

# ***Acid Management in the Vineyard***

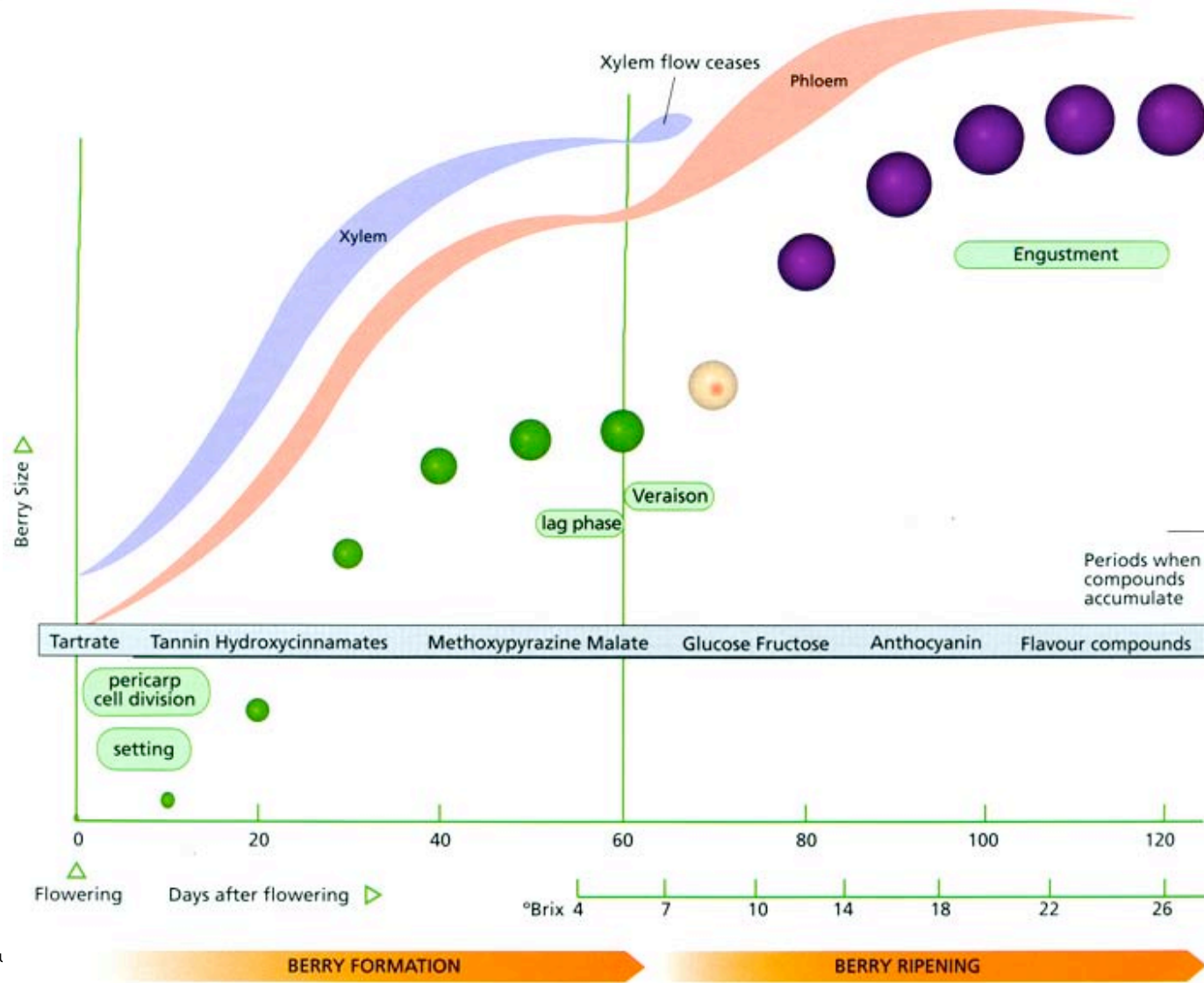
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Wine Grape Team

