# A Comparison of the Efficacy of Vegetal Protein-Based Formulations and Other Wine Fining Agents

Daniel Pambianchi[1]

**Abstract**. Wine consumers' concerns about what goes into wine and possible allergies, and the movement toward more natural wines, have pressed the winemaking industry to look for alternatives solutions to traditional processing aids used in fining wines. Fining agents are used to clarify wine, where limpidity, referred to as turbidity, is an important aspect in whites and rosés. Vegetal protein-based fining agents have now become mainstream as an alternative to traditional fining agents. This study demonstrates that vegetal protein-based agents can have good fining action although bentonite is still most effective in clarification of white wines.

**Key words**: turbidity, fining, proteins, bentonite, silica gel, isinglass, vegetal agents, allergens

**Introduction.** Wines marketed soon after production and meant for quick consumption must be limpid and free of any colloids or sediment. In winemaking, limpidity, or lack thereof, is known as turbidity. This is particularly important in whites and rosés where colloid matter and sediment are visually unappealing.

Removal of colloidal matter and sediment is accomplished by fining, filtration or both. Fining uses processing aids, or fining agents, to clarify wine down to a desired level, or turbidity level.

Traditional fining agent types include mineral substances, such as bentonite and silica; animal-derived proteinaceous agents, such as casein (from milk), egg white, gelatin and isinglass; polysaccharides, such as chitin/chitosan (from crustaceans) and alginates; and polyphenols, namely, tannins. Milk, eggs and shellfish are classified as allergens by regulatory agencies in many countries. Some have implemented mandatory allergen labelling for wines processed with these types of fining agents.

Because of increasing consumer concerns about goes into wine and possible allergies, stricter rules imposed by regulatory agencies, the movement toward more "natural products", and that some fining agents may strip wines of aromas and color, the winemaking industry has been researching alternative sources of proteins for fining applications.

Vegetal protein-based fining agents sourced from, for example, potatoes and peas, have already been accepted and allowed in some winemaking regions (Iturmendi et al. 2013).

Researchers have also developed a method for extracting grape seed proteins from grape seed flour, i.e., the by-product of the grape oil seed industry, and which have demonstrated favorable results in fining applications (Vincenzi et al. 2013).

The purpose of this study was to benchmark the efficacy of some commercial vegetal protein-based fining formulations against traditional agents by measuring turbidity in a white wine. Selected commercial formulations include Laffort's Vegecoll®, derived from potato proteins; Laffort's Polymust ORG®, comprising a complex vegetal protein base and calcium bentonite; Laffort's Polymust® V, comprising a complex vegetal protein base and PVPP (polyvinylpolypyrolidone); and the IOC's (Institut Œnologique de Champagne) Inofine V, derived from pea proteins. Selected traditional agents include bentonite, silica gel with isinglass, and isinglass.

Polymust V was selected for this trial although, according to the manufacturer's literature, it is designed to prevent oxidation and protect aroma and color.

Commercial formulations may include or require to be supplemented with counterfining agents, such as bentonite and tannins, to improve fining efficacy.

Turbidity is measured with a turbidimeter and results are expressed in Nephelometric Turbidity Units, or NTU. It is recommended that wines be bottled with less than 2 NTU. Generally, white wine is considered brilliant when NTU<1.1 and hazy when NTU>4.4; for rosés, when NTU<1.4 and NTU>5.8; and for reds, when NTU<2.0 and NTU>8.0 (Ribéreau-Gayon et al. 2012; El Rayess et al. 2011).

## Materials and Methods

**Test Equipment.** Hach 2100P portable turbidimeter and cuvettes for measuring NTU in wines; vacuum pump for degassing wine samples. The Hach 2100P turbidimeter was calibrated with stabilized formazin standards.

**Wine and Fining Agents.** Unfined, unfiltered 2014 Sauvignon Blanc wine processed from Lodi fruit, started September 28, 2014 with samples taken February 1, 2015; sodium bentonite from stock, rehydrated for 24 hours prior to application; silica gel–isinglass solution prepared using 1 g of Ichtyocolle and 1 mL/L of Kieselsol (silica gel, Nalco 1072, 30%) purchased from Presque Isle Wine Cellars, North East, PA; isinglass powder from stock; Laffort Vegecoll, Polymust ORG (soaked for one hour) and Polymust V provided by Vines to Vintages, Niagara, Ontario; IOC Inofine V purchased from Scott Laboratories, Pickering, Ontario; Inofine V solution with ellagitannins from stock added at a rate of 10 g/hL.

---

[1] Corresponding author (email: Daniel@TechniquesInHomeWinemaking.com)

Date of publication: March 14, 2015

Copyright © 2015 by Daniel Pambianchi. All rights reserved.

**Sample Preparation.** Nine one-liter samples were drawn from a single holding tank and treated with one fining agent at the maximum recommended rate: bentonite (50 g/hL); silica gel–isinglass solution (50 mL/hL); isinglass (3 g/hL); Vegecoll (4 g/hL); Polymust ORG (60 g/hL); Polymust V (80 g/hL); Inofine V (30 g/hL); Inofine V–tannin (30 g/hL). One sample was used as control.

