Grapevine Nutrition & Vineyard Nutrient Management

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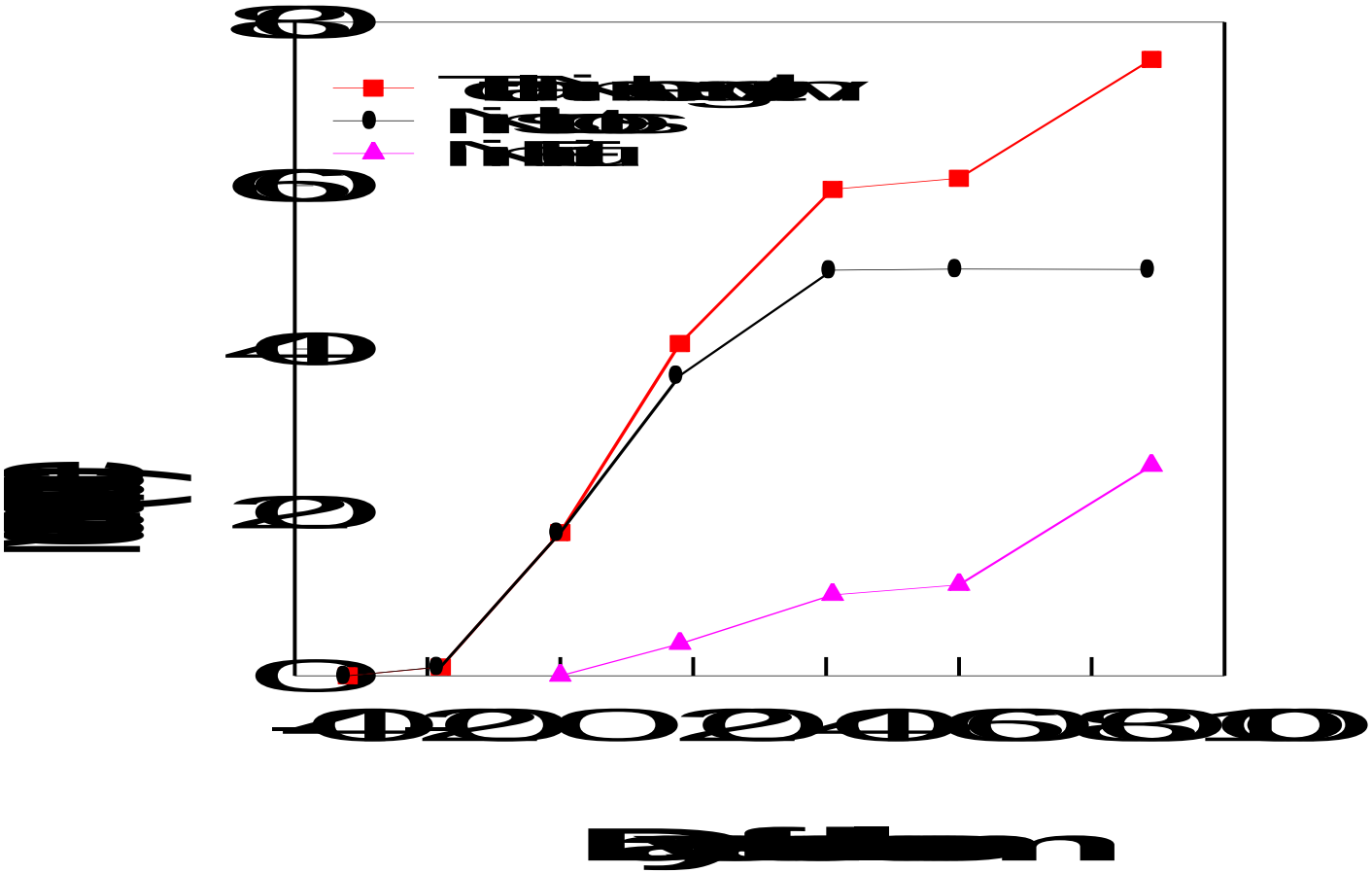
To effectively manage vine nutrition, we need to know:

- **Vine nutrient demand**
- **Vine nutrient supply**
  - **Nutrient reserves**
  - **Soil nutrient availability**
- **Vine nutrient status**

Seasonal patterns of vine N demand
(Concord, based on Hanson, 1995)



Vine N demand

- **Two periods of high demand**
  - **2 wks before bloom to end of shoot growth;**
  - **Veraison to harvest.**
- **Cropload**
  - **2.5 ~ 3 lb. N/ton fruit;**
  - **5 lb. N in shoots and leaves/ton fruit.**
- **Variety difference**
  - **Labrusca (70lb) > hybrids (50) > vinifera (35)**

N supply from reserves

- **Reserve N provides 15 to 30% of the total vine N demand.**
- **Reserve N is a main source for vine growth from budbreak to bloom.**