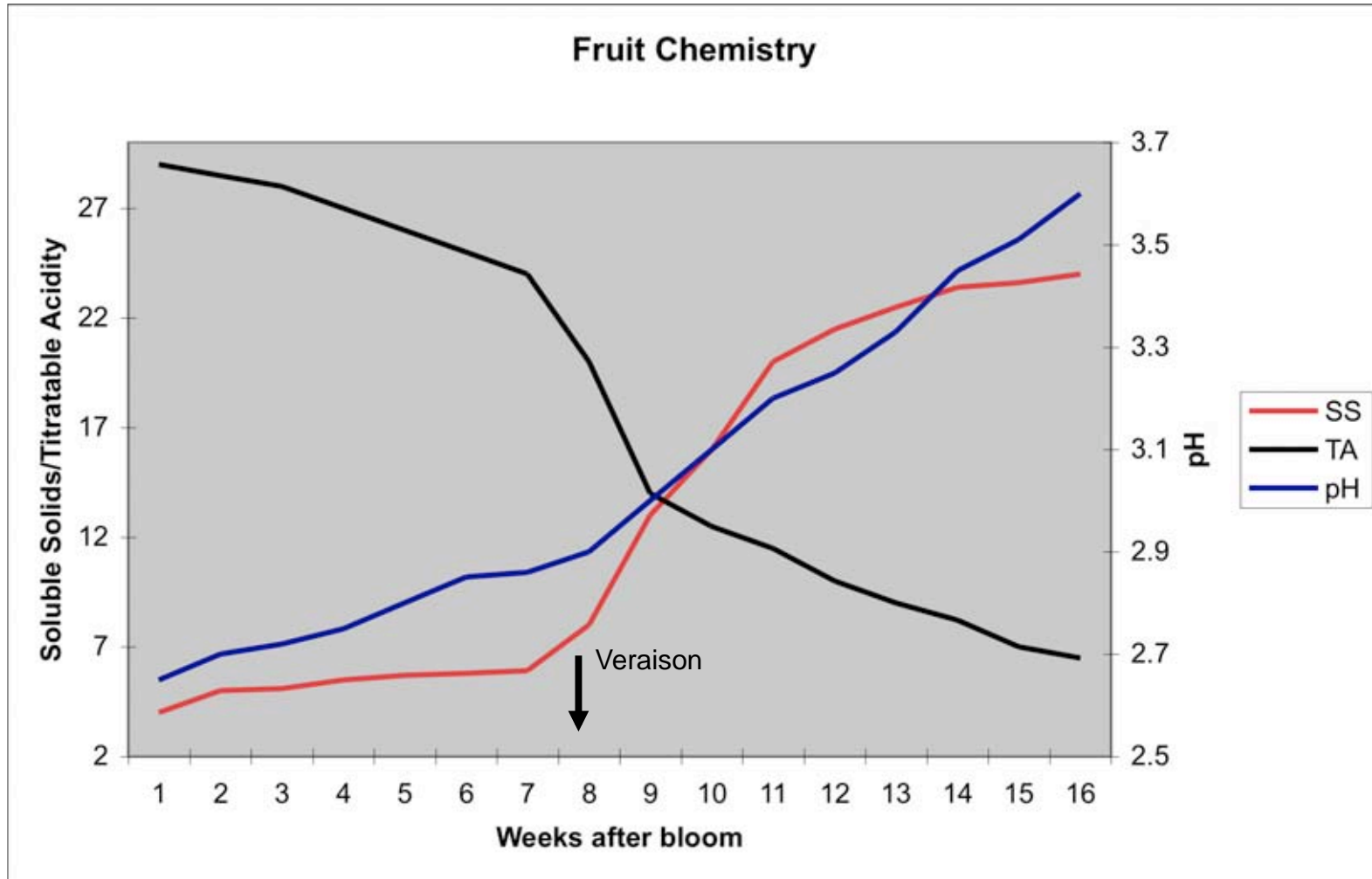
**2008 Spring Workshop**



## Factors affecting acidity

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





# 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 (Extent of Exchange) which causes pH to increase

## Effect of Variety

Variety	Harvest Date	Yield lb/vine	Clst Wt (g)	Berry Wt (g)	SS	pH	TA	PW (lb)	Crop Load
Frontenac	9/17	7.2*	78.1	1.0	22.1	3.28	1.73	0.9	9.5
Frontenac Gris	9/15	8.3	84.7	1.1	24.3	3.38	1.37	0.9	11.2
LaCrescent	9/6	11.5	84.3	1.2	22.3	3.46	1.22	1.3	9.9
Marquette	9/10	5.6*	53.7	1.0	24.8	3.38	0.95	1.0	6.4
Cayuga White	9/5	23.8	148.1	2.7	18.9	3.21	0.92	1.0	24.0
Chardonel	9/21	14.2	146.2.	2.0	22.4	3.23	0.94	0.7	24.2
Seyval	9/13	10.6	110.5	1.7	21.8	3.36	0.75	0.5	23.2
Vidal	9/28	20.4	162.3	1.7	23.4	3.26	0.77	1.0	19.5
Vignoles	9/22	7.1	89.9	1.2	24.4	3.31	1.04	0.5	14.0
Foch	9/6	7.8	53.1	0.9	23.1	3.35	0.89	0.8	13.7
Norton	10/1	8.1*	61.6	1.0	23.2	3.28	1.09	1.4	5.9
Corot noir	9/17	17.5	143.3	2.2	18.9	3.46	0.61	1.2	14.6
Noiret	9/29	14.3	143.7	2.1	19.8	3.20	0.67	2.5	5.7
Steuben	9/23	21.1	177.8	3.2	20.2	3.43	0.47	1.0	21.1

(Throckmorton Purdue Ag Center 2002-2006)

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## 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)  
