Inspiring innovation.

CALCIUM TARTRATE
A NEW METHOD FOR ASSESSMENT AND INSTABILITY MANAGEMENT

The determination of all the factors involved in the crystallization kinetics of calcium tartrate allows for correctly quantifying the potential risk of precipitation.

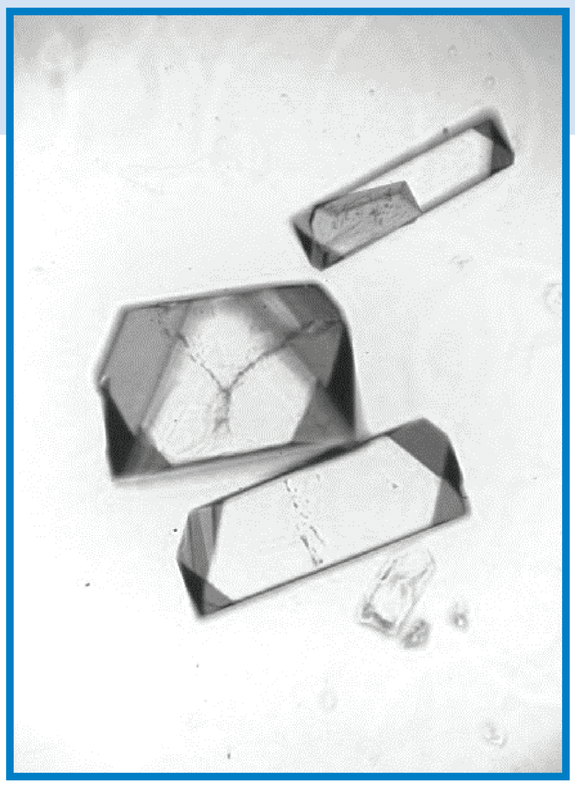
INTRODUCTION

The precipitation of calcium tartrate is an increasingly frequent phenomenon due to the growth in the concentration of Ca++ in must and the rise in pH due to climate change.
Until now, there has been no easy method to define the level of instability of calcium tartrate.
The difficulty lies in the complexity of the processes that lead to tartaric instability of calcium: the kinetics of crystal formation is very slow, a drop in temperature is not enough to accelerate the phenomenon and the timing of precipitation is not always predictable.
Enartis' research and development has developed a reliable method to predict the instability of calcium tartrate and developed a strategy for its proper management.

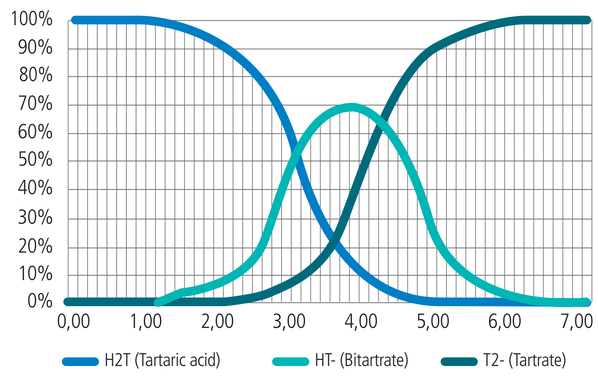
CALCIUM TARTRATE

The pH of wine influences the degree of dissociation of tartaric acid (Graph 1) and consequently the formation of its calcium salts (Figure 1).

Figure 1
Typical form of calcium tartrate crystals



Graph 1
Distribution of tartaric acid forms as a function of pH

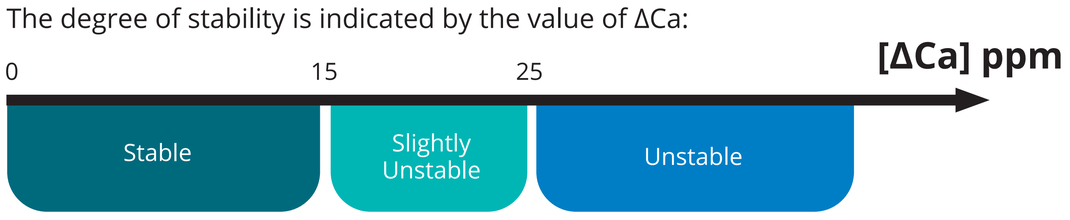


STABILITY TEST FOR CALCIUM TARTRATE

Perform Ca++ (Ca1) analysis on the wine sample, add 400 g/hL of micronized calcium tartrate (CaT), shake for 15 minutes and hold at -4°C for 24 hours.
After 24 hours, repeat the Ca++ analysis (Ca2) and calculate:

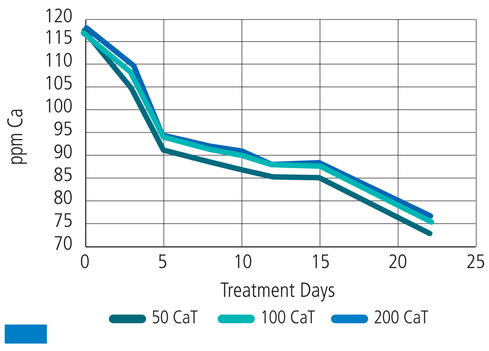
$$\Delta Ca = Ca1 - Ca2$$

The degree of stability is indicated by the value of ΔCa:



TREATMENT OF UNSTABLE WINES

The addition of an appropriate dose of micronized calcium tartrate provides the amount of crystallization nuclei needed to reduce the concentration of Ca++ in solution.



Graph 2
Calcium decrease curve following increasing additions of micronized CaT (g/hL).

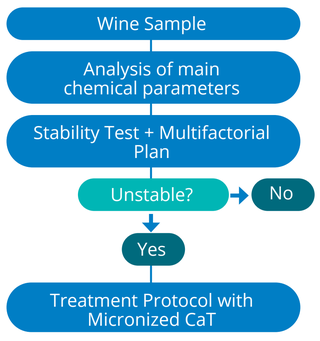


Figure 3
Enartis strategy for the treatment of calcium tartrate instability.

INTERPRETATION OF THE RESULTS

The degree of stability of wine is the result of the interaction between factors that inhibit (colloids, malic acid, low pH, etc.) or stimulate (high concentration of calcium, tartaric acid, alcohol, high pH, etc.) the precipitation of calcium tartrate.
The described test indicates whether the calcium tartrate stability is critical.
The obtained value can be better interpreted through the application of a multifactorial plan that takes the effect of the more influential factors (pH, tartaric acid and calcium concentration) into consideration.
Comparison between the results of the stability test and the value of the multifactorial plane allows for estimating the timing of the formation of crystal nuclei that, growing, will produce a crystalline precipitate. (Table 1)

	PH	ΔCa STABILITY TEST (ppm)	MULTIFACTORIAL ΔCa PLAN (ppm)
Wine 1	3.05	41	27
Wine 2	3.14	38	28
Wine 3	3.27	34	24
Wine 4	3.50	34	36

Table 1 Examples of comparison between the values obtained from stability tests and multifactorial plane.
Wine 1, 2 and 3 = Wines to be considered unstable and the formation of crystallization nuclei will take place long-term. This behavior is shown by the value of the multifactorial plane lower than the value of the stability test.
Wine 4 = The two values shown in the table are similar. The wine will produce crystals faster.

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CONCLUSIONS

The stability test described allows for the identification of wines containing critical levels of calcium. Adding statistical analysis to multiple factors clarifies the kinetics and the combination of the two improves the quality of instability prediction.
Micronized calcium tartrate is a valuable ally for reducing the concentration of potentially unstable calcium in solution. Numerous tests confirm the validity of this strategy. For more details on the subject, please contact technical service at Enartis.