Managing Acidity in the Vineyard and the Winery

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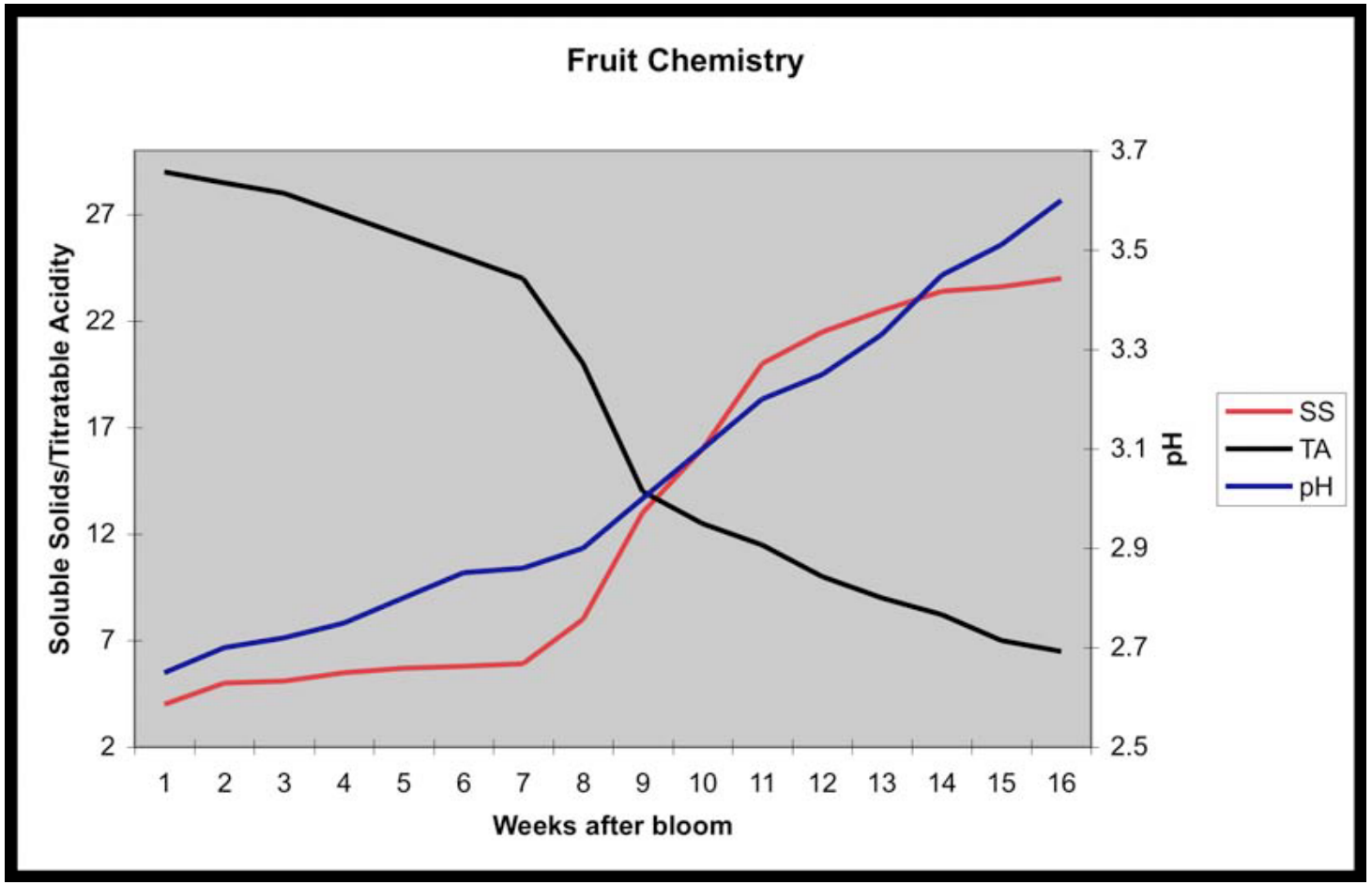
TEXAS A&M AGRILIFE EXTENSION

Factors affecting acidity

- Variety
- Temperature (esp. during ripening)
- Shade/exposure
- Crop level/balance
- Plant nutrition/soil fertility/soil moisture

Factors affecting acidity



Texas A&M AgriLife Extension

Fruit Composition

- Organic Acids
  - Tartaric, malic, citric, others
    - Ratio of tartaric to malic depends on variety and temperature during ripening (0.6 to 3.4)

- Breakdown of malic acid during ripening accounts for decreasing titratable acidity
  - High temps = low TA, esp. malic acid levels

