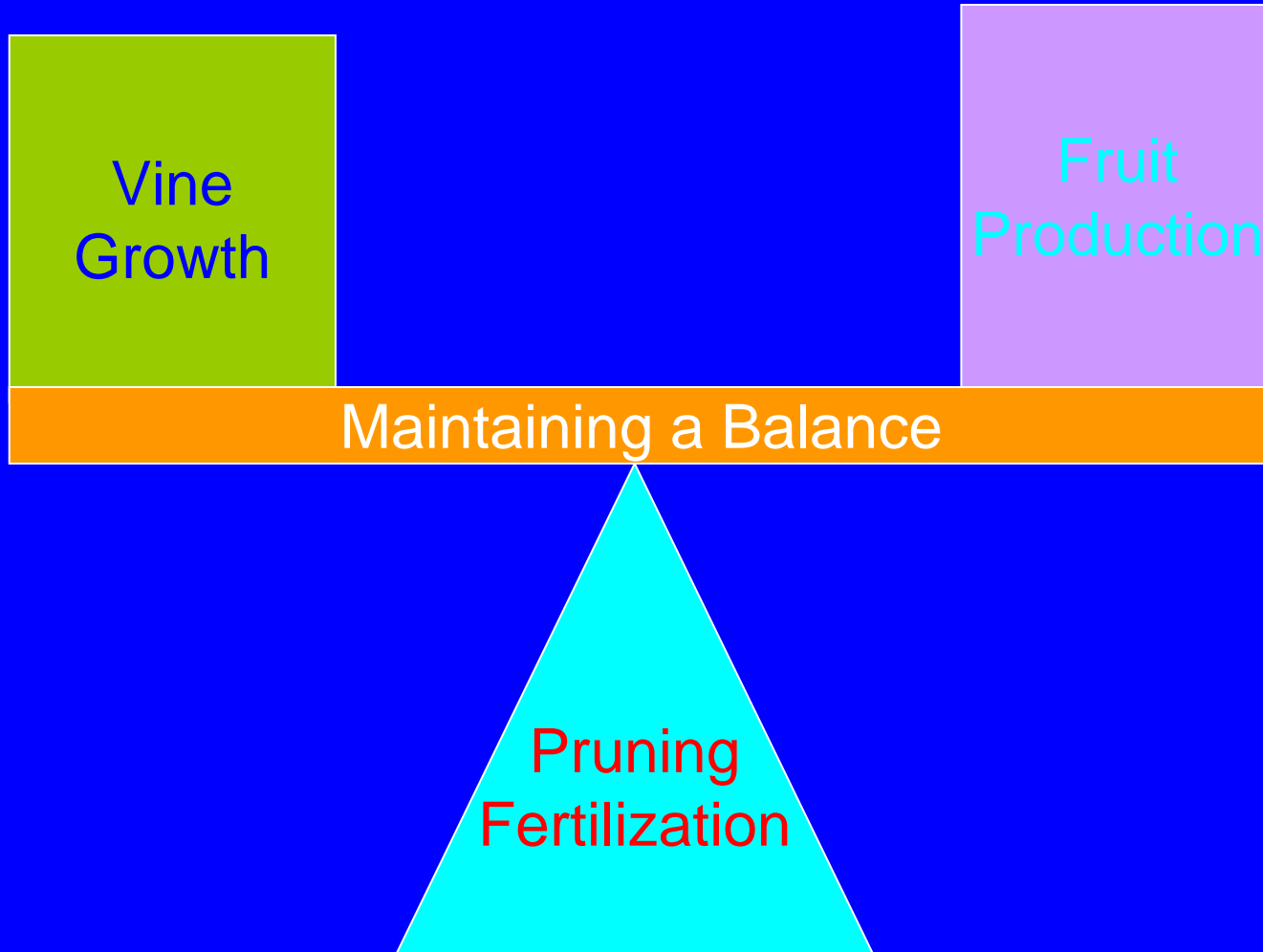


Efficient Vineyard Fertilization and Plant Nutrition

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Vineyard Management



Essential Mineral Nutrients

Macro Elements:

