FOOD & BEVERAGES

Non-invasive evaluation of protein efficiency for wine clarification

In collaboration with French Institute on wine research (INRA)

Introduction

In oenology, in addition to the improvement of colloidal stability and sensory properties of wine, fining is also done to clarify wine. The process consists on introducing a substance (fining agent) that induces the flocculation and sedimentation of suspended particles in a turbid wine. This critical step reduces the number of filtration cycles, required to achieve desired brightness and microbiological stability. Fining agents can be either organic polymers (proteins, polysaccharides) or minerals (bentonite).

This study aims to compare the efficiency of two different vegetal proteins (A and B) used to clarify red wine. Using SMLS, the optimum concentration for more efficient clarification process was determined.

KEY **BENEFITS**

VERSATILE

NO DILUTION

FAST & ACCURATE

Reminder on the technique

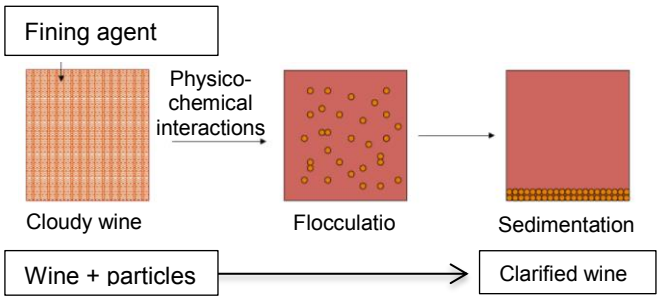
Turbiscan™ instrument, based on Static Multiple Light Scattering, consists on sending a light source (880 nm) on a sample and acquiring Backscattered (BS) and transmitted (T) signal. Combining both detectors (BS & T) enables to reach wider concentration range. The backward reflected light comes from multiple scattering (the photons scatter several times on different particles or drops).

This signal intensity (BS) is directly linked to different parameters, according to the Mie theory

$$BS = f(d, \varphi, n_p, n_f)$$

Method

The following figure describes the evolution process from cloudy to clarified wine, with the first step: the addition of the fining agent.



Comparison of fining agents for red wine clarification

Identification of the destabilization phenomena

The raw data on figures 1 and 2 show that the addition of fining agent leads to size variation followed by the formation of a compact sediment at the bottom and a large clarification on the rest of the tube.

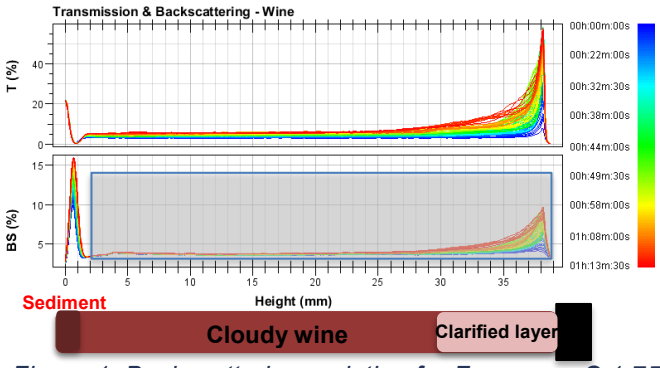


Figure 1: Backscattering variation for Fragrance C 1.75% in emulsion 2

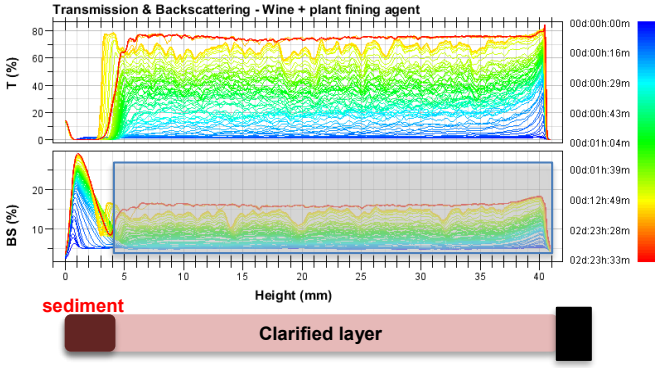


Figure 2: Turbiscan Backscattering and Transmission profiles obtained for the fined wine (fining agent B)