Soil N supply

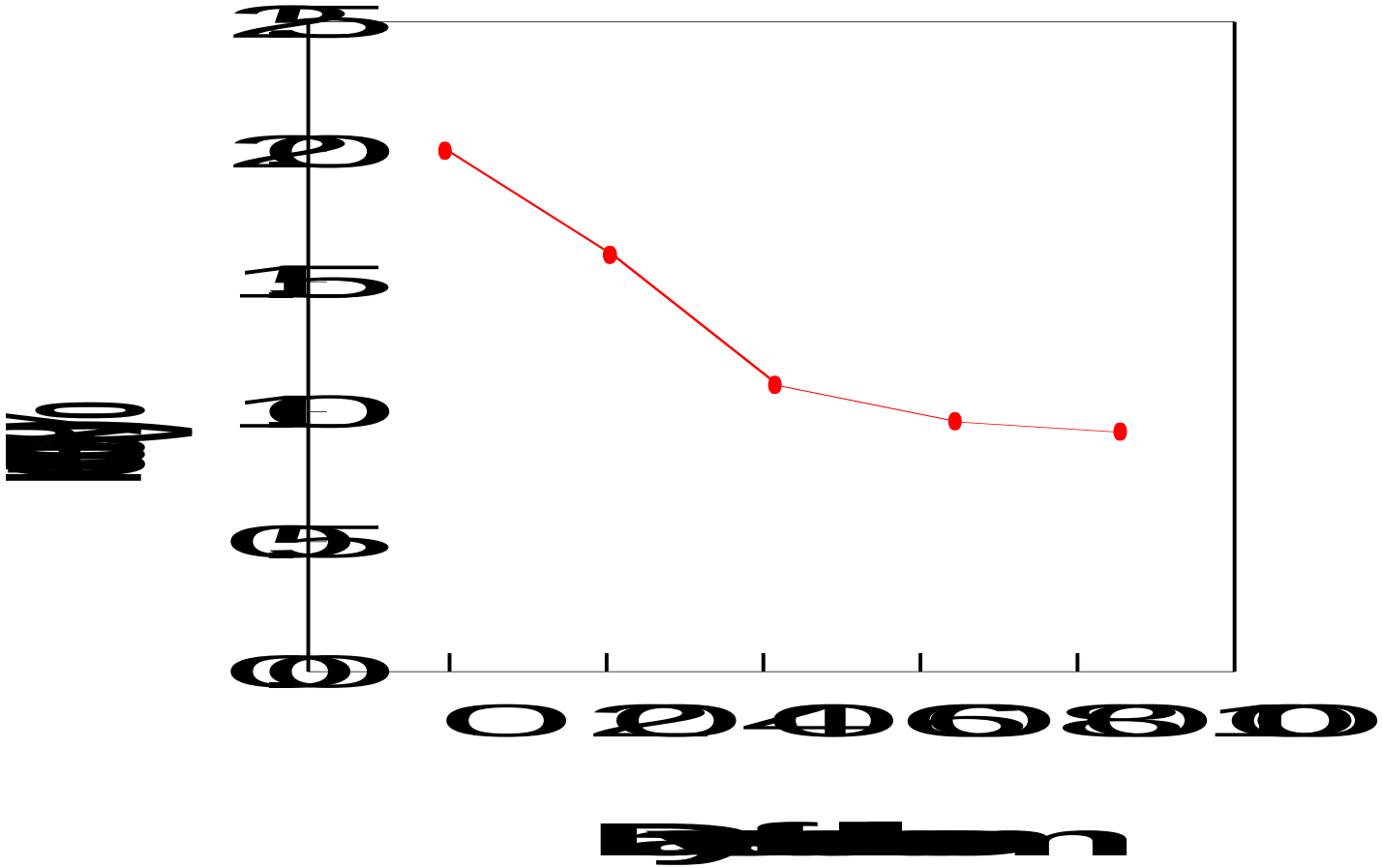
- **Soil texture**
  - **Sandy or gravel soils have low N supply**
- **Organic matter: 1% = 10 to 20lb. N/A**
- **Soil pH.**
- **Soil moisture**
  - **Mineralization is limited in dry years.**
- **Weed competition.**

Vine N status

- **Near veraison petiole samples**
  - **0.8 to 1.2%**
- **Bloom petiole samples**
  - **1.5 to 2%**
- **Vine shoot growth, vine size, and trellis fill.**

Seasonal patterns of petiole N of Concord

(Shaulis, 1956)



N fertilization for labrusca

- **Rate: 30 to 80 lb/acre**
- **Timing**
  - **1/2 applied to soil between budbreak and bloom**
  - **1/2 applied shortly after bloom**

N fertilization for vinifera

- **Rate: 0 to 50 lb./acre**
- **Timing and method**
  - **2/3 applied to soil between budbreak to bloom;**
  - **1/3 applied to foliage just before and during veraison.**
- **For sandy soils: split applications.**

Yeast available nitrogen in NY musts

(Henick-Kling et al., 1997)

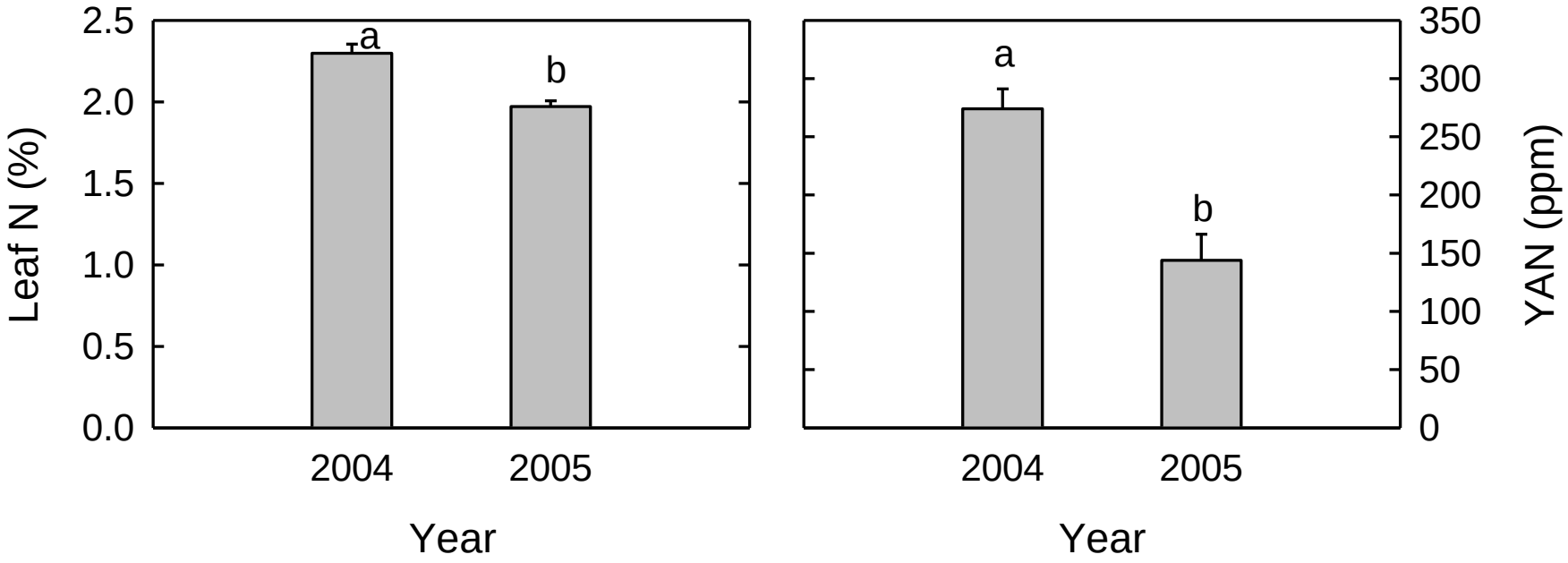
A total 120 samples were analyzed:

