

Acid Management in the Vineyard

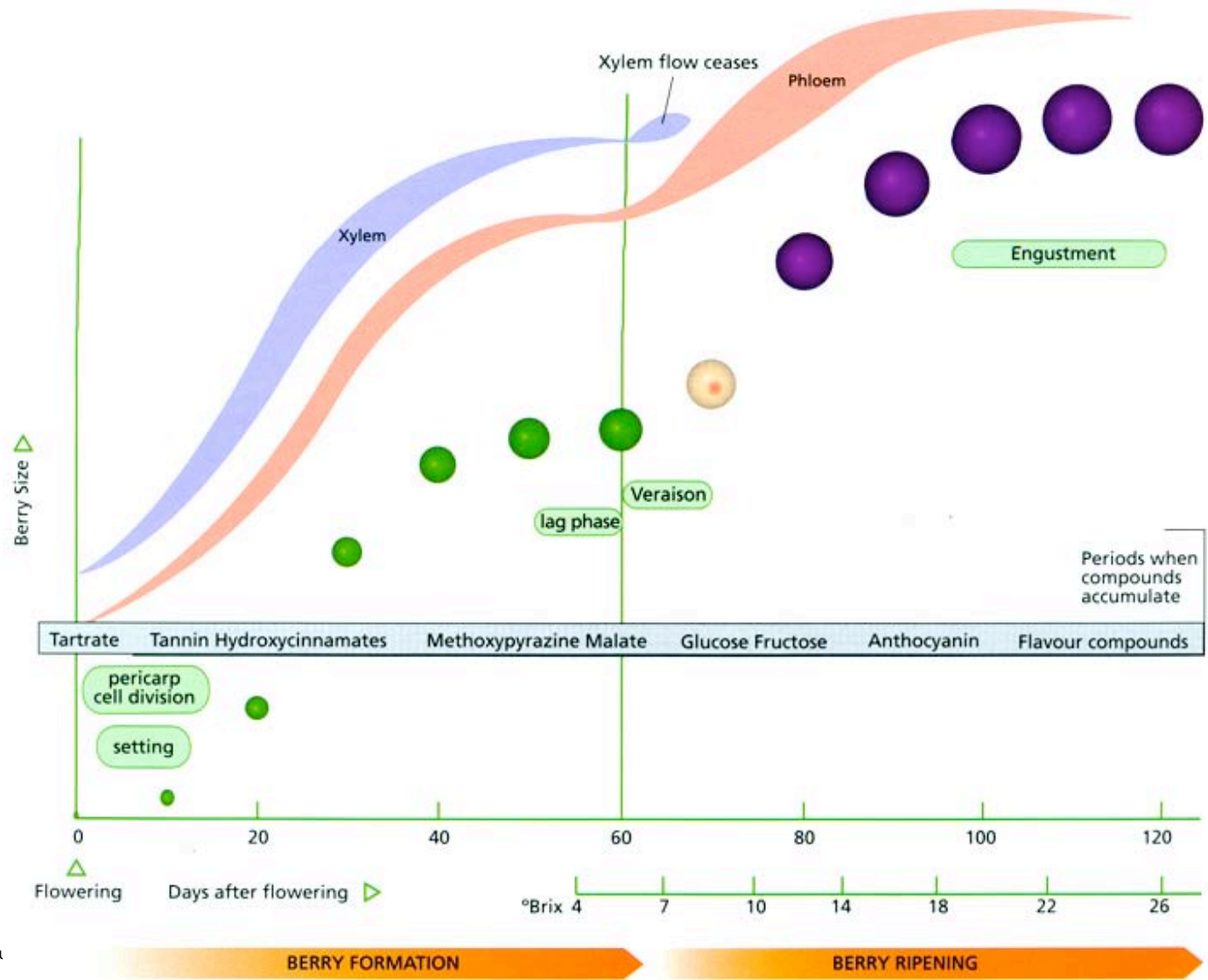
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Wine Grape Team

