameters remained stable, although total anthocyanins decreased significantly with protein fining, particularly for gelatine. In Ruby wines, fining treatments significantly reduced colour intensity and total phenolic index, with gelatine showing the strongest effect, while vegan treatments induced moderate changes. Volatile composition was only marginally affected, with minor variations in higher alcohols and esters, indicating limited sensory impact. Elemental composition remained largely unchanged across treatments, and cadmium showed no variability. Overall, observed differences were often statistically significant but of low oenological magnitude. **Conclusions:** Vegan fining agents demonstrated comparable performance to gelatine in maintaining wine quality while reducing reliance on animal-derived products. From a One Health perspective, these findings support the adoption of non-animal-based fining strategies as a sustainable alternative, minimising environmental impact and aligning with evolving consumer and regulatory expectations without compromising wine stability or composition.

**Keywords:** One Health; Port wine; sustainable fining

### Acknowledgements/Funding

This work received financial support from Sogrape Vinhos and the PT national funds (FCT/MECI, Fundação para a Ciência e Tecnologia and Ministério da Educação, Ciência e Inovação) through the project UID/50006/2025 DOI 10.54499/UID/50006/2025 – Laboratório Associado para a Química Verde – Tecnologias e Processos Limpos. Mariana Carvalho acknowledges her Innovhealth scholarship supported by the Young STEAM Impulse Programme of the Resilient P.PORTO Programme (02/C06-i03.03/2021.PID-15), co-funded by the Next Generation EU programme funds under the Recovery and Resilience Plan (PRR).

### References

1. Ribéreau-Gayon, P. et al. Handbook of Enology. Volume 2: The Chemistry of Wine – Stabilization and Treatments. 2<sup>nd</sup> ed.; John Wiley & Sons: Chichester, UK, 2006; pp. 347–387.
2. Marangon, M. et al. Wine Fining with Plant Proteins. *Molecules* **2019**, *24*(11), 2186, doi:10.3390/molecules24112186
3. Río Segade, S. et al. Phenolic composition influences the effectiveness of fining agents in vegan-friendly wine production. *Molecules* **2020**, *25*(1), 120, doi:10.3390/molecules25010120



In *Scientific Letters*, articles are published under a CC-BY license (Creative Commons Attribution 4.0 International License at <https://creativecommons.org/licenses/by/4.0/>), the most open license available. The users can share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material for any purpose, even commercially), as long as they give appropriate credit, provide a link to the license, and indicate if changes were made (read the full text of the license terms and conditions of use at <https://creativecommons.org/licenses/by/4.0/legalcode>).