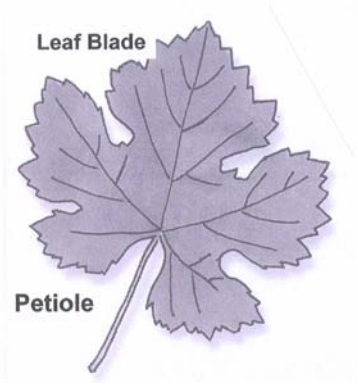
Bunch Grape Nutrition Management

The nutritional needs of established vineyards are best determined by utilizing several things: soil testing, tissue analysis, observations of vine growth and fruiting, and past experience. The role of soil testing is primarily to monitor soil pH since soil analysis results in established plantings may correlate poorly with plant tissue analysis and plant response. Tissue analysis indicates the level of nutrients in the entire plant. It may be done for two reasons: the first is troubleshooting to confirm or deny a suspected nutrient problem within a plant, and the second is to monitor nutrient levels within the plant to detect a nutritional problem before it negatively impacts yield and quality. This process entails sampling an area annually or every couple of years over a period of time to establish background information for comparison of analytical results. Frequently, by the time visible symptoms of nutrient problems become evident, yields and/or fruit quality have already been negatively impacted. Tissue analysis can help avoid this problem.

The tissue to sample for analysis may vary depending on the crop. For many fruit and nut crops, entire leaves or leaflets are sampled. With muscadine grapes, only the leaf blade is used for analysis. While leaf blades can also accurately reflect the nutrient status of the vine for bunch grapes, leaf petioles (the slender stem connecting the leaf blade to the shoot) are more commonly utilized.



Troubleshooting a suspected nutrient problem

When to sample:

Anytime during the season when symptoms are visible.

What to sample:

Collect 80 to 100 petioles per sample from leaves displaying symptoms regardless of their position on the shoot.

Collect the same number of petioles from the same position on healthy vines of the same variety/rootstock and age in a location near the affected vines.

Be sure to label and submit the samples separately to enable comparison of results.

Monitoring the nutrient status of a vineyard

When to sample:

The times for sample collection may be at full bloom or at veraison. Advantages and disadvantages exist for each. Select the sampling time based on the recommendations of the laboratory where the samples will be sent as the sufficiency ranges will vary somewhat based on sampling time.

Grape Petiole Analysis: Sufficiency Ranges

Element	Full Bloom	Veraison
N (%)	1.6 – 2.8	0.9 – 1.3
P (%)	0.20 – 0.60	0.16 – 0.29
K (%)	1.50 – 5.00	1.50 - 2.50
Ca (%)	0.40 – 2.50	1.20 – 1.80
Mg (%)	0.13 – 0.40	0.26 – 0.45
Mn (ppm)	18 - 100	31 – 150
Fe (ppm)	40 – 180	31 – 50
B (ppm)	25 – 50	25 – 50
Cu (ppm)	5 – 10	5 – 15
Zn (ppm)	20 – 100	30 - 50

Full bloom is considered to be when about two-thirds of the flower caps have been shed. Since nutrient element concentration changes throughout the growing season, the more consistent that the timing of sample collection is, the more valid the comparison of elemental concentration from year to year will be.

Nutrient Concentration as Affected by Time Throughout the Growing Season

Decreases	Stable	Increases
Nitrogen	Magnesium	Calcium
Phosphorus (slight)	Iron	Manganese
Potassium	Copper	
Boron		

Sampling at full bloom may provide a more accurate reflection of the nitrogen status of the vine and is early enough to allow amendments to the fertility program to be made during the same growing season.

Sampling at veraison may provide a more accurate assessment of the status of other elements. Due to the timing, adjustments to be made to the fertility program will be applicable to the next growing season.

While the best results would occur through the use of samples collected at both full bloom and veraison, the expense and time involved would be excessive. However, if

results from samples collected at full bloom indicate problems, especially for potassium, a second sample collected 70 to 100 days following bloom may be warranted.