- Tartaric acid is converted to K+ salt forms which causes pH to increase

Interaction of Variety Ripening Season and Temperature

Fruit quality is best when ripened under warm days and cool nights

- Early ripening grapes in a long season, hot area: Excess heat (especially night temps >60˚F)
  - High sugar, low acid, high pH, poor color, poor flavor & aroma
- Late ripening grapes in a short season, cool area: Insufficient heat (especially daytime temps <70˚F)
  - Low sugar, high acid, low pH, unripe herbaceous flavors

- Some varieties have a tendency for high pH and high TA
  - Black Spanish
  - Tempranillo

Relative Time of Ripening

- Early ripening varietals
  - Blanc du Bois, Viognier, Tempranillo

- Late ripening varietals
  - Cabernet Sauvignon, Mourvedre, Black Spanish

Appropriate Harvest Decisions

- Sugar, acid and pH?
- Flavor, aroma?
- Skin and seed maturity?

- Problem with TX varieties
  - As we wait for complete phenolic maturity sugar increases, TA drops, pH increases
  - What guidelines will be used to harvest these? pH?

Effect of Sun & Shade on Acidity

- TA
  - Excessive exposure of clusters leads to low TA
  - Shaded canopy leads to low TA
  - Shaded clusters leads to high TA
- pH
  - Shaded canopy (3+ leaf layers) leads to high pH
  - Well exposed canopy (1-2 layers) leads to low pH

Effect of Crop Load on Acidity

- TA
  - High crop load leads to high TA
  - Low crop load leads to low TA
- pH
  - High crop loads leads to low pH
  - Low crop loads leads to high pH

Soil and Plant Nutrition

- Soils deficient in K^+ lead to plant health problems (poor growth, reduced cold hardiness, increased disease susceptibility, etc)
- K^+ levels in soils are indirectly related to K^+ levels in plants
- Excess K^+ in soils will not lead to excess K^+ levels in plants
  - Active uptake, enzyme site saturation
- Large rootstock effect
  - *V. champinii* increase K^+ up to 2x
- Soil pH can be important
  - K is less available at low soil pH
  - High K and high pH can lead to excess K and Mg deficiency.
- Soil moisture is important… K^+ must be in solution for uptake

Irrigation

- Higher TA at the end of ripening (Tempranillo)
  - results are not clear cut, so no consensus on the issue

Managing Acidity in the Winery

1) Low TA and high pH (TA < 6g/L) (pH > 3.5)

2) Moderate TA and pH (TA 6-9g/L) (pH 3.0-3.5)

3) High TA and low pH (TA>9g/L) (pH<3.5)

4) High TA and high pH (TA>9g/L) (pH>3.5)

Managing Acidity in the Winery

- Low acidity wines
  - Acid additions
    - Tartaric acid (most common)
    - Citric acid
    - Other acids (malic, fumaric, etc)
  - Blending
    - Blending trials recommended
    - Stable wines pre-blend can produce an unstable wine post-blend

Managing Acidity in the Winery

- Low acidity wines
  - Acidic reserve additions
    - Underripe pre-harvested grapes
      - Either juice
      - Or wine
  - No MLF
  - Consider acid balance – Index of Acidity
    - TA - pH

Managing Acidity in the Winery

- High acidity
  - MLF fermentation (lactic acid bacteria Pediococcus, Lactobacillus, and Leuconostoc)
    - TA can decrease by 1-3 g/L
    - The higher the initial pH, the higher the reduction
    - pH will increase by 0.1-0.2
  - Amelioration (adding…water and sometimes sugar to must)
    - TA drops
    - pH remains stable (must buffering capacity)
    - Legality?

Managing Acidity in the Winery

- High Acidity (continued)
  - Calcium Carbonate additions
  - Single salt precipitation

$$CaCO_3 + H_2T \longrightarrow CaT + H_2O + CO_2$$

0.66 g $CaCO_3$ → ↓ H_2T by 1 g

    - Double salt precipitation
      - To precipitate both calcium tartrate and calcium malate (2 salts)
      - Part of the wine is treated and then blended back
      - TA ↓ pH ↓

Managing Acidity in the Winery

- High Acidity (continued)
  - Blending
    - Blending trials recommended
    - Stable wines pre-blend can produce an unstable wine post-blend
  - Sugar addition
    - No chemical de-acidification but
    - Sensory profile is improved, acidity is balanced by perceived sweetness

Managing Acidity in the Winery

- Choice of yeast strain
  - Lalvin C
  - Exotics
- Plastering – focuses on pH without affecting TA
  - For high pH & low/medium TA wine
  - pH can drop by 0.1-0.3
    - May cause Ca instability
    - May affect sensory profile