Calcium and its unpredictable presence

Earlier in the year this column featured KHT deposits and cold stability. This month the focus is shifting to calcium instabilities, another type of deposit seen quite commonly by the AWRI helpdesk.

CALCIUM-INDUCED INSTABILITIES continue to be a problem for winemakers. While there are many types of calcium deposits that can arise in wines such as calcium DL-tartrate, calcium oxalate, calcium sulfate and calcium mucate, it is calcium tartrate, or more importantly crystals of calcium L-tartrate, which the AWRI helpdesk sees most often.

Q. HOW CAN I TELL IF MY WINE IS AT RISK OF THROWING A CALCIUM TARTRATE DEPOSIT?

Knowing the concentration of calcium in wine will give an understanding of the risk of calcium instability. Calcium deposits are often seen in wines where calcium concentrations exceed 60 mg/L for red wines and 80 mg/L for white wines. If a wine has calcium levels close to or above those levels, then other factors that may increase pH, such as malolactic fermentation and blending, can also increase the likelihood of calcium L-tartrate precipitation.

Q. WHY IS MY WINE HIGH IN CALCIUM?

The calcium content in grapes will vary from year to year and from vineyard to vineyard. Soil composition including limestone content, structure and hydraulic properties plays a large part in how much calcium is present, and how this calcium is transported through the vine and into the fruit.

Typically, in wetter years there will be more ion movement through the vine, which will see higher levels accumulate in the fruit. Other potential sources of calcium can include use of fertilisers (e.g. calcium nitrate) during the growing season and use of calcium-based sunscreens; however calcium can also be picked up at varying levels during the winemaking process.

Winemaking sources of excess calcium include the use of calcium carbonate rather than potassium bicarbonate in deacidification, the use of casein or other milk products for fining (avoid using calcium-enriched products) and the use of some calcium-based bentonites. Fermentation and wine storage in unlined or inadequately coated concrete tanks has also been a cause of calcium instability in the past; however, this is now uncommon because of the decreasing use of concrete vessels in contemporary winemaking and better concrete lining.

It is generally the AWRI's experience that few winemakers analyse for calcium content in juice and wine.

> Calcium L-tartrate deposits can be a frustrating problem for winemakers because the crystals are slow to form and usually do not come out of solution for some time, often months, after bottling.

Q. WHAT HAPPENS TO CALCIUM TARTRATE DURING COLD STABILISATION?

Unlike for potassium bitartrate, temperature has little effect on the rate of calcium L-tartrate precipitation and therefore there is no predictive test for calcium L tartrate instability.

This fact means that simple cold tests are ineffective indicators of calcium L-tartrate instability and cold stabilisation cannot be employed as a reliable method of precipitation to remove the threat of instability.

Wines that are potentially subject to calcium L-tartrate precipitation may prove to be impossible to stabilise even if kept at low temperature for long periods.