Collecting the sample:
To obtain the best analytical results, certain steps need to be taken in sample collection.

1. Collect only one variety/rootstock combination per sample from vines of approximately the same age.
2. Sample areas displaying different growing patterns separately.
3. Select petioles from leaves that are well-exposed to sunlight and free from injury and disease
4. Collect petioles from the same approximate locations in the canopy.
    a. Take petioles from the most recently matured leaves (usually five to seven leaves from the shoot tip and opposite from a fruit cluster).

    b. Collect samples from shoots occupying approximately the same position on vines.
5. Collect only one to two petioles per vine.
6. Restrict the area of collection to a maximum of 10 acres per sample.
7. Separate petioles from leaf blades immediately, place them in a clean paper bag or envelope and store in a clean, warm, well-ventilated area until air dry (about one day).
8. Label bags containing samples and make a map of where samples were collected for future reference.
9. Take soil samples from the same areas where petiole samples were collected.
10. Send samples to laboratories for analysis.

As previously mentioned, vine growth and fruiting along with experience from previous years should be considered when formulating a fertility program. Cropping levels and climatic conditions from previous years may have an impact on vine growth and should be considered when evaluating reports from petiole analysis. Keep in mind, also, that some other factors may mimic certain nutrient disorders. The herbicide simazine may cause interveinal chlorosis patterns on leaves similar to magnesium deficiency. While poor fruit set, straggly clusters and uneven berry size could indicate boron deficiency, these same symptoms could be caused by tomato ringspot virus.

The pattern of symptoms in the field could give some clues as to whether nutritional disorders are to blame. Nutritional disorders are generally widespread in the field as opposed to being confined to a single vine or small number of vines. In hilly sites, especially where erosion has occurred, nutrient deficiency symptoms will appear first on higher sites. Uniformly weak vine growth may be a symptom of low nitrogen or water stress, disease and overcropping.

The location of symptoms on a shoot should also be considered when diagnosing problems. As a rule, deficiencies of mobile elements (nitrogen, potassium and magnesium) appear first on older or midshoot leaves whereas symptoms of less mobile elements (iron, zinc) appear first on the youngest leaves.

The patterns of the symptoms on a leaf may also serve to indicate a nutritional problem. With nitrogen deficiency, there will be a general fading of green to a pronounced yellowing of leaves beginning with the basal to midshoot leaves and progressing to the younger leaves. It will be accompanied by slow shoot growth; short intermodal length; small leaves; reddening of leaves, petioles and shoot stems; and a reduced number of clusters, berries or a poor fruit set. Potassium deficiency is characterized by interveinal and marginal chlorosis progressing to chlorosis or scorching of leaves from the margin and inward. Magnesium deficiency shows up as interveinal chlorosis that does not extend to the leaf margin. It will progress to necrotic spots and leaf chlorosis including the leaf margins. Symptoms occur first on basal to midshoot leaves.

Soil & Plant Tissue Testing Laboratories

A & L Analytical Laboratories
2790 Whitten Rd.
Memphis, TN 38133
800-264-4522

A & L Eastern Agricultural Labs, Inc.
7621 Whitepine Rd.
Richmond, VA
804-743-9401

Brookside Farm Laboratory
P.O Box 456
New Knoxville, Ohio 45871
419-753-2448

Agricultural Analytical Service Lab
The Pennsylvania State University
University Park, PA 16802
814-863-6124

Plant Analysis Laboratory/ICP
Fruit & Vegetable Science Dept.
Cornell University
Ithaca, NY 14583
607-255-1785

Plant Analysis Laboratory
Agronomic Division – NCDA
4300 Reedy Creek Dr.
Raleigh, NC 27607-6465
919-733-2655

Soil Testing Lab
145 Smyth Hall
Virginia Tech
Blacksburg, VA 24061
703-231-6893

Soil, Plant & Pest Center
5201 Marchant Drive
Nashville, TN 37211-5112
615-832-5850

Soil, Plant and Water Testing Laboratory
The University of Georgia
2400 College Station Rd.
Athens, GA 30602-9105
706-543-5350