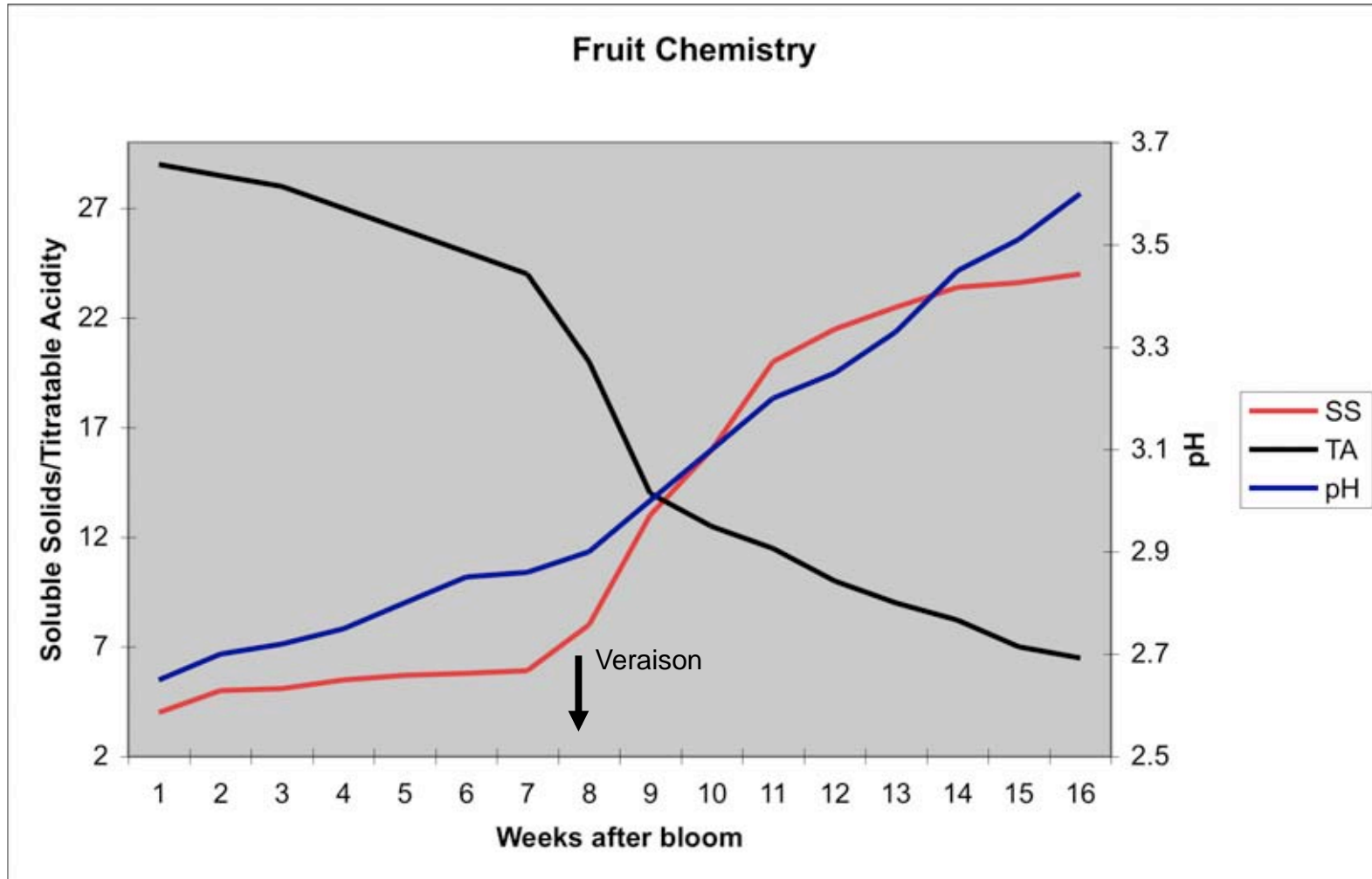
2008 Spring Workshop



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 $>60^{\circ}\text{F}$)
 - 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 $<70^{\circ}\text{F}$)
 - 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

Early	Foch, Leon Millot, Marquette, St. Croix, Valvin Muscat, Vignoles*
Mid	Frontenac, LaCrescent, Seyval, LaCrosse, Chardonel, Cayuga White, Vignoles, DeChaunac, Traminette, Noiret, Corot noir, etc.
Late	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