Low 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
  - GR-7 (Laf) pH: 3.55 TA: 0.90
  - St Croix (Laf) pH: 3.42 TA: 1.09 (SWPAC) pH: 3.57 TA: 1.04
  - LaCrescent (Laf) pH: 3.46 TA: 1.22

## Relative Time of Ripening

<b>Early</b>	Foch, Leon Millot, Marquette, St. Croix, Valvin Muscat, Vignoles*
<b>Mid</b>	Frontenac, LaCrescent, Seyval, LaCrosse, Chardonel, Cayuga White, Vignoles, DeChaunac, Traminette, Noiret, Corot noir, etc.
<b>Late</b>	Chambourcin, Norton, Vidal, Cabernet sauvignon, Cabernet franc

# Harvest Dates

- Northern Indiana:
  - Early varieties: Mid-September
  - Mid varieties: Late September
  - Late varieties: Mid-October?
- Central Indiana
  - Early varieties: Late August
  - Mid varieties: Mid-September
  - Late varieties: Early October
- Southern Indiana
  - Early varieties: Mid-August
  - Mid varieties: Late August
  - Late varieties: Mid-September



# Appropriate Harvest Decisions

- Sugar, acid and pH?
- Flavor, aroma?
- Skin and seed maturity?
  
- Problem with MN varieties and high acidity.
  - As we wait for TA to drop, flavors are lost, fruit shrivels...
- Problem with NY varieties: low sugar and acid
  - 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

