FACT SHEET

AUGUST 2020 | ©Perennia 2020

Deacidification Practices for Winemaking

Deacidification is the process of decreasing the total acidity (TA) of must and wine, leading to an increase in pH. Various approaches and methods are available to treat the must before or during fermentation and to treat the wine post-fermentation.

When considering the use of these methods, it's a good idea to remember the following concepts:

- The main organic acids coming from the grapes are tartaric acid and malic acid, as well as citric and other acids in smaller amounts.
- While tartaric acid is the most dominant organic acid in terms of concentration in fully ripened grapes, in the case of unripe grapes, malic acid concentrations can be greater than those of tartaric acid.
- During fermentation, other organic acids are formed, such as pyruvic acid, succinic acid, lactic acid and acetic acid, to name a few.
- All these acids contribute differently to the chemical and organoleptic characteristics of wine. Therefore, it's important to examine the organic acid profile of must or wine, along with the pH before choosing the most suitable process to follow or product to apply for deacidification.
- In literature, the following classification for must and wine in terms of their pH and TA can be found.

Definition	pH	TA*
Low TA and high pH	>3.5	<6g/L
Moderate TA and pH	3.0-3.5	6-9g/L
High TA and low pH	<3.0	>9g/L
High TA and high pH	>3.5	>9g/L

*** All TA values in this factsheet are expressed in tartaric acid.**

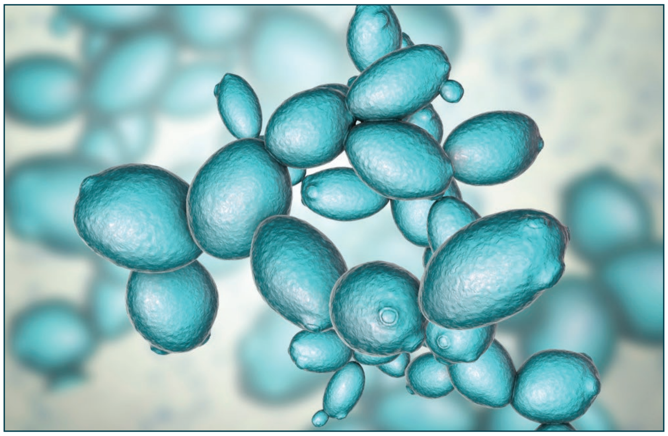
Here are a few of the different methods and approaches of the deacidification process.

1. Biological deacidification

1.1. Yeasts

The yeasts which are involved in the fermentation process affect the final quality and organoleptic characteristics of the wine, including acidity levels and specific organic acids produced.

- *Saccharomyces cerevisiae* is the most widely used winemaking yeast, which is known as conventional yeast. There are many different strains of *Saccharomyces cerevisiae* available commercially. Among these, malic-acid-degrading strains can be used to achieve partial deacidification.
- Currently, particular yeast species, which are called non-*Saccharomyces* or non-conventional yeasts, can be found in the market. Among these, *Schizosaccharomyces pombe* is relevant for the context of deacidification. This yeast can achieve deacidification due to its particular metabolism of malo-alcoholic fermentation, meaning that it consumes malic acid by converting it to ethanol and CO2.



1.2. Malolactic fermentation

Malolactic fermentation is done by the lactic acid bacteria, which converts malic acid into lactic acid. Upon completing a full malolactic fermentation, the acidity can be reduced, depending on the amount of malic acid consumed. Theoretically, fermentation of 1 g/L malic acid will result in a decrease of 0.6 g/L TA. The increase in the pH varies between 0.1 and 0.45 units (generally 0.1–0.25 pH units). This process is accompanied by a change in aroma and flavour profile of the wine. Therefore, the stylistic aspect should be taken into consideration when deciding on whether to conduct malolactic fermentation.

2. Chemical deacidification

Chemical deacidification involves using different processing aids on must and wine, depending on the conditions and the type of wine. In general, it's best to perform major deacidification treatments on the must, while minor ones can be performed on the wine. Always consider conducting a bench trial, before deciding on the product and dose to be applied.

2.1. Single salt deacidification

Among the single salts used for chemical deacidification in winemaking, calcium carbonate, potassium bicarbonate, potassium carbonate, and others can be considered.

Calcium carbonate:

- Calcium carbonate neutralizes and precipitates tartaric acid by producing double calcium salt of tartaric acid. It has minimal effect on the malic acid content.
- In cases where a major deacidification (around 2 g/L or higher) is necessary, calcium carbonate can be used before or during fermentation.
- The disadvantages of this method are slow rate of precipitation of calcium tartrates (meaning that it takes longer time to precipitate compared to potassium bitartrate) and the possible formation of salty taste upon application. Moreover, in the case that wine has high calcium content, further precipitation in the bottle may be seen.

Potassium bicarbonate:

- Potassium bicarbonate reacts with a similar mechanism as calcium carbonate, by combining with tartaric acid and precipitating as an insoluble salt. As in the case of calcium carbonate, it has minimal effect on the malic acid content.
- Potassium bicarbonate is recommended only for slight acidity adjustments (around 1 g/L). Theoretically, 1 g/L of potassium bicarbonate results in a decrease of 1 to 1.5 g/L TA.
- Before the application of this salt, conduct a bench-top trial to decide the appropriate dosage.
- Keep in mind that actual effect of this treatment will become evident only after proper tartaric stabilization and consequent precipitation of potassium bitartrate.
- It's important to be vigilant during the application of these salts. Gradually adding and applying in tanks with sufficient head space is strongly recommended since there will be a CO_2 generation from the reaction. It's necessary to read the application procedure provided by the manufacturer and apply accordingly. Finally, it's important to be aware of limitations in the usage of these processing aids.

2.2. Double-salt deacidification

- Double-salt deacidification is a technique that involves the formation of insoluble double calcium salts between malic and tartaric acids.
- The advantage of this method is its ability to reduce tartaric acid, as well as malic acid. For this reason, it's recommendable for must and wine that have high malic acid concentration.
- During the application of some double-salt products, a partial volume of the must or wine needs to be deacidified until it reaches a pH of 4.5. It's then blended with the rest of the volume. Therefore when such products are used, this blending should be done as quickly as possible to avoid any possible oxidation during the process.

3. Blending

Blending is a common practice that is mainly used to create balance and style of the wine. It's also used as a method to adjust the acidity of the must or wine.

For stylistic blending, different grape varieties and grapes from different plots are generally fermented separately and blended once the fermentation is finished. This method can also be used when decreasing acidity. However, if there are higher acidity grapes available during harvest, along with a batch of lower acidity grapes, these grapes or their juice can be blended before fermentation. This will allow for an easier fermentation, both alcoholic and if it's performed malolactic.

It's recommended to consider regulations around the grape varieties and vintages, and in the case of Tidal bay the appellation rules, before moving forward with blending.

4. Amelioration

Amelioration is the method of decreasing acidity by dilution with water. This is generally accompanied by adding sugar before fermentation. Dilution with water decreases the acidity however, does not have a significant impact on the pH, due to the buffering capacity of the must.

It's advisable to refer to the regulations around water and sugar additions before moving forward with amelioration.

5. Other methods

- Electro-membrane treatment (electrodialysis with bipolar and anionic membranes)
- Anion exchange resins