Nitrogen (N)

Phosphorous (P)

Potassium (K)

Magnesium (Mg)

Calcium (Ca)

Sulfur (S)

Micro Elements:

Manganese (Mn)

Iron (Fe)

Boron (B)

Copper (Cu)

Zinc (Zn)

Molybdenum (Mo)

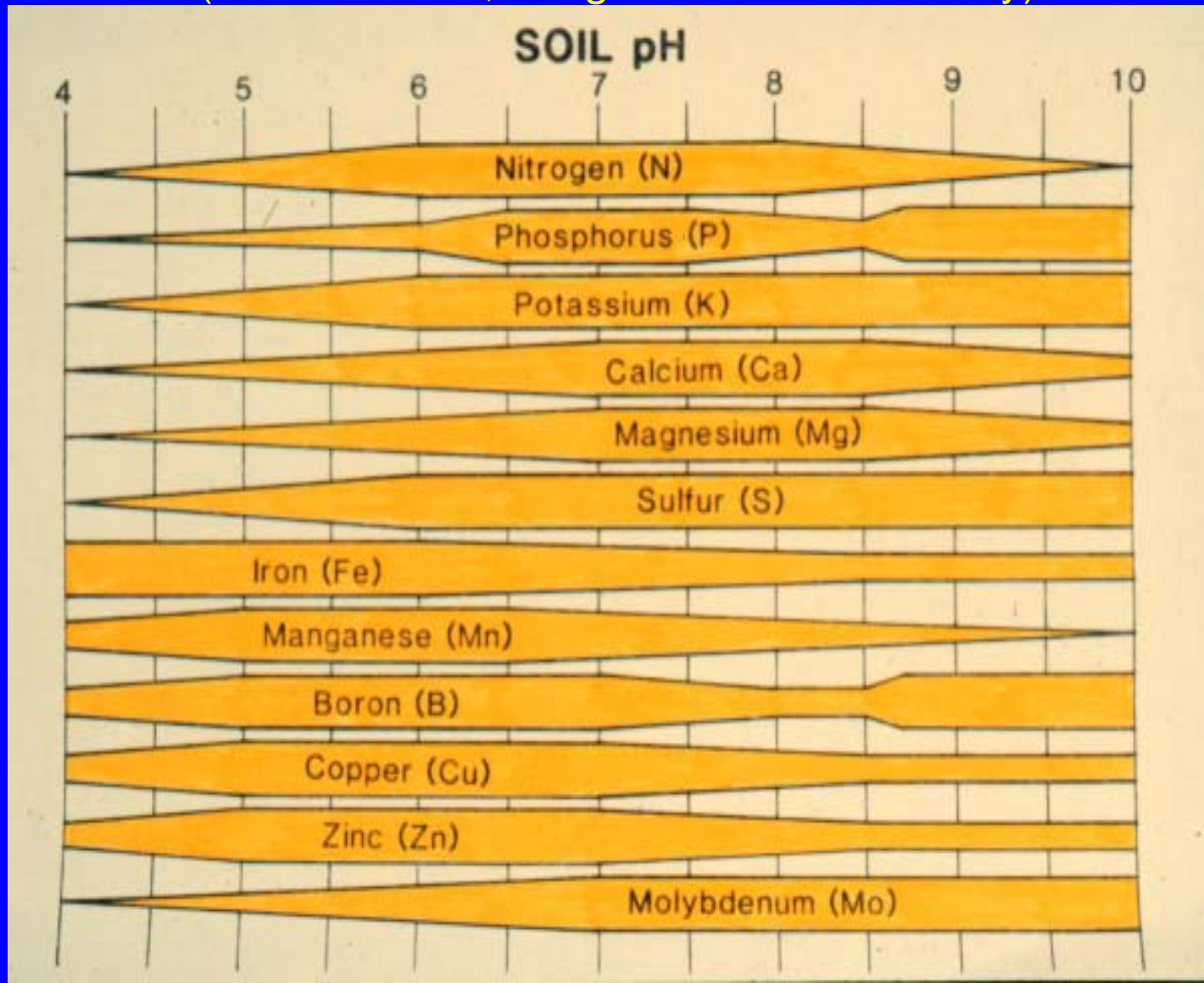
N, K and Zn are the nutrients that will most likely limit grape production in Iowa.

