The Australian Wine Research Institute

Fact Sheet
WINEMAKING

Protein stability

Background

Proteins are extracted from grapes during winemaking and can cause haze in white and rosé wines. Removing proteins from wine currently involves adding bentonite – a clay that binds to the proteins and settles out. To determine how much bentonite is needed to remove the protein from a specific wine, a predictive test is needed.

Haze formation

Haze can form in wine at any temperature but tends to form more quickly if wine is stored at higher temperatures. Higher concentrations of wine proteins, lower wine pH, and higher levels of phenolics, sulfate ions and salts all increase the chance of a wine becoming hazy, and so predicting haze relies on a heat test rather than measuring the individual wine components.

Predicting haze with a heat test

A heat test is a simple method to determine the likelihood of a wine becoming hazy and the amount of bentonite required to prevent haze formation.

The test involves inducing a haze by heating a wine sample (80°C, 2 h) to unfold the haze-forming proteins and then cooling the wine (20°C, 3 h) to allow the unfolded proteins to stick together, forming a visible haze. Consistent heating and cooling steps are essential for reproducible results.

Optimal conditions for the heat test:

- Filter wine sample at 0.45 µm*
- Measure turbidity
- Heat sample in a water bath (80°C, 2 h)
- Cool sample (20°C, 3 h) in a water bath or container of water **

- Measure turbidity (<2.0 NTU difference before and after heating for stable wines)

*Filtering wine stops existing particles from seeding haze formation. Use a pore size that will be used to filter wines before bottling.

**The quicker wines are cooled, the greater the amount of haze forms. If wine samples cannot be brought down to 20°C immediately after heating, place samples in a fridge for 1 hour, then at room temperature for 2 hours. Keep cooling conditions consistent for best results.

As an alternative, a longer heat test may be preferred, as this test will induce the greatest amount of haze in a 24-hour period. For this method, heat wine at 80°C for 6 hours, cool at 4°C for 16 hours then at room temperature for a further 2 hours before measuring.

Predicting haze with a test kit

Commercially available test kits offer an alternative to a heat test and can be used when an immediate heat stability results are required. Proteotest® and Prostab® predict a similar bentonite dose to the shorter heat test (2 hours heating, 3 hours cooling). Bentotest® predicts higher doses than the 24-hour heat test. All bentonite doses predicted by the different test kits and heat tests have been shown to keep wine clear and bright after extended storage.

Optimising the bentonite dose

Bentonite dose is not directly related to the amount of haze produced in a heat test or to the amount of protein in the wine. Fining trials are required to determine the optimal dose. Fining trials are best conducted by adding the prepared bentonite slurry at a range of doses, first at 0.5 g/L concentration intervals to give a ballpark dose and then a second round at 0.2 g/L intervals. The optimal bentonite dose results in a change in turbidity of less than (not equal to) 2.0 NTU. When in doubt, always fine at the higher bentonite dose.

Any additions made to wine after bentonite fining, particularly copper and tannin, can destabilise a heat-stable wine. Heat stability should be rechecked after all additions have been made and bentonite added as required.

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References and further reading

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Contact

For further information, please contact:
Dr Keren Bindon

Phone 08 8313 6600 **Fax** 08 8313 6601 **Email** keren.bindon@awri.com.au

Website www.awri.com.au

Address Wine Innovation Central Building, Corner of Hartley Grove & Paratoo Rd, Urrbrae (Adelaide), SA 5064