Factors affecting wine stability: Innovative approaches for sustainable enology

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Aim of the Ph.D. thesis research project

- Setting up tailored experimental strategies on both laboratory and winery pilot scale level to identify the technological and organoleptic consequences of applying selected dosages of mannoprotein just prior wine bottling.
- Understand the role of mannoprotein on wine physico-chemical and sensory characteristics to provide a guide for their selection and dosage and thus improve the quality of the wine.

State-of-the-Art

- Commercial preparations of yeast mannoprotein were authorized in the early 2000s for their addition in white wine to improve its tartaric and protein stability.[3]
- As color is one of the most recognized aspects of red wine quality and together with in-mouth sensations strongly determine its overall quality.[5,8]
- Its use in red wines quickly started to be attractive due to its apparent positive effect on technological and organoleptic properties.[3]
- Its effect could respond to their composition, concentration, molecular weight, and timing of application, as can be seen in **Table 1**.
- However technological and organoleptic implications of its addition at the very end of the winemaking process, need further clarification.

Table 1 Enological properties of mannoproteins linked to a particular molecular weight.[1,2,4,6]

Properties	Molecular weight (MW KDa)	Specific effect	Studied at
Inhibition of tartrate salt crystallization	30-50 kDa	Improve tartaric stability	WW
Interaction with flor wines	49 kDa	Velum formation and surface hydrophobicity	FW
Prevention of Haze	420 kDa	Decreasing the particle size of the haze	WW
	Enzymatic extracted 31.8 kDa	Heat-stability in the presence of them	WW
Improving foaming	Mild thermal extracted 10-21.5 kDa	Contribute to foam quality and stability	SW
Improving mouthfeel and taste	PS fraction of 13–93 kDa*	Reduction of palate hotness and increasing of viscosity at high pH	WW
Tannin precipitation	high-MW ~110 kDa	Reduction of proanthocyanidins	RW
Color stability	high-MW ~110 kDa	Possible stable color loss	RW

PS: polysaccharide; WW: White wine; FW: Flor wine; SW: Sparkling wine; RW: Red wine

*: Polysaccharide contains both grape and yeast polysaccharide

Ph.D. Thesis Objectives and Milestones

Within the overall objective mentioned above this Ph.D. thesis project can be subdivided into the following activities according to the Gantt diagram given in **Table 2**:

A1) Physicochemical Characterization of Mannoproteins (MP) extracted by different methods (A1.1) and different commercial mannoprotein (A1.2) preparations as enzymatic, heat, ultrasonication, PEF treatments or combination of them, and measuring recovery, d-mannose, d-glucose, and protein concentration, plus molecular weight screening.

A2) Determination of Technological Effects of Commercial Yeast Mannoprotein Dosage in model wine (A2.1) and red wine (A2.2) in the laboratory by the identification of the effects on filterability index, tartaric stability, color index, CIELAB color parameters, color stability, total polyphenol index, viscosity and tribological measures.

A3) Determination of Technological and Organoleptic Effects of Commercial Yeast Polysaccharides Dosage Prior Filtration in red wine at winery pilot scale by the identification of the effects of same physiochemical parameters measured at A2 (A3.1), plus sensorial analysis of bitterness, astringency, viscosity, and hotness (A3.2).

A4) Data analysis, writing and Editing of the PhD thesis, scientific papers and oral and/or poster communications.

Table 2 Gantt diagram for the Ph.D. thesis project.

Activity / Months	4	8	12	16	20	24
A1) MP Characterization						
1) Extracted						
2) Commercial						
A2) Effects of Dosage						
1) In model wine						
2) In red wine						
A3) Winery Pilot Scale						
1) Physicochemical analysis						
2) Sensorial analysis						
A4) Thesis and Papers						

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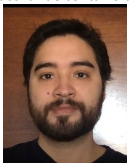

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