Availability of Essential Mineral Nutrients

- Composition of the soil parent material.
- Soil pH
- Soil weathering / leaching
- Soil organic matter content
- Previous fertilizer history

Nutrient Availability as Influenced by Soil pH

(Wider the bar, the greater the availability)



Determining the Need for Fertilizer

- **Visual:**

Plant vigor – A “shot in the dark”

Should be adjusting pruning to plant vigor – practicing the “30 Plus 10 Rule” to maintain a balance between vine growth and fruiting.

Deficiency symptoms – Generally too late

- **Soil testing:**

Suitable for pre-plant testing.

Only good for of some nutrients.

- **Petiole Analysis:**

Reliable after first growing season.

Measures what plants are able to take up.

Pre-plant Soil Test

- Test for: **pH, P, K, Zn, O.M.**
- Separate sample for each soil type.
- Separate samples for different cropping histories.
- Submit samples collected from 2 depths:
 - 0 to 6 or 8 inch depth.
 - 6 or 8 inch to 12 or 16 inch depth.
- For samples sent to the ISU Soil Testing Lab. indicate on submission form that the results be sent to me for interpretation.

Desirable Soil Test Ranges for Grapes

Test	Bul. 861*	Corn / Soybeans
pH	5.5 to 6.5	- -
Organic matter	2 to 3 %	- -
Phosphorous (P)	20 to 50 ppm	30 ppm
Potassium (K)	125 to 150 ppm	150 ppm
Magnesium (Mg)	100 to 125 ppm	- -
Boron (B)	.75 to 1.0 ppm	- -
Zinc (Zn)	4 to 5 ppm	> 1 ppm

* Midwest Small Fruit Pest Management Handbook

Soil vs Petiole Analysis

Soil

Pre-plant:

- Adjust pH, bring P & K to optimum.
- Not an accurate test for many nutrients.

2nd year & beyond:

- Monitor pH.
- Basis for K rate if petiole analysis indicates a short supply.

Petiole

1st year:

- Not accurate
- Reflects growing conditions in the nursery.

2nd year & beyond:

- Accurate measure of most essential nutrients.
- Sampling time is important.
- Annual analysis allows for fine-tuning of the fertilizer program, & correcting shortages before they become a problem.

ISU Soil Testing Laboratory

- **Phone:** (515) 294-3076
- **Web:** <http://www.agron.iastate.edu/soiltesting/>
- **Publication:** ST-11 “Soil sample information sheet for horticultural crops”
<http://www.extension.iastate.edu/Publications/ST11.pdf>
- **Sampling kits and submission forms (ST-11)**
Available at County Extension offices

Commercial Plant Analysis Labs

(Also do soil analysis)

- **A & L Laboratories** Atlantic, IA Ph: 712-243-6933
<http://www.al-laboratories.com/lab-atlantic.htm>
- **Belmond, Labs, Inc** Belmond, IA Ph: 641-444-3384
<http://www.belmondlabs.com>
- **Harris Laboratories** Lincoln, NE Ph: 402-476-2811
- **Midwest Laboratories, Inc.** Omaha, NE
Ph: 402-334-7770
<http://www.midwestlabs.com>
- **Minnesota Valley Testing Laboratories** Nevada, IA
Ph: 515-382-5486 or 800-362-0855
<http://mvtl.com>

