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REVIEWING COLD STABILITY IN WINE

WHAT IS THE PURPOSE OF COLD STABILITY?

The cold stabilization process is a technique used during wine production to minimize the risk of potassium bitartrate from precipitating out of the wine post-bottling. The appearance of solid potassium bitartrate is often white colored and can appear hazardous to consumers. While its presence is not dangerous, cold stabilizing the wine is especially important in white and rosé wines in which people can easily see solid potassium bitartrate crystals in the bottom of a bottle.

TESTING FOR COLD STABILITY

Winemakers should always test a wine for cold stability to make sure the wine is not cold stable. Otherwise, going through the cold stabilization process may be a waste of time and resources, and may also create undesirable changes to the wine. The wine should also be tested after the cold stabilization process has completed to ensure the wine is actually cold stable.

There are several ways to test a wine for cold stability. The two most common analyses used by wineries include:

- **Freeze Test**
  - The freeze test is the simplest way to test for cold stability.
  - Two samples are put into individual sample bottles, and one sample is placed in a freezer for a defined period of time. The sample from the freezer is later thawed and compared to the control.
- **Conductivity**
  - In conductivity testing, a wine sample is brought to a specific temperature, usually 0°C to 1°C for whites or rosés or 4°C to 5°C for red wines, and the initial conductivity is read. After the wine is

subjected to that temperature for at least 20 minutes, the conductivity is measured again.
    - Conductivity readings that exhibit more than a 5% change are generally not considered cold stable.

WINE COMPONENTS THAT INFLUENCE COLD STABILITY

There are several factors that can influence a wine's cold stability properties:

- **Lower Temperature**: Lowering the wine temperature decreases potassium bitartrate stability, which helps favor precipitation.
- **Potassium Concentration**:
    - While adequate potassium is required to bind to bitartrate in order for it to precipitate out, too high potassium also influences the pH of the wine.
    - High potassium concentrations can alter the efficacy of the cold stabilization process.
- **Wine pH**: pH determines the percentage of tartaric acid in the bitartrate form that is capable of binding with potassium. The wine pH also influences how the pH will get altered after the completion of cold stabilization:
    - At a starting wine pH below ~3.60-3.65, cold stabilization will decrease the pH and decrease the titratable acidity (TA).
    - At a starting wine pH above ~3.60-3.65, cold stabilization will increase the pH and decrease the TA.
- **Alcohol**: As the alcohol concentration increase, potassium bitartrate becomes less soluble. This means it is more likely to precipitate out.
- **Nucleation Sites**: These starting points are required for crystal growth to develop and grow.
- **Complexing Agents**: These are chemical components in the wine that interfere with the development of potassium bitartrate crystals. It includes things like metals, proteins, gums, and polyphenols (tannins).

COLD STABILIZATION TECHNIQUES

There are two cold stabilization processes that wineries can use to facilitate the precipitation of potassium bitartrate.

- Natural cold stabilization

    - This is the subjection of wine to controlled cold temperatures for a specific period of time.
        - OIV Standard: -4°C for 10 days
        - Australian recommendation: -4°C to -2°C (24.8°F to 28.4°F) for up to 7 days
        - In general, red wines require a longer time at a cold temperature compared to white or rosé wines.
    - Natural cold stabilization success:
        - Provide a steady, non-fluctuating cold temperature.
        - Allow the wine to sit at that temperature for the minimum time requirement.
        - Rack off of tartrates while the wine is cold, but remember to manage oxygen.
        - Keep timing in mind. Any latent pH changes may affect cold stability properties of the wine.
- Contact seeding
    - This is the addition of fine potassium bitartrate powder to the wine at cold temperatures and with agitation that accelerates the precipitation of potassium bitartrate from the wine.
        - 30 – 40 g/hL (2 – 3 lbs/1000 gal) of potassium bitartrate (Cook 2017)
        - 3 – 6 hours of maintained agitation and cold temperature
    - Contact seeding success:
        - Pre-filter the wine prior to contact seeding.
        - Constant agitation is essential for effective cold stabilization.
        - Rack off of tartrates using a 3 – 5 μm pore size filter to separate out small crystals. Keep the wine cold to avoid crystals from re-dissolving in the wine.

Reviewing Cold Stability in Wine: Action Steps

1. Create a plan to test for cold stability.
2. Review the SOP for cold stabilization.

RESOURCES

Cook, K. (March 7, 2017) Stabilization of Sparkling Wine. Oral presentation at *Sparkling Wine Production: Improving the Eastern U.S.'s Bubblies* workshop hosted by Penn State Extension. Malvern, PA.

Iland, P., N. Bruer, A. Ewart, A. Markides, and J. Sitters. (2012) Monitoring the Winemaking Process from Grapes to Wine: Techniques and Concepts, 2nd Edition.

Waterhouse, A.L., G.L. Sacks, and D.W. Jeffery. (2016) 26.1 Cold Stabilization. *In* Understanding Wine Chemistry. Pg. 319 – 331.

Zoecklein, B.W., K.C. Fugelsang, B.H. Gump, and F.S. Nury. (1999) Chapter 15: Tartrates and Instabilities. In Wine Production and Analysis. Pg. 228 – 241.

NEED MORE HELP?

The Darn Good Winemakers is an educational winemaking coaching service provided by *DGWinemaking*. We feature one webinar and an open "Winemaking Advice Hour" each month so that we can all learn and build confidence in our winemaking decisions.

If you find yourself needing further assistance or would like more access to the services that *DGWinemaking* provides, please contact Denise at info@dgwinemaking.com. See how other winemakers like you are benefiting from *DGWinemaking's* consulting services.