Average: 181 mg/L

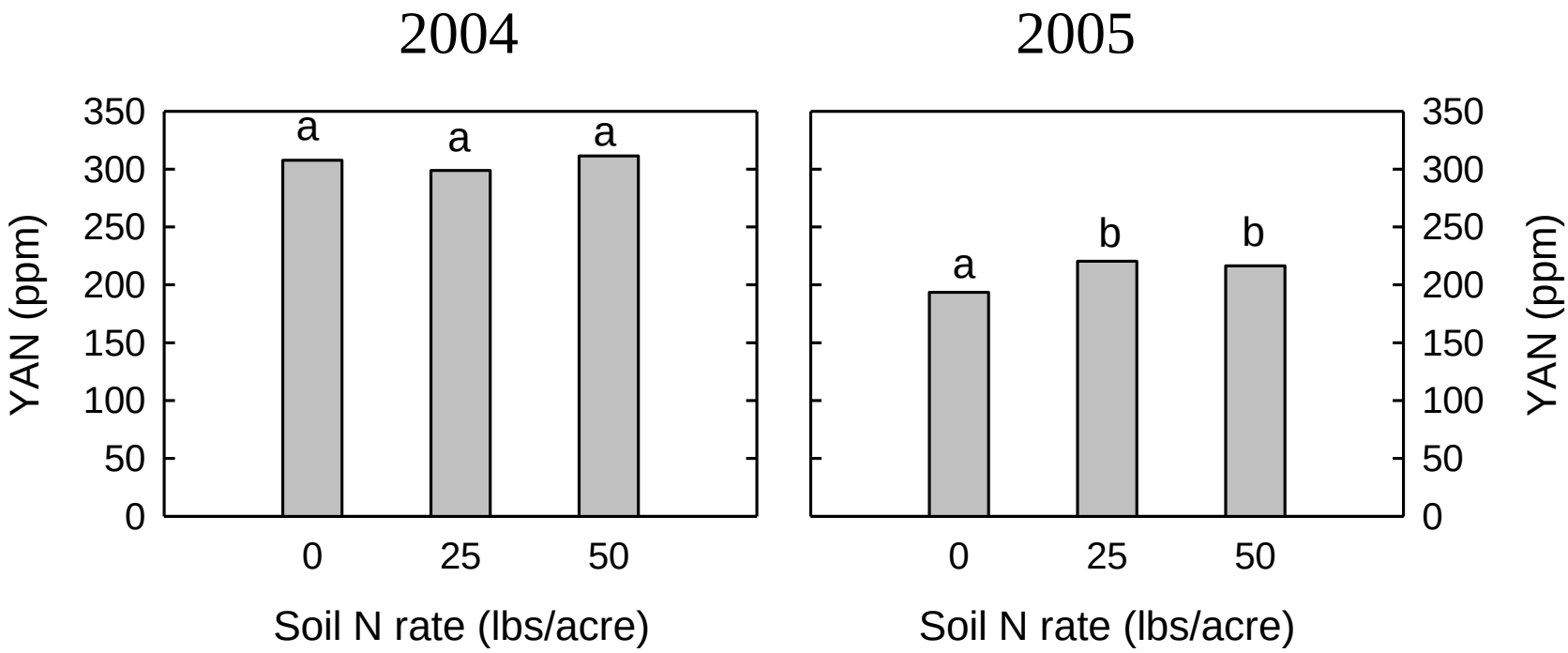
Lowest: 51 mg/L

Highest: 346mg/L

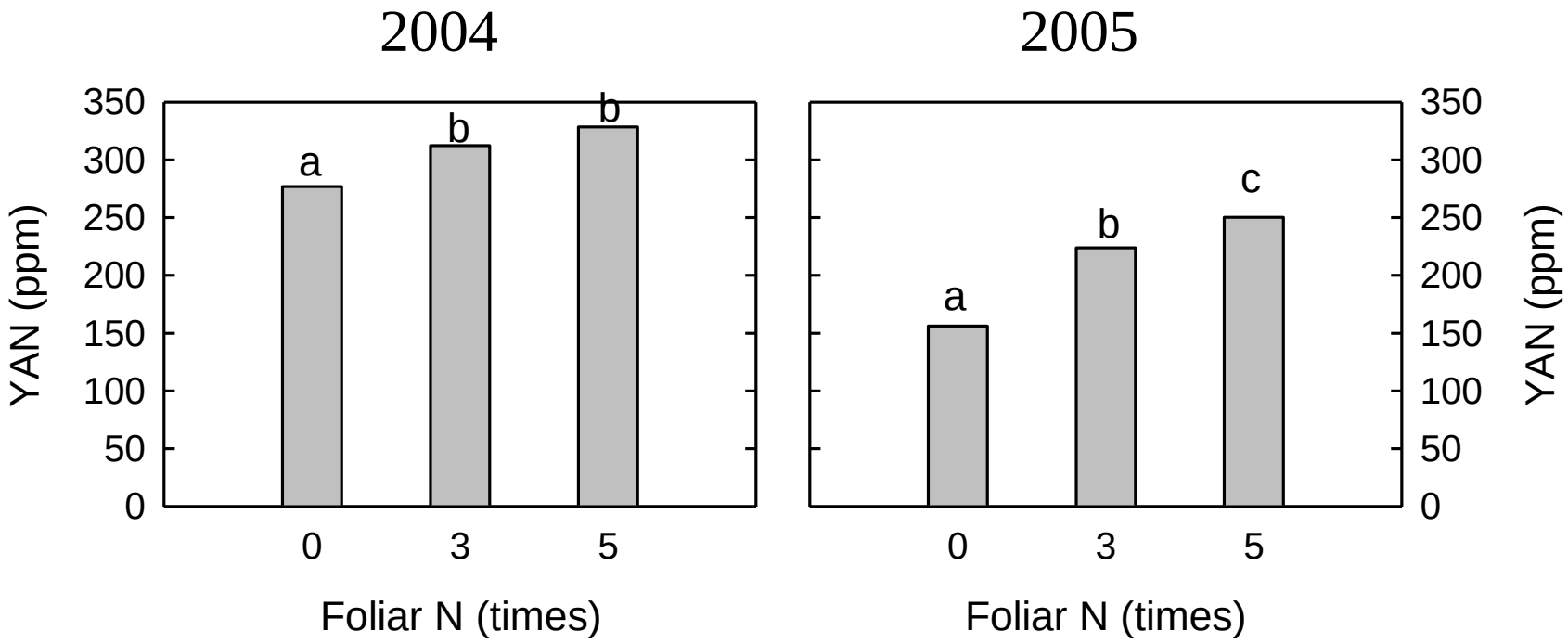
Leaf N and Juice YAN without any N application



Juice YAN in response to soil N application



Juice YAN in response to foliar N application

