Acidity – Frequently asked questions PART 2

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Basic Wine

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The acidity and the various measurements of acidity is used in a wide range of wine production decisions including harvest timing, acid adjustments and cold stabilisation. Part 2 of this blog post continused addressing frequently asked questions and misconceptions regarding acidity.

Why do my titratable acidity measurement differ from measurement done in Europe?

When determining the titratable acidity, the European standard is to **titrate to an end-point of pH 7.0**, whereas the **South African wine industry titrate to a phenolphthalein end point of pH 8.2**. In addition, the **EU express acidity as g/L sulphuric acid while the local industry express titratability as g/L tartaric acid**.

By doing acid conversion calculations (using molecular weights), g/L sulphuric acid can be converted to g/L tartaric acid. The fact that different end-points are used during titration cannot be corrected so easily/accurately, however on average, a difference of approximately 0.5 g/L of tartaric acid is observed due to the different titration end points.

How do you convert one unit of acidity to another?

Sometimes it is necessary to **convert one acidity unit to another acidity unit**. For instance, if you need to convert titratable acidity in g/L as tartaric acid to g/L as sulphuric acid. The calculations involved in doing these interconversions are not too complex[1], but for ease of use the **interconversions can be simplified by using a constant value**. The table below and more details regarding the inter-conversion approach of acidity units can be accessed here[1].

To convert from acidity expressed as ⇒			tartaric acid	malic acid	citric acid	lactic acid	acetic acid	sulfuric acid
to acidity expressed as ⇒	tartaric	multiply by...	1	1.1193	1.1718	0.8331	1.2497	1.5302
	malic		0.8934	1	1.0469	0.7443	1.1165	1.3671
	citric		0.8534	0.9552	1	0.7109	1.0664	1.3059
	lactic		1.2003	1.3436	1.4066	1	1.5001	1.8369
	acetic		0.8002	0.8957	0.9377	0.6666	1	1.2245
	sulfuric		0.6535	0.7314	0.7658	0.5444	0.8166	1

Therefore, to obtain an approximate conversion from the South African expression of titratable acidity (g/L tartaric acid) to the European Economic Community (EEC) expression of titratable acidity (g/L sulphuric acid), one should subtract 0.5 g/L and then apply a conversion factor of 0.6535 to express in g/L sulphuric acid. Subtraction (or addition) of the 0.5 g/L is only applied between the conversion of titratable acidity units g/L tartaric acid and g/L sulphuric acid.

How will a wine's titratable acidity and pH change during cold stabilisation?

The initial assumption is that bitartrate precipitation will lower the titratable acidity while increasing the pH. However, as explained in the previous blog post, while acid content affects pH, there is no direct or predictable relationship between pH and titratable acidity.

The question:

How will a wine's titratable acidity and pH change during cold stabilisation?

The answer:

The effect will depend on the initial pH of the wine.

Bitartrate precipitation in wines with a **pH at or below 3.65** will

- **Reduce the titratable acidity**
- **Reduce the pH**

This is because of the generation of one free proton per molecule of potassium bitartrate precipitated at this pH. The pH may drop by as much as 0.2 pH units, with a corresponding decrease in titratable acidity of up to 2 g/L. Although the above values represent ranges seen in practice it may vary significantly for each unique wine.

Bitartrate precipitation in wines with a **pH above 3.65** will

- **Reduce the titratable acidity**
- **Increase the pH**

This is the result of removal of one proton per tartrate anion precipitated at this pH.

The precipitation of potassium bitartrate thus has a positive effect when the initial pH of the wine is lower than 3.65. While the precipitation will have undesirable effects if the initial pH is above 3.65. Because of the interactive effects of pH and potassium bitartrate precipitation it **is important that the initial pH of a wine be below 3.65 during cold stabilisation and during vinification** when some precipitation may occur naturally. In this way the decrease in titratable acidity will be coupled with a lowering of the pH which is advantageous to the winemaker.

More details on the reasons for the changes in pH due to bitartrate precipitation will not be discussed in detail in this blog post, but further information is available here[2,3].

Why did the titratable acidity increase during fermentation?

In general, the titratable acidity will decrease during fermentation due to the precipitation of potassium bitartrate, which becomes **less soluble with increasing ethanol** concentration. **However, increases in titratable acidity can occur.** If analytical error and other factors can be ruled out, then increases in titratable acidity can often be attributed to **increased production of succinic acid** which is a normal by-product of alcoholic fermentation. Several factors can result in succinic acid production of which the yeast strain used to conduct the ferment is important. A number of other factors might also influence the production of succinic acid, including fermentation temperature, aeration, must clarity and composition and other environmental factors. More information on succinic acid will be provided in a future blog post.

References[4,5]

(1) The Australian Wine Research Institute. Interconversion of Acidity Units. *AWRI Techical Notes TN14*.
(2) The Australian Wine Research Institute. POTASSIUM INSTABILITY. *The Australian Wine Research Institute Website*.
(3) The Australian Wine Research Institute. Ask the AWRI: Winemaking with High PH, High TA and High Potassium Fruit. *The Australian & New Zealand Grapegrower & Winemaker* **2018**, No. 657.
(4) De Klerk, J.-L. Succinic Acid Production by Wine Yeasts, Stellenbosch University, 2010.
(5) The Australian Wine Research Institute. Acidity and PH. *The Australian Wine Research Institute Website*.

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