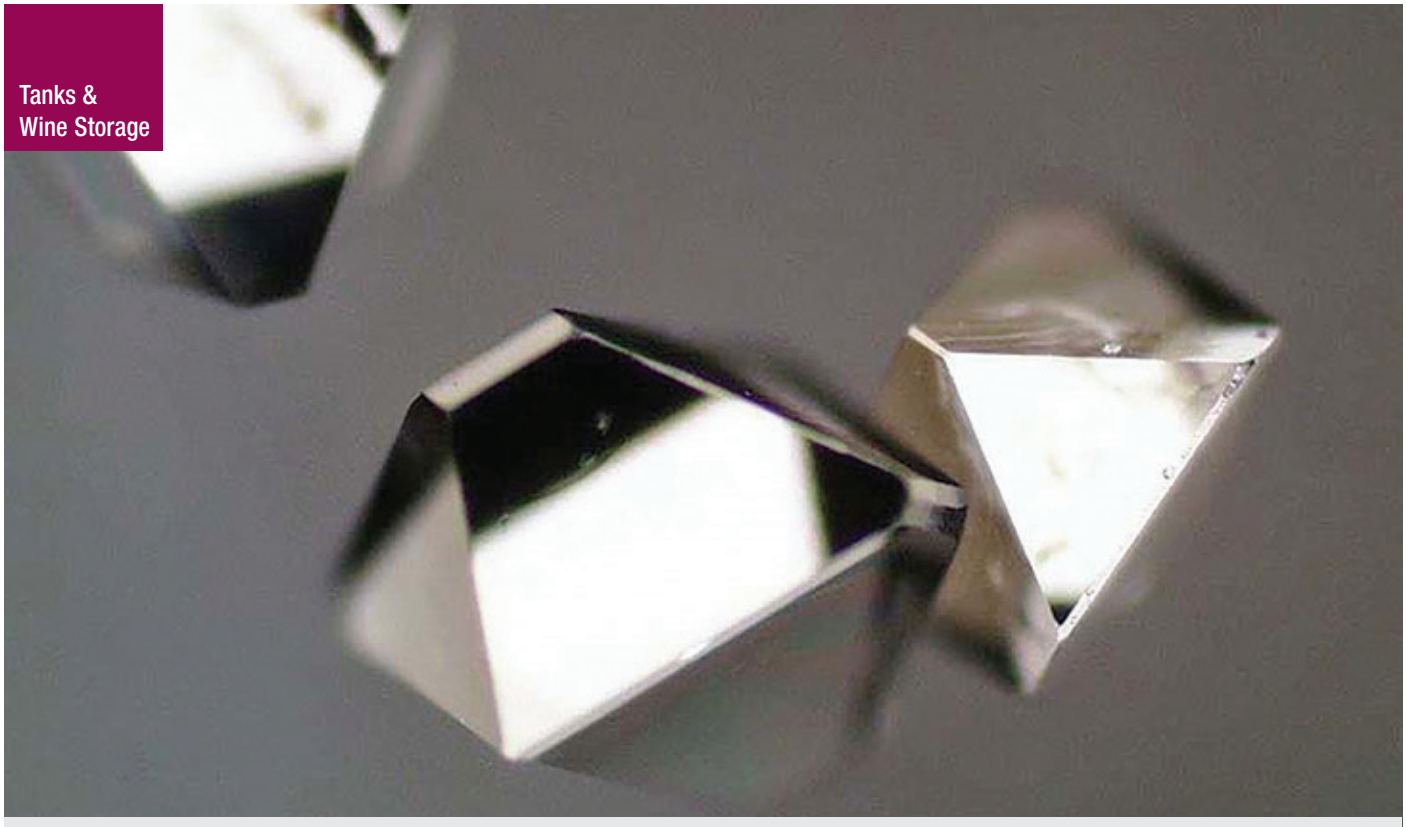
Q. DOES CMC PREVENT CALCIUM TARTRATE PRECIPITATION?

Trials to date suggest that CMC does not inhibit calcium tartrate formation.

Q. HOW CAN I LOWER THE CALCIUM LEVEL IN WINE?

There are essentially three ways to remove calcium from wine. The first and most effective way is to remove the calcium ions, which can be done via ion exchange; however this requires access to ion exchange equipment, and may have a sensory impact.

The second is to blend the concentration down using a wine containing lower levels of calcium. The third and least predictable way is to chill the wine and seed it with pure calcium L-tartrate crystals. Seeding relies on the availability



Calcium tartrate crystals isolated from a white wine.

of calcium L-tartrate crystals of high quality and in a finely ground state. This technique is somewhat unpredictable in terms of how much calcium will drop out.

L-tartaric acid, D-tartaric acid and DL-tartaric acid are all permitted winemaking additives in Australia. Using D- or DL-tartaric acid will see calcium DL-tartrate precipitate out, which in turn could be another way of reducing the level of calcium. This technique for calcium reduction is considered high risk and not recommended, as precipitation could continue to occur post-bottling.

The AWRI advises winemakers to continue to use L tartaric acid for acid adjustments in winemaking in order to avoid the formation of the unpredictable calcium DL-tartrate deposits.

Q. IS THERE A REGULATORY LIMIT FOR CALCIUM IN WINE?

There is no Australian MRL for calcium in wine and Argentina is the only current export destination with an MRL for calcium (maximum permitted concentration of calcium expressed as calcium oxide is 0.25 g/L).

FINAL COMMENTS

Calcium L-tartrate deposits can be a frustrating problem for winemakers because the crystals are slow to form and usually do not come out of solution for some time, often months, after bottling.

Measuring the level of calcium in juices or wines and adjusting winemaking procedures when required appears to be the most practical method of avoiding calcium instability problems.

For more information on calcium instabilities, contact the AWRI helpdesk:

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