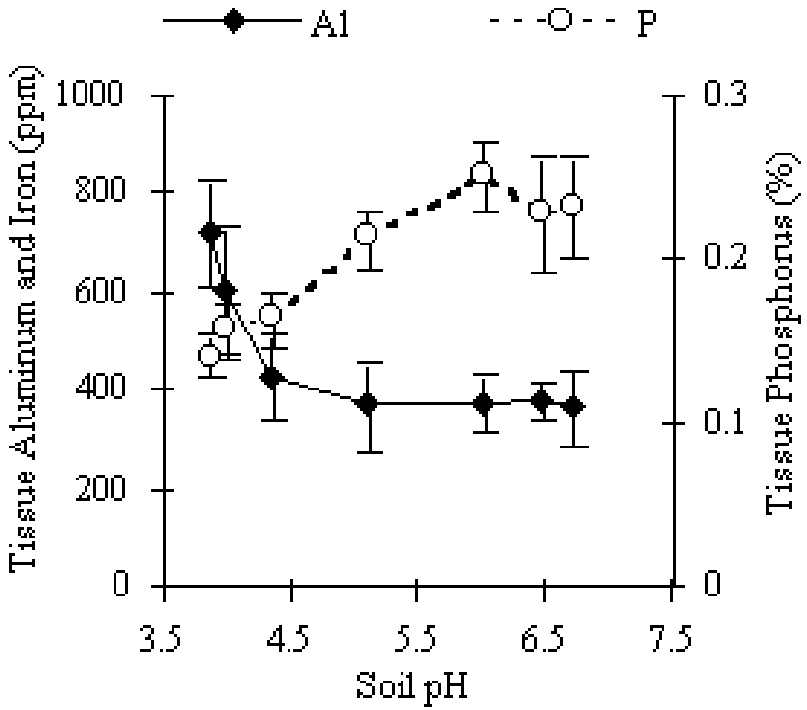


Summary on YAN

- **Background juice YAN was lower in a dry year than in a wet year.**
- **Foliar N application was more effective in a dry year than in a wet year.**
- **It appears that 25 lb soil N plus 3 foliar urea sprays was a good combination.**

