

Winemaking and Titratable Acidity

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Outline:

Titratable Acidity (TA)

Definition. How knowing TA is useful.

Measuring TA in white wines (Color indicator method).

Measuring TA in red wines (pH indicator method).

Titratable Acidity

(Why is TA useful to know?)

- Guides harvest decision-making.
- Dictates compatible wine “styles”.
- Determines if must treatment is required prior to fermentation.
- Diagnose “unplanned” MLF during bulk aging.

Note:

TA should never trump sensory evaluation!!!

Titratable Acidity

(Amount of Acid in Wine)

- Grapes contain significant amounts of acid
- Tartaric and malic acid account for 90% of TA
- Acid concentration of grapes varies from 4-16 g/L

Less than 6 g/L typically tastes flat/flabby

Greater than 9 g/L typically too tart

Acidity Titratable

- **Low acid wines** can be augmented by the addition of tartaric acid.
- Best to add tartaric acid before fermentation.
- Most wines can tolerate an addition of 1-2 g/L before developing a “manipulated” flavor.

Acidity Titratable

- High acid wines are much more difficult:
- Best controlled in the vineyard (e.g., hang time)
- Modest adjustment via calcium carbonate prior to fermentation (also: *Acidex*; *Sihadex*)
- Moderate post-fermentation reductions
 - MLF (1-2 g/L)
 - Potassium bicarbonate (1-2 g/L)
- Yeast selection (Malic acid metabolizing)
- Blending with low acid base wine

Relationship between TA and pH

- Wine TA and pH are “loosely” coupled.
- High TA tends to be related to low pH.
- High pH/High TA grapes are not all that uncommon in some regions/harvests (e.g., cool nights; rain just before harvest).
- pH decreases accompanying tartaric acid addition are highly unpredictable (due to complex chemical buffering).

BENCH TRIALS ARE ABSOLUTELY NECESSARY!

Logic of TA Titration Procedure

- Measure a small wine sample (e.g., 5 ml)
- Add sodium hydroxide (NaOH) base solution to the wine until the acid is “neutralized” (pH=8.2)
- 2 molecules of NaOH (OH^- ions) are required to neutralize one molecule of tartaric acid (2H^+ ions)
- Concentration of tartaric and/or malic acid can be accurately estimated by the volume of NaOH needed to neutralize the wine sample

(See <http://www.moundtop.com/pdf/TA-procedure2.pdf> for details)

TA Calculation

$$\text{TA (g/L)} = \frac{(\text{ml NaOH})(\text{N NaOH})(\text{mol. wt. H}_2\text{T})(\text{mol H}_2\text{T}/\text{equiv})}{(\text{ml Wine Sample})}$$

Given:

NaOH concentration = 0.1 N (equivalents/L)

mol. wt. tartaric acid (H₂T) = 150 g

mol H₂T per equivalent NaOH = 0.5

volume of wine sample = 5 ml

$$\text{TA (g/L)} = \frac{(\cancel{\text{ml NaOH}}) (\cancel{0.1 \text{ NaOH eq/L}}) (\cancel{150 \text{ g/mol}}) (\cancel{0.5 \text{ mol/eq}})}{(\cancel{5 \text{ ml Wine}})}$$

$$\text{TA (g/L)} = (\text{ml NaOH}) * 1.5$$

$$\% \text{TA (g/100ml)} = \text{TA}/10$$

[Simplified Formula]

Titration Procedure Video

Youtube Video showing TA Measurement Procedure

http://www.youtube.com/watch?v=XstQOtL3H8E&feature=player_embedded