Normal Nutrient Ranges for Grapes Based on Petiole Analysis

Macro Nutrient	At Full Bloom	Mid-July / Mid-Aug.
Nitrogen (N)	1.6 to 2.8 %	0.9 to 1.3 %
Phosphorous (P)	0.20 to 0.60 %	0.16 to 0.29 %
Potassium (K)	1.50 to 5.00 %	1.50 to 2.50 %
Calcium (Ca)	0.40 to 2.50 %	1.20 to 1.80 %
Magnesium (Mg)	0.13 to 0.40 %	0.26 to 0.45 %
Sulfur (S)	No data	No data

The nutrient content changes during the season. Therefore, it is important to collect petiole samples at the proper time.

Normal Nutrient Ranges for Grapes Based on Petiole Analysis

Micro Nutrient	At Full Bloom	Mid-July / Mid-Aug.
Manganese (Mn)	18 to 100 ppm	31 to 150 ppm
Iron (Fe)	40 to 180 ppm	31 to 50 ppm
Boron (B)	25 to 50 ppm	25 to 50 ppm
Copper (Cu)	5 to 10 ppm	5 to 15 ppm
Zinc (Zn)	20 to 100 ppm	30 to 50 ppm
Molybdenum (Mo)	0.2 to 0.4 ppm	0.3 to 1.5 ppm

Sampling at full bloom is good for N. However, sampling from mid-July to mid-August is more reliable for all nutrients.

Nitrogen

Source	Fate
<ul style="list-style-type: none">• Fertilizer• Legumes (Fix up to 300 lb / A / yr)• Soil organic matter (Releases ~20 lb / A / % OM / yr)• Lightning (Fix ~10 lb / A / yr)	<p><u>Lost from Soil:</u></p> <ul style="list-style-type: none">• Leaching• De-nitrification <p><u>Taken up by Plants:</u></p> <ul style="list-style-type: none">• Recycled: Leaves & Prunings• Removed: Fruit• Tied up: Old wood

How Much Nitrogen is Needed?

Mid-Atlantic Wine Grapegrower's Guide:

- Grapes ~.18% N, Canes ~ .25% N
- **Nitrogen removed:**
 - Grapes: 3.6 lb / A / ton
 - Canes: 1.7 lb / A / lb of prunings / vine
- **For a 3 ton crop & 2 lb prunings / vine:**
 - Grapes: 10.8 lb / A + prunings 3.4 lb / A