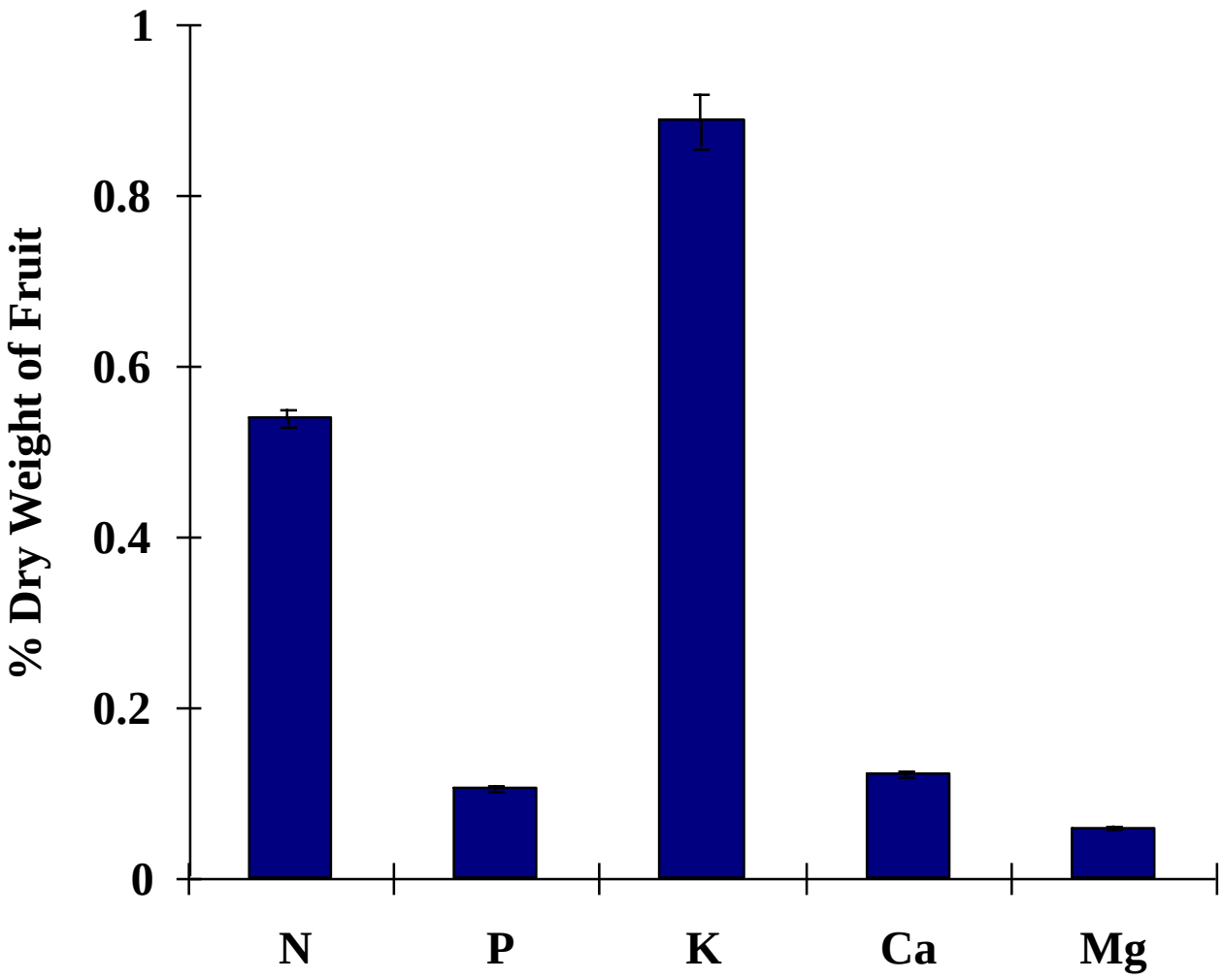
Phosphorous deficiency

Pinot noir on Long Island grown on low pH soil with low petiole P.
From: Bob Pool, NYAES.



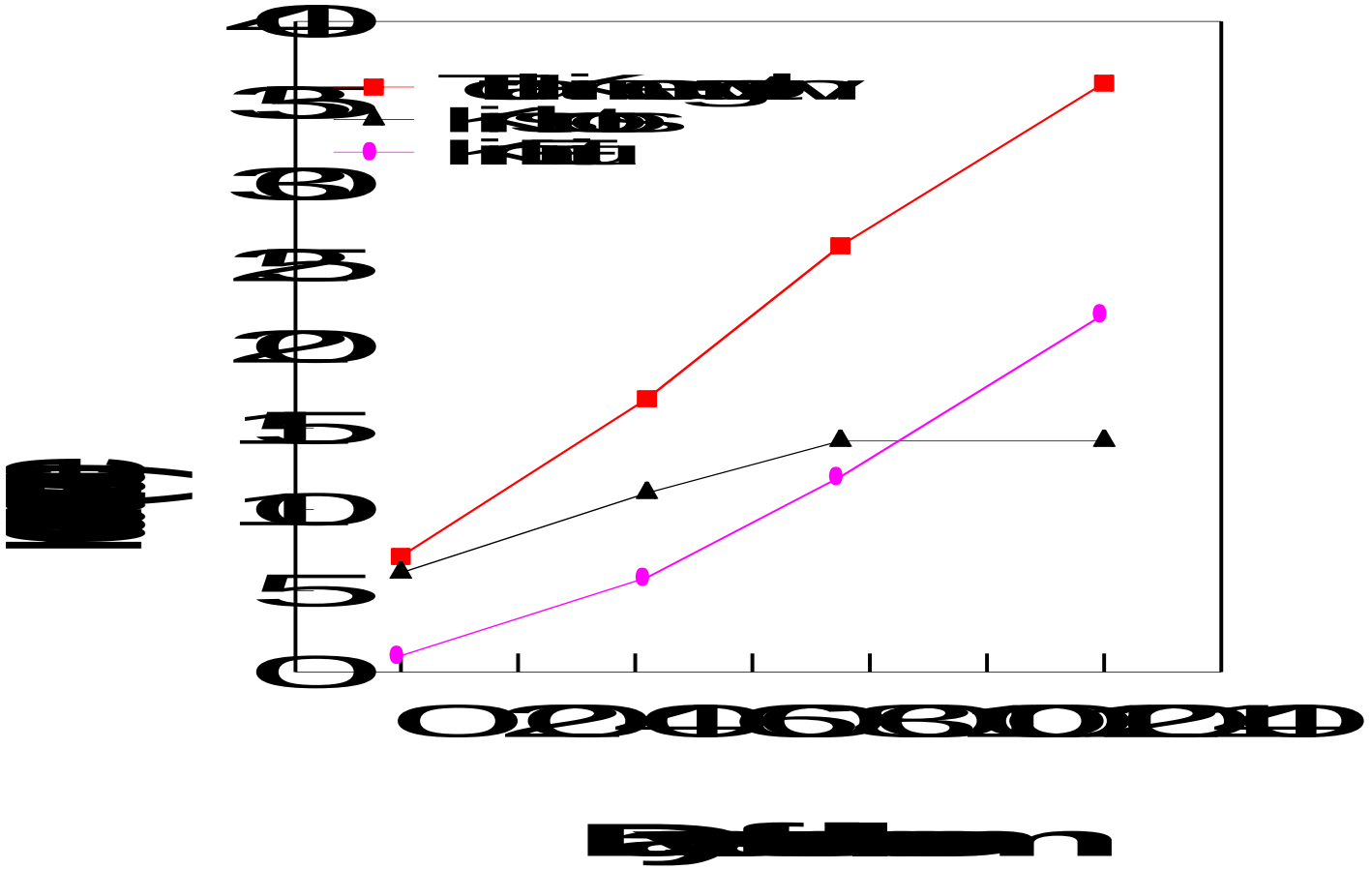
Concord petiole AI and P concentration
In relation to soil pH.
From Terry Bates