**Test Procedure.** Each treated sample was transferred to eleven 60-mL bottles, one for each measurement, capped, and held at a temperature of approximately 20°C. An untreated wine sample was measured for initial NTU. At the time of the measurement, 15-mL samples taken from the middle of bottles were transferred to cuvettes using 15-mL class A volumetric pipettes. Samples were degassed in cuvettes with a vacuum pump to avoid $CO_2$ skewing measurements. Cuvettes were first wiped with an alcohol solution to remove any foreign matter on the glass surface. Cuvettes were then treated with a thin layer of silicone oil having the same refractive index as glass to minimize interference from any scratches. Measurements were taken once only immediately with the turbidimeter and the results recorded.

**Test Errors.** The Hach 2100P turbidimeter has an accuracy of ±2% of the reading.

## Results and Discussion

**Turbidity.** The untreated sample at the start of the study measured 41.5 NTU.

Table 1 tabulates NTU readings obtained at each test interval for the fining agents part of this study. Figure 1 graphically compares the rate of fining at each test interval.

After only 6 hours, the NTU in samples treated with bentonite and Polymust ORG already dropped by 30–33 %. The bentonite component in Polymust ORG can be assumed to greatly enhance fining, although this is not its primary purpose. The control sample dropped by 8 NTU, or approximately 20%. All other samples were at higher NTUs than the control sample. Samples treated with Vegecoll, Polymust V and Inofine V registered high readings—higher than the initial NTU.

After 12 hours, all samples improved with the ones treated with bentonite and Polymust ORG measuring the lowest NTUs. However, NTU for the sample treated with Polymust V dropped by 57% from the measurement taken after 6 hours.

Only the bentonite-treated sample fell below 2.0 NTU after 14 days. The Polymust ORG-treated sample was close behind at 2.35 NTU. The Polymust V-treated sample was at 4.70 NTU. All other samples were still above 14 NTU.

No significant changes were observed between the second and third week for the samples treated with bentonite, Polymust ORG and V. All other samples continued improving, albeit at a slower rate.

The bentonite-treated sample dropped below the 1.1 NTU mark after 5 weeks. In the same time, the Polymust ORG-treated sample dropped to close to this mark, at 1.19 NTU, while the Polymust V-treated sample dropped to 2.36 NTU. All other samples were still in the 11–13 NTU range, and only slightly better than the untreated sample at 15.3 NTU.

Silica gel only slightly improved the efficacy of isinglass, while tannins hampered the efficacy of Inofine V.

| Time Interval | Control | Bentonite | Silica Gel + Isinglass | Isinglass | Vegecoll | Polymust ORG | Polymust V | Inofine V | Inofine V + Tannins |
|---|---|---|---|---|---|---|---|---|---|
| 6 hours | 33.5 | 27.3 | 33.8 | 36.5 | 59.6 | 28.9 | 60.9 | 37.7 | 59.3 |
| 12 hours | 27.0 | 14.4 | 24.6 | 29.9 | 54.4 | 16.1 | 26.2 | 32.2 | 43.4 |
| 24 hours | 22.5 | 10.8 | 20.1 | 26.9 | 49.3 | 11.9 | 18.1 | 30.4 | 40.9 |
| 2 days | 24.2 | 7.08 | 18.2 | 22.4 | 43.7 | 8.15 | 13.1 | 27.7 | 33.1 |
| 3 days | 21.5 | 5.68 | 16.7 | 22.0 | 37.0 | 6.16 | 10.1 | 25.8 | 31.7 |
| 4 days | 20.5 | 4.77 | 16.3 | 21.1 | 38.7 | 5.44 | 8.89 | 24.6 | 29.1 |
| 5 days | 19.8 | 4.10 | 16.0 | 19.9 | 33.4 | 4.47 | 7.96 | 22.9 | 28.9 |
| 7 days | 19.9 | 3.89 | 15.9 | 19.0 | 27.7 | 4.26 | 7.41 | 21.2 | 24.9 |
| 2 weeks | 17.5 | 1.94 | 14.1 | 16.7 | 20.2 | 2.35 | 4.70 | 17.3 | 19.8 |
| 3 weeks | 16.5 | 2.07 | 13.1 | 14.6 | 15.3 | 2.76 | 3.67 | 14.5 | 17.0 |
| 4 weeks | 15.5 | 1.24 | 11.8 | 13.8 | 13.2 | 1.54 | 2.79 | 12.2 | 15.2 |
| 5 weeks | 15.3 | 1.07 | 11.0 | 12.8 | 11.6 | 1.19 | 2.36 | 11.3 | 12.8 |

**Table 1** Turbidity readings (NTU) as a function of time for each fining agent.

Copyright © 2015 by Daniel Pambianchi. All rights reserved.

