TESTING WINE STABILITY
fining, analysis and interpretation

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FROM TANK TO BOTTLE
Enartis’ Stabilisation School
Testing wine stability

Hazes/colour/precipitate

Temperature, oxygen exposure, insufficient antioxidants, contamination

Oxidation

in combination with a unique wine composition

Microbial
Testing wine stability

Hazes/colour/precipitate

Oxidation

Microbial

Protein

Pinking

Tartaric acid

Colour
When conducting stability tests it is important to consider ALL factors when interpreting results.

It's not just about the numbers!
Protein Stability

Is my wine protein stable?

Is my wine protein stable enough?

When deciding what level of heat stability is needed, consider the risk of heat exposure the wine might experience.
Impact of Temperature during Bulk Shipping on the Chemical Composition and Sensory Profile of a Chardonnay Wine

Ann-Kathrin Walther, Dominik Durmer, Ulrich Fischer

Protein Stability

Vinlab method for measuring protein stability

- Filter wine
- Measure ntu
- 2 hours at 90°C
- Temp shock 5°C
- Room Temp
- Measure ntu & calculate
- Visual check

Other methods do exist, consistency is key!
Protein Stability

Interpreting results
White & rosé

NTU After – NTU Before

< 2 stable
2-3 borderline
> 2 unstable
Proteins

< 2 stable
2-3 borderline
> 2 unstable

Stable ntu
Borderline 2.5 ntu
Unstable 11 ntu

Unstable 17 ntu
Unstable 39 ntu
Proteins

Unstable 92 ntu
Protein Stability

Interpreting results
Red

- Seldom unstable due to interaction with phenolic compounds
- Light red wines can be protein unstable due to lower level of tannins

NTU After – NTU Before

> 30 unstable
Stable 0.6 ntu

Unstable 35 ntu
Protein Stability

Bentonite Fining

First test the wine!

Prevent over fining

Unnecessary extra fining agent, time, treatment, energy, labour, costs can remove aroma compounds (often unwanted compounds)
Protein Stability

Bentonite Fining

Follow supplier recommendations

- Temperature
- pH

Follow instructions carefully
Protein Stability

Bentonite Fining

Preparation

- Prepare in clean, chlorine-free hot water (60°C)
  - Not in wine (less effective swelling)
  - Warm temperature

- Immediate, vigorous mixing to water

- Allow at least 6 hours swelling (maximum 24 hours)
  - Longer swelling times can promote microbial growth

- Lump-free slurry
  - Lumps = too little water leading to ineffective swelling
Protein Stability

Bentonite Fining Addition

- Add to the top of the tank while mixing
- Vigorous mixing for at least 15 minutes
  - Reaction is rapid but not instantaneous
  - Use inert gas as oxidative protection
- Wine temperature should be >17°C
  - Warmer temperature increase effectiveness
- Allow to settle for 1 week
  - Tank height will affect settling time
Protein Stability
Bentonite Fining
TESTING

- Sample can be taken before settling, after sufficient contact time

- Result = still unstable
  - Make sure the wine is not too cold
  - Mix the settled bentonite again
  - Ensure sufficient contact time

- Test again

- If still unstable = add additional bentonite and ensure proper preparation
Protein Stability

Bentonite Fining

Sodium Bentonite vs Calcium Bentonite

Sodium bentonite swell more
✓ greater absorption surface area

Calcium bentonite swell less
✓ more compact lees for easier racking
✓ smaller loss of wine at racking
✗ calcium tartrate instability
Protein Stability

Bentonite Fining

Remember!

stable + stable ≠ stable

Change in alcohol/pH/sugar/composition could lead to instabilities!

Any changes occurred since your last test? Test again!

Additional fining might be needed
Protein Stability

Bentonite Fining

Laboratory trails are only an indication

It is not possible to entirely replicate cellar conditions
  • Representative sample
  • Cellar temperatures
    • Mixing regime
    • Bentonite batch

Wines should always be tested for protein stability after bentonite treatment
Protein Stability

Is my wine protein stable enough?

Heat stability tests use heat ranges that should never be encountered by your wine.