K concentration in ‘Concord’ berries



Seasonal patterns of vine K demand

(From Larry William)



Vine K demand

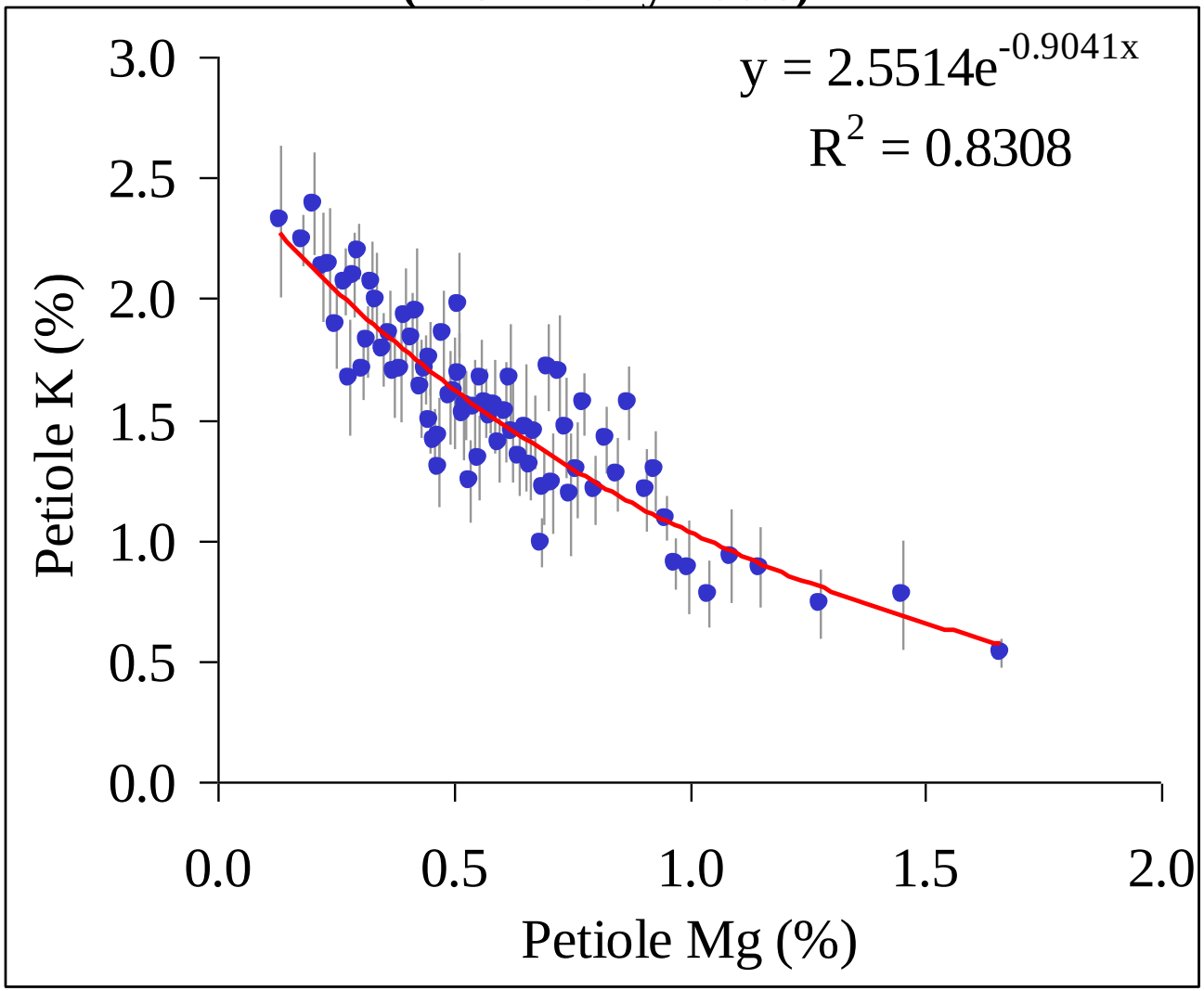
- **Fruit is a major sink of K.**
- **Cropload**
  - **5 lb. K/ton fruit;**
  - **2.5 lb. K in stems and leaves/ton fruit.**
- **Variety difference**
  - **Labrusca (75lb) > hybrids (50) > vinifera (35)**

