



# **Sustainable Practices in Vineyard Nutrition**

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# Benefits

- Make more informed fertilization decisions
- Reduced fertilizer inputs
  - Reduce expense
- Reduce environmental pollution
- Reduce problems associated with improper fertilization



**Photo by Andy Allen**

# Sustainable vineyard nutrition management

- Can vineyard manager identify nutrient deficiency and toxicity symptoms?
- Are nutrients applied on as need basis based on soil and petiole sampling?
- Are records of applications and analyses results kept and compared?
- What sources of nutrients are used?
- Are nutrients applied when they are most likely to be taken up?





# Nutrition monitoring

- Soil analysis
  - Monitor status through soil tests (every 2-3 years) as well as petiole tests
  - Soil test shows only what is present in the soil but pH affects actual availability
- Petiole tests
  - Petiole tests show actual current nutrient status of the vines
  - Every year
  - Done at bloom or veraison, early in the day
  - Collect 80-100 petioles, opposite from flower cluster or from youngest fully expanded leaf
- Sample areas with symptoms separately

**Leaf opposite  
flower cluster  
at bloom**





# Veraison Petiole Sampling Location





# Applying fertilizer

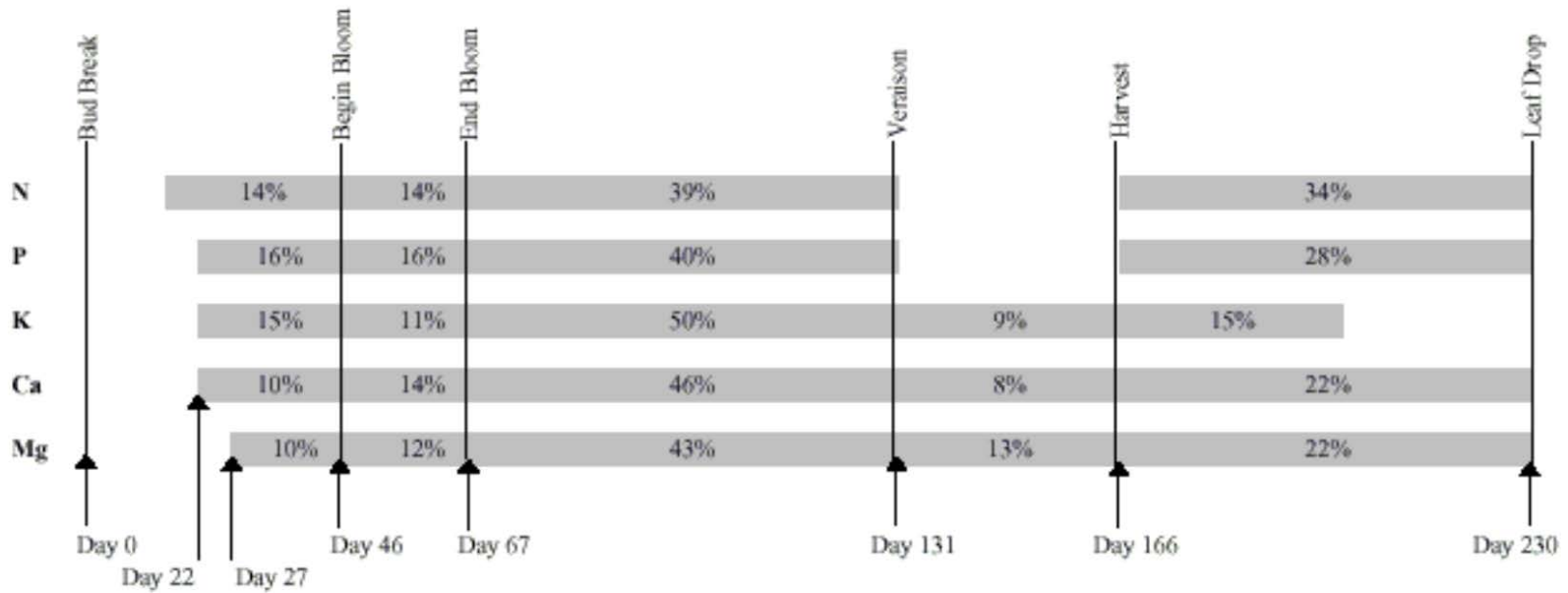
- Soil applications:
  - Broadcast or banded
  - Apply at or just after bloom
  - Apply at or right after bloom and again post-harvest for split applications
- Foliar applications:
  - Effective immediately
  - Mostly for micro nutrients
- Fertigation

# Fertigation

- Can be used in a “broadcast” mode (i.e. larger quantities at convenient times)
- Less fertilizer is needed than with direct soil (broadcast) applications
- Can improve fertilizer efficiency:
  - Smaller amounts over longer periods
  - Applying at times when vine is taking up specific nutrients

# Vine Nutrient Uptake

**Nutrient and Proportions of Uptake by Chenin Blanc / 99R**



Adapted from Conradie (1980) and Conradie (1981)

# Organic Vineyard Nutrition

- Organic approach is to feed the soil, i.e. – feed soil fauna and microbes that decompose organic matter
- Is heavily reliant on use of cover crops and compost
- Primary challenge is synchronizing nutrient release from organic sources with vine needs
- Organic vineyard soils need OM content of 3-6%

# Cover crops

- Much interest in use of cover crops as “green manure”
- Many potential benefits
  - Legumes for N fixation
  - High biomass crops for organic matter
  - Insectaries for beneficial/predatory insects
- Some potential risks
  - Alternate hosts for diseases
  - May encourage pathogenic nematodes
  - Uncontrolled N release
- Much research needed for this region

### Petiole tissue analysis

Issue	Category 4	Category 3	Category 2	Category 1
13. Is petiole analysis done on a regular basis?	A nutrition management plan is in place that includes petiole analysis done on all blocks every year.	Petiole analysis is done on most blocks every 1 to 2 years.	Petiole analysis done less frequently than 2 years or only when a problem appears.	No petiole analysis since the vineyard was planted.