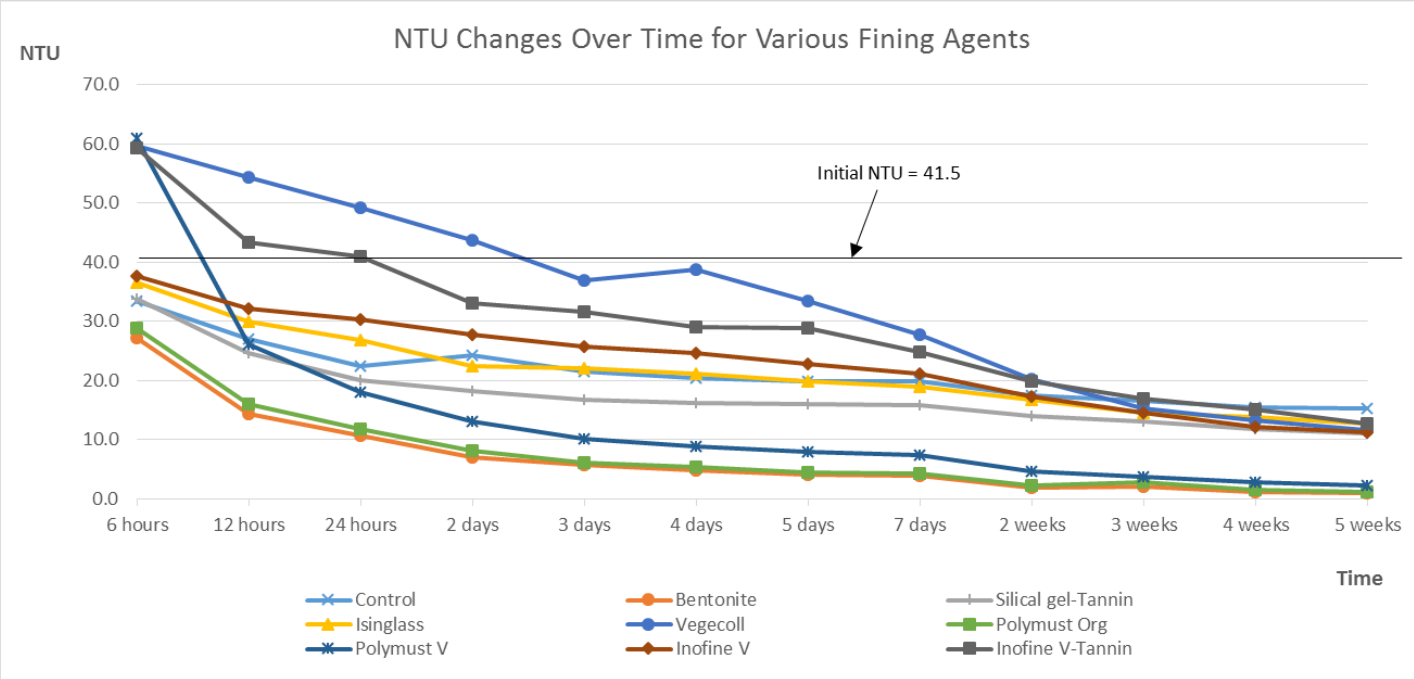


**Figure 1** Turbidity readings (NTU) as a function of time for each fining agent.

## Conclusions

This study demonstrates that vegetal protein-based fining agents can be good alternatives for clarifying white wines.

For processing white wine for clarification, Polymust ORG and V are good alternatives to bentonite, although they require slightly longer to achieve comparable turbidity levels. The bentonite component in Polymust ORG is assumed to greatly enhance the fining action. Vegecoll and Inofine V, which are specifically designed for clarification, would appear to require a considerably longer contact interval to achieve the target NTU of 2.0. The study was only carried out for 5 weeks and could not confirm if that target would be achieved.

No quantitative tests were performed to assess aroma or color loss, if any, from treatments. This could be the focus of a new study.

## Literature Cited

El Rayess, Y., C. Albasi, P. Bacchin, P. Taillandier, J. Raynal, M. Mietton-Peuchot and A. Devatine. 2011. Cross-flow microfiltration applied to oenology: A review. J. Membr. Sci. 382:1-19.

Iturmendi, N., V. Moine, V. Renouf, A. Rinaldi, A. Gambuti and L. Moio. 2013. Agent de collage des moûts et des vins: Une nouvelle source de protéine végétale, la pomme de terre. Revue des œnologues et des techniques vitivinicoles et œnologiques. 149:25-28.

Ribéreau-Gayon, P., Y. Glories, A. Maujean and D. Dubourdieu. 2012. Traité d'œnologie, Tome 2 - Chimie du vin. Stabilisation et traitements. 6e édition. Dunod, Paris.

Vincenzi, S., C. Dinnella, A. Recchia, E. Monteleone, D. Gazzola, G. Pasini and A. Curioni. 2013. Grape seed proteins: a new fining agent for astringency reduction in red wine. Aust. J. Grape Wine Res. 19:153-160.

Copyright © 2015 by Daniel Pambianchi. All rights reserved.