Soil K supply

- **Soil parent materials**
  - **NY soils generally have low K level (<200lb).**
- **Soil texture**
  - **Sandy or gravel soils have low K supply power**
- **Organic matter**
  - **Low organic matter leads to low K supply**
- **Soil moisture**
  - **Drought or weed sharply reduces K supply.**
- **Mg/K competition:High Mg often leads to low K.**

K-Mg competition in ‘Concord’

(From Terry Bates)



- **Potassium deficiency is most likely to occur in a dry year in a vineyard with heavy cropload, poor weed management, and after application of dolomitic limestone.**

Soil and petiole K standards

- **Soil: 300 to 400 lbs/A.**
- **Fall petiole samples: 1.3 to 2.0%**
- **To support a high cropload in a dry year, petiole K needs to be maintained at the upper end of this range.**

Soil K fertilization

- **Maintenance Rate: 50 to 120 lb K_2O/A**
- **Correcting deficiency: 150 to 300 lb/A**
- **Timing: fall/spring application**

Ca and Mg

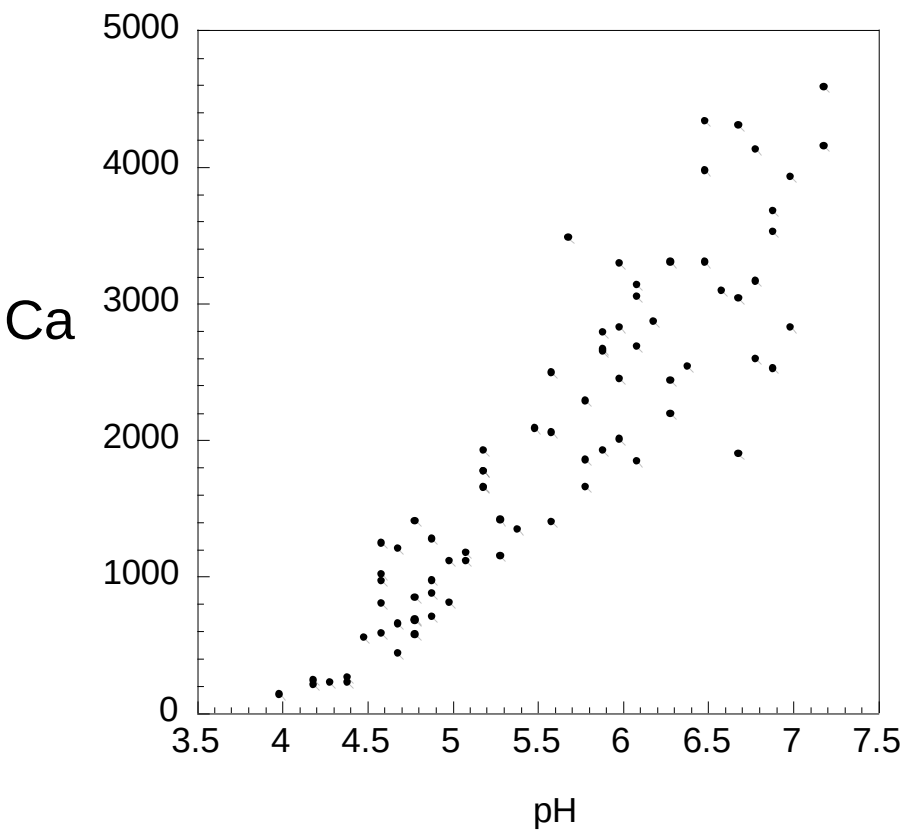
- **Soil:**

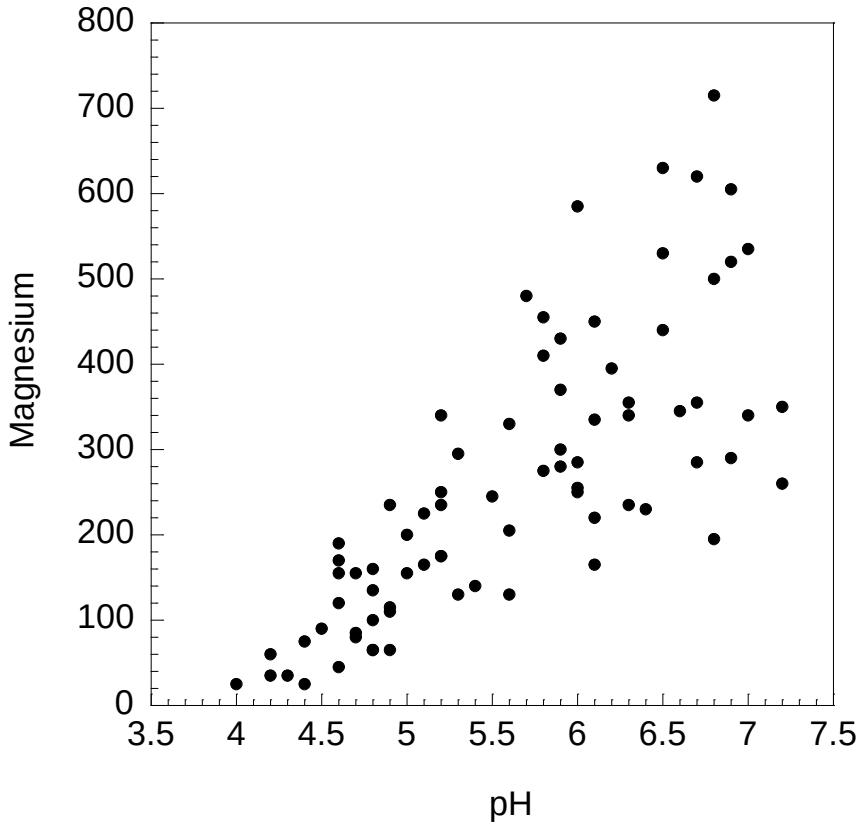
	Ca	Mg
Labrusca	**1500 ~ 2500 lb**	**150 ~ 300lb**
Vinifera	**2500 ~ 4000 lb**	**300 ~400 lb**