**Notes:** We recommend petiole tissue analysis at **véraison** for native (*Vitis labruscana* and Norton/Cynthiana) and hybrid cultivars and at bloom for *Vitis vinifera* cultivars. See the ICCVE website for petiole sampling protocols (<http://iccve.missouri.edu>).

### Soil analysis

Issue	Category 4	Category 3	Category 2	Category 1
14. Is soil analysis used to monitor and maintain pH, nitrogen, macronutrients and micronutrients in range appropriate for each cultivar?	A nutrition management plan is in place that includes conducting soil analysis on all blocks every 3 years to manage pH, nitrogen, potassium, phosphorus and micronutrients.	Soil analysis is done on most blocks every 5 years.	A single soil analysis regardless of soil type differences for the entire vineyard is collected occasionally or only when a problem occurs.	No soil analysis since the vineyard was planted.

**Notes:** We recommend soil analysis for mature vineyards every three years for all blocks in the fall after harvest to manage nitrogen, micronutrients, potassium and phosphorus. The grower needs to determine if the pH is appropriate for each cultivar: 5.5 to 6.5 pH for native cultivars (*Vitis labruscana* and Norton/Cynthiana); and 6.0 to 7.0 pH for American hybrid, French-American hybrid and *V. vinifera* cultivars.



### Nitrogen management

Issue	Category 4	Category 3	Category 2	Category 1
15. How are the need, rate and timing for nitrogen fertilization determined and implemented?	N rate is based on leaf petiole analyses, soil organic matter and vine size. <b>And</b> The recommended rate of N is applied as a split application at fruit set and post harvest but not during dormancy.	N rate is based on leaf petiole analyses, soil organic matter and vine size. <b>And</b> The recommended rate of N is applied at one time, before budburst.	N application is based on leaf petiole analyses and vine size. <b>And</b> N is applied at one time, before budburst.	Even though vine size the previous year was more than adequate, N is applied every year when the vines are dormant. <b>Or</b> N rarely applied even though vine size was inadequate.

Notes:

### Nitrogen source

Issue	Category 4	Category 3	Category 2	Category 1
16. What is the method of N application?	N is provided strictly by organic sources and cover crops.	N is provided mainly through organic sources and cover crops. <b>But</b> Some synthetic N is applied as needed.	N is provided mainly through synthetic fertilizer but some by cover crops or organic matter.	N is provided by synthetic fertilizer.

**Notes:** Organic fertilizers are slower to release N, often have an unpredictable rate of release and are more dilute. If used long-term, they may improve the quantity and quality of soil organic matter, promote soil biodiversity and reduce leaching. It is more difficult to ascertain the exact rate of organic fertilizer to add given the unpredictable rate of N release. Use of split applications and supplementation with foliar N will allow tweaking of the N rate. Examples of common organic N fertilizers include peanut meal, soybean meal, feather meal and fish meal. Be sure to read the label on synthetic and organic N and nutrient sources or request a nutrient analysis.  
**Modified from** "New York Guide to Sustainable Viticulture Practices" at <http://vinebalance.com>

### Nitrogen application

Issue	Category 4	Category 3	Category 2	Category 1
17. How is N fertilizer applied?	N is applied in several small doses via fertigation.	N is applied by both fertigation and soil surface application.	N is band applied by the vine row (soil surface or subsurface).	N is only broadcast applied to soil surface.

Notes:

### Macronutrients

Issue	Category 4	Category 3	Category 2	Category 1
18. How are other macronutrients managed (P, Ca, Mg, K)?	Macronutrients are maintained at acceptable ranges based on soil and petiole analysis results. <b>And</b> Vineyard manager can identify deficiency and toxicity symptoms.	Macronutrients are maintained at acceptable ranges based on soil and petiole analysis results. <b>But</b> Vineyard manager cannot identify deficiency and toxicity symptoms.	Macronutrient levels are only adjusted when deficiencies occur.	A fixed amount of macronutrients are applied every year.

Notes:

## Micronutrients

Issue	Category 4	Category 3	Category 2	Category 1
19. How are micronutrients managed (B, Mn, Zn)?	Micronutrients are maintained at acceptable ranges based on soil and petiole analysis results. <b>And</b> Vineyard manager can identify deficiency and toxicity symptoms.	Micronutrients are maintained at acceptable ranges based on soil and petiole analysis results. <b>But</b> Vineyard manager cannot identify deficiency and toxicity symptoms.	Micronutrient levels are only adjusted when deficiencies occur.	A fixed amount of micronutrients are applied every year.
<b>Notes:</b>				