# High Cordon Training





Downward shoot positioning is critical to reducing shading of the cordon

Shading is a major concern











## Upright Varieties

Vignoles

Chardonel

Cayuga White

Traminette





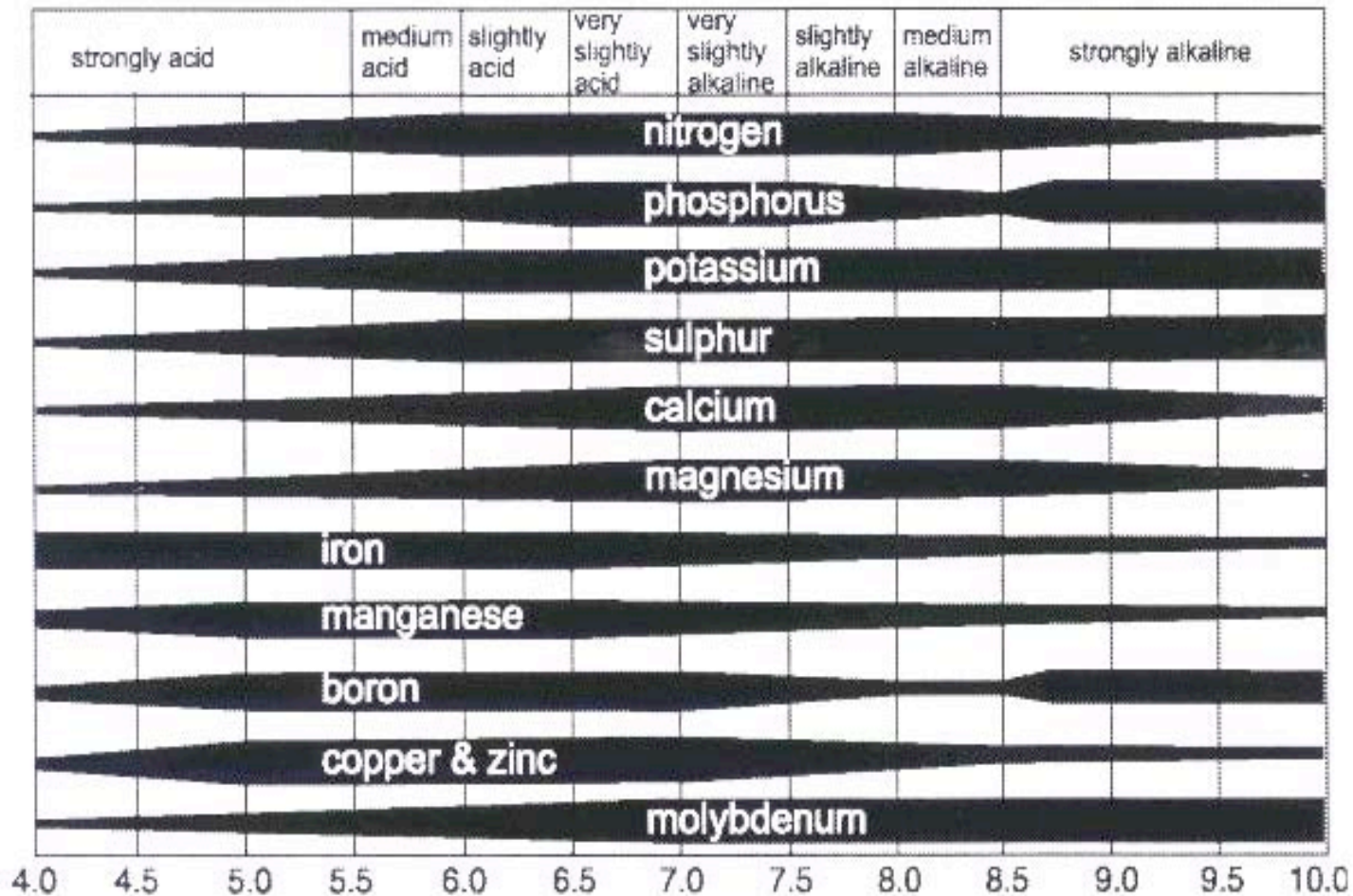
## Effect of Crop Load on Acidity

- TA
  - High crop load ( $>10$ ) leads to high TA
  - Low crop load ( $<5$ ) leads to low TA
- pH
  - High crop loads ( $>5$ ) leads to low pH
  - Low crop loads ( $<5$ ) 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* (Ramsey, Dogridge, Freedom, Harmony) 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

## Nutrient Availability and Soil pH



## Summary

- Managing Acidity in the Vineyard:
  - Variety effects
  - Temperature effects (matching variety to site)
  - Shading effects (training, canopy management)
  - Crop load effects (pruning to balance)
  - Soil nutrition, K<sup>+</sup> availability
  - Combined effects of each....
- Vineyard management should take into account each of the variables above and address them as needed.