- **Fall petiole: Ca: 1.2 to 2%; Mg: 0.35 to 0.5%**
- **Low Ca and Mg availability typically associated with low soil pH.**

Soil calcium and magnesium in relation to pH

(A survey of the vineyards in the Finger Lakes)





pH and Liming

- **Optimum pH**
  - **Labrusca: 5.5**
  - **hybrids: 6.0**
  - **vinifera: 6.5**
- **Maintenance rate**
  - **1 ~ 2 tons dolomitic lime per year.**

Correcting Mg deficiency

- **In addition to liming, Mg can also be provided by Sulpomag (22% K_2O and 11% Mg) and Epsom salts (10% Mg).**
- **Foliar application of Epsom salts at 15 lb/100 gal at 1 to 2 wk intervals.**
- **Monitor petiole K/Mg ratio (4:1).**

Boron

- **Important for fruit set and fruit growth.**
- **A narrow range between deficiency and toxicity (25 to 50ppm).**
- **Soil moisture affects B availability.**
- **Soil application at 1 to 2lb B/acre at budbreak.**
- **Foliar spray at 1 lb Solubor/100 gal at 6 to 10 inch shoot growth and 14 days later.**


Poor Fruit Set

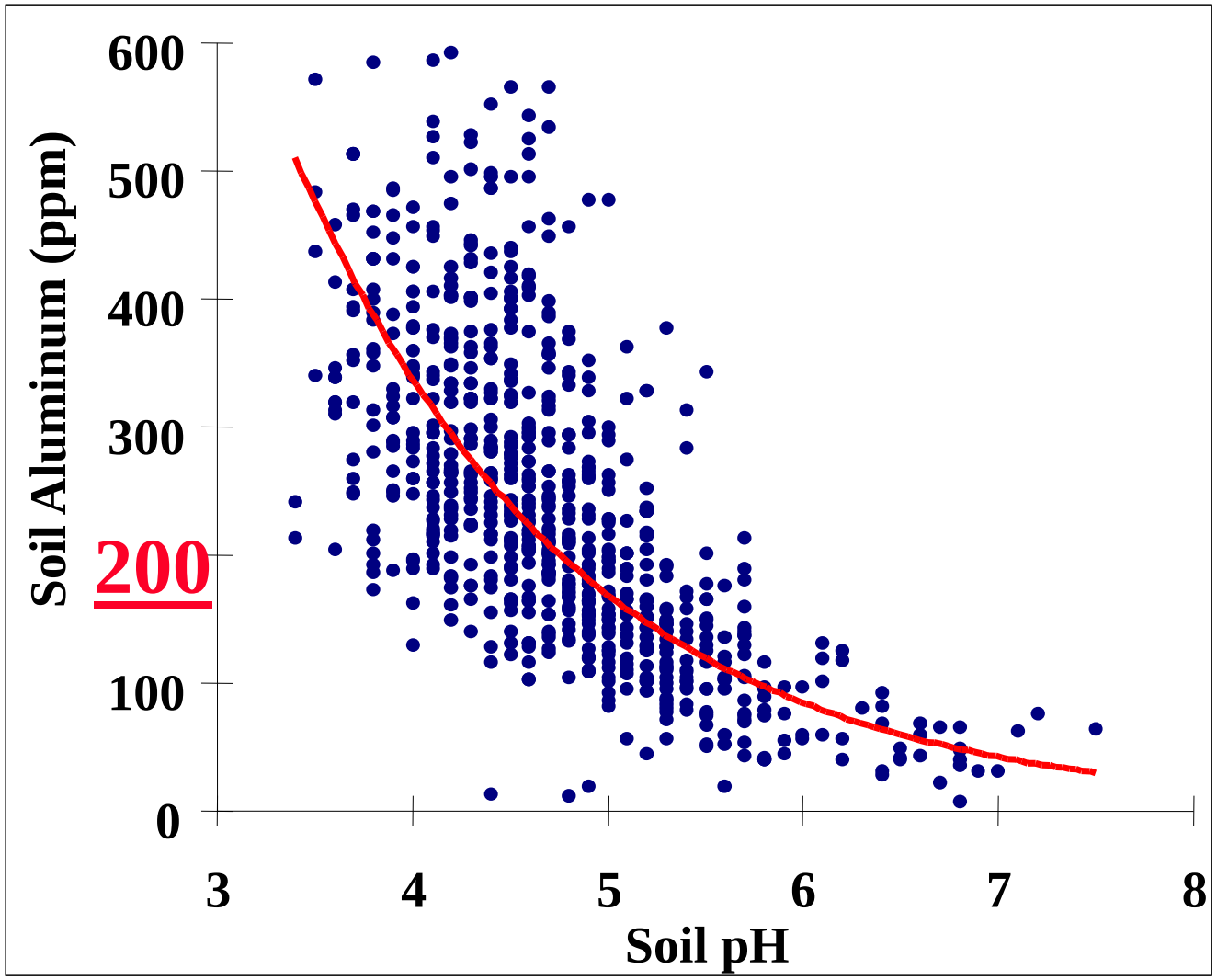

Boron Toxicity

Zn

- **Important for shoot and fruit growth**
- **Optimum range 30 to 60 ppm**
- **Foliar spray of Zn-chelate or other Zn products at 1 lb Zn/ acre 2 wk before bloom.**

Soil aluminum in relation to pH

(From Terry Bates)



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