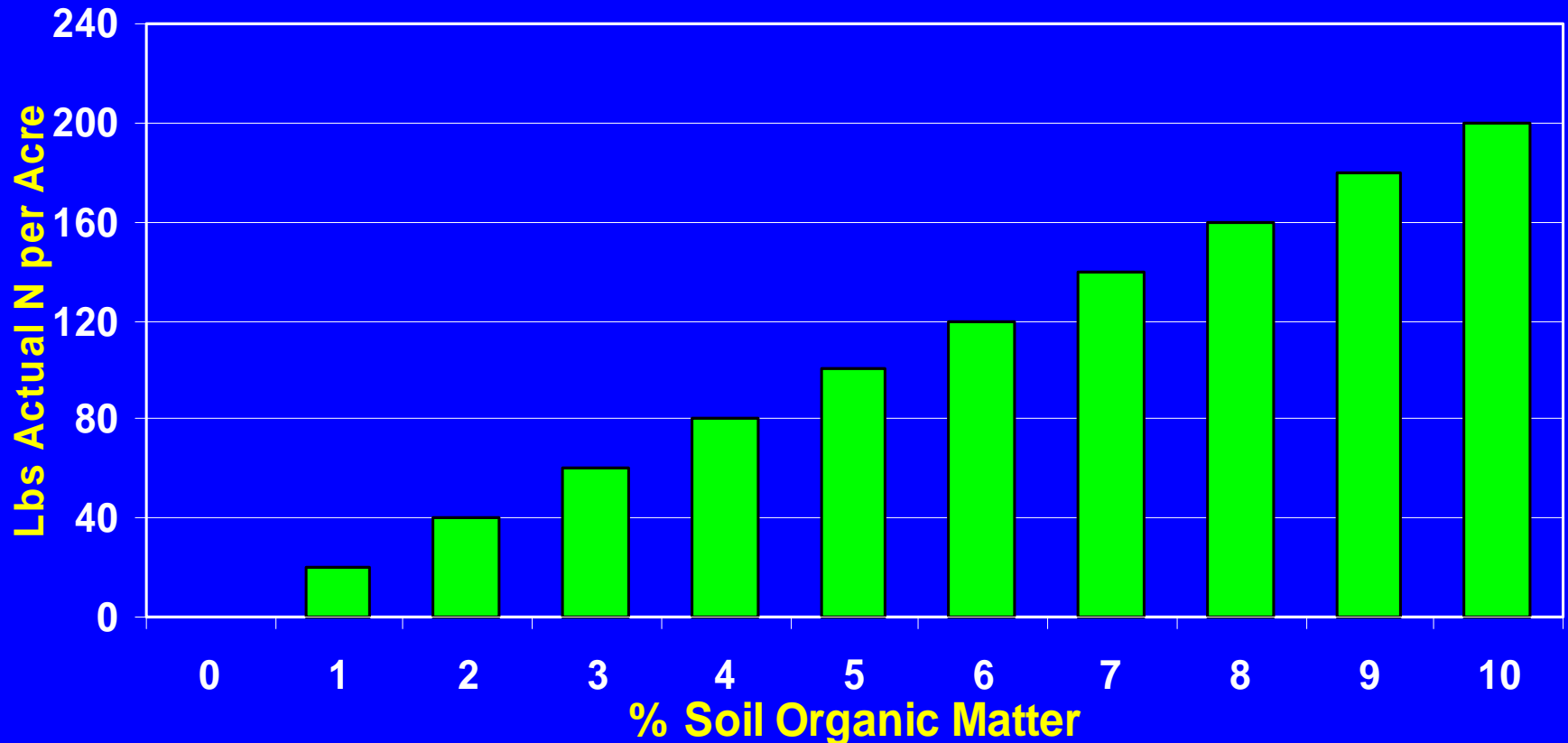
How Much Nitrogen is Needed?

Cahoon. *Grapes, Production, Management & Marketing*. Ohio State Bul. 815:

“Most vineyards should receive between 40 and 80 pounds of actual nitrogen per year.”

- Sod occupies 2/3's of the land and requires ~ 1 lb N / 1000 sq.ft. (~30 lb / A).
- Grapes are receiving from 10 to 50 lb of N per acre.

Nitrogen Released from Organic Matter



Need to adjust N fertilization practices based on the organic matter content of your soil.

Summary of Grape Nutrient Management

- Pre-plant Soil Test: pH, P, K, Zn, O.M.
- Amend soil as needed and incorporate as deep & as uniformly as possible.
- Apply a low rate of N after planting, and in 2nd year. (40-50 lb N / A - .4 to .6 oz N applied around each vine, remained broadcast applied. Adjust based on soil organic matter content.)
- Begin petiole analysis during the 2nd year, and adjust N fertilizer rates based on test results and vine vigor (prunings removed).
- Apply other nutrients as needed based on petiole analysis results.

Determining How Much Fertilizer Product to Apply

- **Fertilizer analysis written as % N - P - K**

“20-10-15” = 20% **N**, 10% **P**, & 15% **K**

Urea = 46-0-0 or 46% **N**, 0% **P**, & 0% **K**

- To determine how much of a N product to apply, **divide lbs of actual N by the % N analysis of the product:** (50 lb actual N / A)

Lbs of 20-10-15 / A = 50 lb N / .20 = 250 lbs

Lbs of Urea / A = 50 lb N / .46 = ~109 lbs