If your wine is heated to near boiling for a few hours in the real world, protein hazes are the least of your worries.
All white varieties has the ability to pink

- White wine processed under **highly reductive conditions** and subsequently exposed to air without the protection of antioxidants (SO$_2$, ascorbic acid, inert gas)

- Relatively recent problem caused by the introduction of modern winemaking techniques, inert gas, refrigeration and more stringent use of antioxidants such as SO$_2$ and ascorbic acid

- **RISK**
  - reductive handling prior to fermentation
  - potential oxygen influx
Pinking

Vinlab method for measuring pinking potential

- Filter the wine
  - Control
  - Treatment

- Add 25 mg/L hydrogen peroxide
- Keep in a dark cupboard for at least 12 hours
  - The pinking will not worsen over time (unlike oxidation)

- Visual assessment of colour & spectrophotometric measurement (500 nm)
- Compare the control to the treated sample
Interpreting results

Pass
Borderline
Fail
Fail
Fail & Brown
Yellow
Pinking

Prevention

- Handling of juice
  - Not too reductive
  - PVPP during fermentation
  - Casein

- Wine: Ensure sufficient Free SO₂ (45 mg/L)

Treatment

- PVPP (higher dosage needed)
- Casein
- UV light
Tartrate stability

Potassium vs Calcium tartrate

Wine is saturated with **potassium tartrate**
- Equilibrium dependant on
  - Temperature
  - pH
  - Alcohol

**Calcium tartrate** not usually a problem
- Unless high calcium levels
- Cannot be effectively removed using temperature
- Precipitate over time, usually in bottled wines

*depending levels of other compounds, especially tartaric acid

Potassium source
- Grapes
  - Skin contact
- > 800 mg/L*

Calcium source
- Grapes
- Concrete tanks
- Synthetic products
  - Bentonite
  - Carbonate
  - Filter powder
- > 80 mg/L*
Synthetic tartaric acid products can induce CaT instability even with low calcium concentrations (< 60 mg/L)

**Synthetic**
- DL - tartaric
- D - tartaric

**Natural**
- L - tartaric
Tartrate stability

Inhibiting crystal formation

Compounds that loosely bind to tartrates to form soluble complexes

- Polyphenols, proteins, pectins, glucans, metals, sulphates, malic acid

These complexes are not necessarily stable over time and can break, leading to precipitation
Tartrate stability

Cold stabilization (Conventional)

Seeding:
- Provide crystal nucleation sites by adding KHT crystals
- 4 g/L
- 40 µm

Stirring:
- Constant stirring/mixing
- Ensure sufficient surface contact
- Minimum 90 minutes
- Optimal 4 hours

Temperature:
- Ideally below 0°C
- Important: wine will only remain stable above the treatment temperature
- No seeding: Several days/weeks at this temperature

Not effective on CaT

Change in composition = might change stability!
Tartrate stability

Freeze test
Quick freeze
Conductivity
Drop-out
Tartrate stability

3-Day Freeze Test

-4°C for 3 days
Visually inspected

STABLE

FINE CRYSTALS

UNSTABLE
Tartrate stability

STABLE

FINE CRYSTALS

UNSTABLE

UNSTABLE

Tartrate Stability

vinlab
your partner in quality wine making
**Tartrate stability**

**3-Day Freeze Test**

**Why do we report Fine Crystals?**

There is a risk that the amount of crystals can increase over time.

If unsure, submit again for 6-day freeze test to check.

The fine crystals can serve as a seeding source.

If the wine was treated to prevent tartrate instabilities, then you do not have to worry about further increases in crystals.
Tartrate stability

Quick Freeze

STABLE

FINE CRYSTALS

UNSTABLE

Tartrate Stability
Conductivity is a measure of ions in wine mainly attributed to $K^+$.

- Seed sample
- Measure the change in conductivity after seeding a cold sample of wine

Large change in conductivity = High degree of instability

Seeding can swamp the natural crystallization inhibitors giving false positives and resulting in over stabilization.
Minicontact Relative

Start conductivity (µS): 1,419,8
Final conductivity (µS): 1,301,1

Analysis results:
- Final precipitation (µS): 118,7
- Final precipitation (%): 8,36
Minicontact Relative

Start conductivity (µS): 1532,8
Final conductivity (µS): 1467,5

Analysis results:
Final precipitation (µS): 65,3
Final precipitation (%): 4,26
Minicontact Relative

Project: RC  Sample: 2266271
2018/06/28 2:20:45 PM

Start conductivity (μS): 1 628,5
Final conductivity (μS): 1 571,8

Analysis results:
Final precipitation (μS): 56,7
Final precipitation (%): 3,48
Project: RC
Sample: 2265251

Start conductivity (μS): 2,431.2  Final conductivity (μS): 2,381.7

Analysis results:
Final precipitation (μS): 49.5
Final precipitation (%): 2.04
Colour stability
3-Day Freeze Test

Colour Stability
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