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Sustainable fining strategies in Port wine: a One Health perspective on non-animal protein alternatives

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Abstract

Background: Fining is a key step in Port wine production, traditionally relying on animal-derived proteins to improve clarity and stability. However, concerns related to sustainability, allergenicity, and environmental impact have intensified the search for alternative approaches [1-3]. Within a One Health framework, the adoption of non-animal fining agents may contribute to more sustainable practices while addressing consumer health and environmental considerations. **Objective:** To evaluate the clarification efficiency and economic feasibility of non-animal protein-based fining agents applied to different Port wine styles. **Methods:** Eleven fining treatments were assessed, including ten alternative agents of plant, yeast, and fungal origin, with gelatine as a reference. Trials were conducted in White, Ruby, and Tawny Reserve Port wines, using three dosage levels within recommended ranges. Bentonite (45 g/hL) was applied to ensure protein stability. Clarification efficiency was evaluated through spectrophotometric measurement of colour intensity. **Results:** Liquid pea protein and yeast-derived protein demonstrated the highest reductions in colour intensity across the evaluated wines. However, these alternatives were associated with substantially higher costs compared to gelatine, with increases ranging from approximately four- to twenty-four-fold depending on wine style and dosage. **Conclusions:** Non-animal fining agents can achieve clarification performance comparable to conventional gelatine, supporting their potential as more sustainable and allergen-free alternatives. Nevertheless, despite higher costs, these alternatives may remain viable considering their technological performance and sustainability advantages. From a One Health perspective, these findings highlight the need to balance technological performance, economic feasibility, and sustainability in the transition towards more responsible wine production systems.

Keywords: One Health; Port wine; sustainable fining

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