Quantification of the clarification

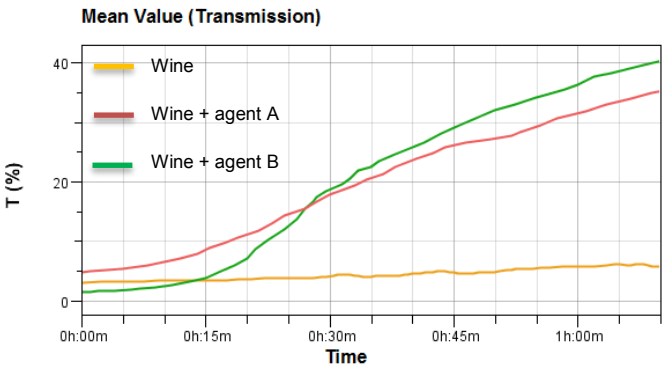


Figure 3: Transmission level (%) versus time in the middle of the tube for unfined wine and wine with fining agents

The initial transmission level, very low (around 5%), reflects the turbidity of the initial wine. The introduction of fining agents induces an increase of the transmission level versus time, meaning that in presence of fining agents particle size increases: the fining agents enable flocculation.

In this example, the transmission level obtained with the fining agent B is greater than the one obtained with the fining agent A.

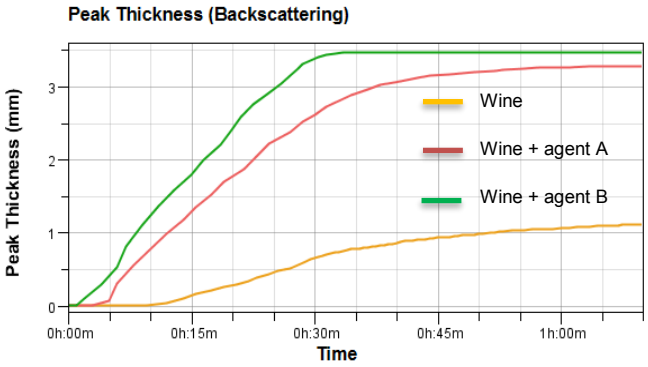


Figure 4: Sediment layer thickness (mm) versus time for unfined wine and wine with fining agents

A sediment forms for the three samples after one hour, but the thickness is greater for the fined wines. This, associated with the higher transmission level, indicates that both fining agents allow particle sedimentation and so suspended particles are removed, wine is clarified.

Impact of the fining agent concentration

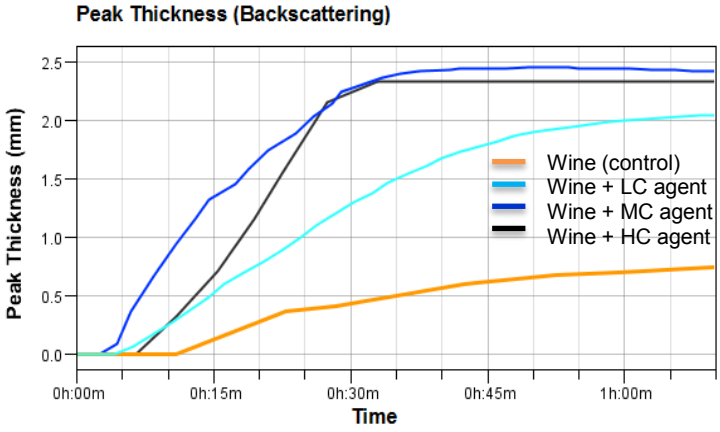


Figure 5: Sediment layer thickness (mm) versus time for the unfined wine (control) and for the wine with a fining agent at different concentrations (Low LC, Medium MC and High HC)

Sample	Unfined wine	Wine + LC agent	Wine + MC agent	Wine + HC agent
Migration rate (mm/h)	0.7	3.2	5.2	5.8
Sediment thickness (mm)	0.8	2.0	2.4	2.3

Adding a fining agent increases the rate of sediment formation and the sediment layer thickness after flocs settling. The medium concentration is the best compromise: it enables to trigger the sedimentation sooner and the layer formed equals the one formed at high concentration. The number of filtered particles is not impacted.

CONCLUSION

Turbiscan™ technology enables to determine the most suitable vegetal protein for fining, adjust the concentration to optimize the clarification of wine. Differences between fining agents in terms of efficiency can be identified by the quantification of migration rates, which reflects flocculation and sedimentation, and by the determination of the sediment layer height.