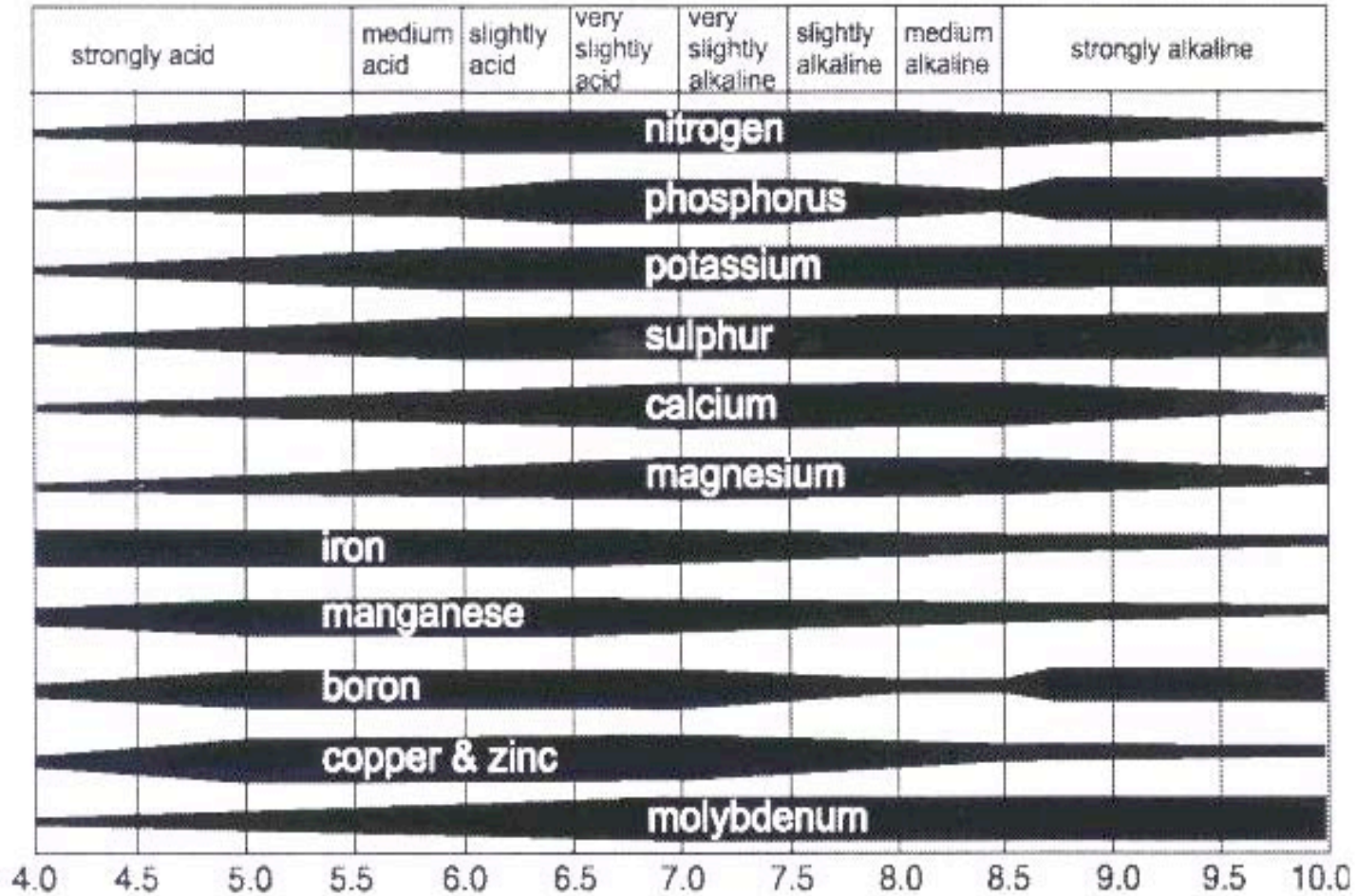
Effect of Crop Load on Acidity

- 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⁺ availability
 - Combined effects of each....
- Vineyard management should take into account each of the variables above and address them as needed.