

**Title:** Petiole Analysis for Bunch Grapes in the Southeast

**Final Report**

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**Extension Proposal**

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**Objectives:**

1. To develop fact sheets detailing uniform protocols for the collection and handling of petiole samples and for the interpretation of analytical results
2. To introduce viticulturists to petiole analysis and work with them to secure its acceptance as a recommended production practice
3. To establish desired nutrient levels for bunch grape vineyards in the Southeast

**Justification:**

The acreage of bunch grapes in the southeastern states has risen rapidly with the development and continued expansion of the wine industry. Vineyard establishment and maintenance is an expensive, long-term venture. Adequate support for bunch grape growers is lacking in some areas. Currently, university and state laboratories in Georgia, North Carolina and Tennessee do not have standards for petiole analysis of bunch grapes, although developing such capability has become a significant priority. As a result, growers are either not utilizing tissue testing or sending samples to commercial laboratories or laboratories in other states.

As is the case in all fruit crops, a sound nutritional program is essential to maximize returns from bunch grape vineyards. Deficiencies, toxicities or imbalances of certain nutrients can result in a wide array of problems ranging from weak vines incapable of filling their allotted space on the trellis and failure to set enough fruit buds for a crop to excess growth where disease problems are magnified and fruit bud development is impeded due to excessive shade within the canopy. Oftentimes, nutritional problems result in poor growth, yields and quality before any visible symptoms of problems arise. A unique potential problem can occur with bunch grapes in that the ripened grape is only an intermediate step in the winemaking process. Fertilization not only affects vine health and productivity, but also the wine. For example, deficient nitrogen levels in the must can cause sluggish or stuck fermentations. High nitrogen rates may delay soluble solids accumulation, increase juice pH, and increase the nitrogenous compounds in the must and wine. High potassium levels decrease the color, quality and stability of the juice and can cause a high pH and reduced acidity of the berries and the wine resulting in potential instability problems.

A good fertility program for fruit crops includes both pre- and post-plant soil testing, tissue analysis, records of crop yields and quality, observations of vine performance and grower experience. Tissue analysis provides a way to determine nutrient levels in the plant. While leaves or leaflets are used for analysis in most crops, leaf petioles are the accepted tissues used with bunch grapes in the United States and many other countries. The timing for collecting leaf petioles may vary with full bloom or veraison being the recommended options. Petiole tissues at bloom may provide a more accurate measure for elements such as boron and zinc, whereas sampling at veraison may more accurately reflect the status of elements such as magnesium and potassium. Growers are reluctant to sample at both stages due to costs and time involved in collecting and preparing samples.

Petiole analysis can be utilized as a troubleshooting technique to either confirm or deny a suspected nutrient disorder by comparisons of “normal” versus “affected” vines. It may also be used as a way to monitor nutrient levels within vines to detect trends in nutrient levels thus

enabling correction of nutrient problems before they become yield or quality limiting. With this latter use, regular sampling of a vineyard over a period of several years will be needed to establish a baseline from which to compare results of future petiole samples.

The validity of petiole test results is only as good as the care taken in securing good samples and preparing them for analysis. Fact sheets will be developed to clearly detail procedures for taking good petiole samples. Information will include time to sample, limiting a sample to one variety/rootstock combination, area to include in one sample, number of petioles needed for analysis and preparation of samples prior to submission for analysis. Interpretation of petiole analysis results can create confusion among growers and information will be developed to enable growers to more easily follow recommendations.

### **Methodologies:**

Petiole samples were collected at veraison in 2010 from 12 cultivars and 8 vineyards in North Georgia and 2 cultivars from a vineyard in West Tennessee at veraison. Soil samples were taken from 16 areas from which petiole samples were collected. Samples were sent to the UGA Soil, Plant and Water Testing Laboratory and the UT Soil, Plant and Pest Center for analysis. In 2011, petiole samples were collected at full bloom from 11 cultivars and 5 vineyards in North Georgia. These samples were analyzed at the UGA Soil, Plant and Water Testing Laboratory.

Sample selection protocol was followed as recommended in the literature to obtain representative samples. For the full bloom sampling period, petioles were collected from leaves opposite the basal cluster on fruiting shoots. With the veraison sampling, petioles were taken from the most recently matured leaf on non-topped shoots.

A side study was conducted at the Georgia Mountain Research and Education Center in Blairsville, GA comparing petioles taken at veraison from the most recently matured leaves on non-topped shoots and from the terminal leaf on topped shoots to compare differences in nutrient content. The primary goal was to determine which nutrients would be most affected by this departure from the recommended sampling method.

### **Results:**

Overall, nutrient levels in petiole samples collected at full bloom and at veraison corresponded very well with sufficiency ranges used in other parts of the country. There were some exceptions, however. For several samples, potassium levels in veraison samples were very high – well above what is considered to be excessive as were zinc levels, leading one to suspect that foliar contamination from a pesticide or foliar fertilizer application may have been involved. Petiole samples were not washed at the time of collection. While potassium and zinc levels trended toward the high side of the sufficiency range, or possibly exceeded it slightly, they were much closer to the desired range than were the samples taken at veraison. Since potassium

concentrations within the plant tend to decrease as the growing season progresses, sample contamination appears to be a more realistic issue.

### **Conclusions:**

A routine petiole analysis program accompanied by a soil test from the same area should be combined with visual observations of vine growth and fruiting and records on yields and fruit quality to develop an overall picture of the vineyard's nutritional status. While petiole analysis is suggested for either full bloom or for veraison, samples collected at full bloom would probably be of greater value to growers. Due to high vigor in many vineyards and the need for shoot topping, sample collection at veraison, which is based on getting the most recently mature leaf, can be difficult to impossible at best. Standardizing collection methods and treatment of samples among states could eliminate confusion and result in an overall increase in the acceptance of petiole analysis by growers.

There is definitely a need to acquire more experience and data on vineyard nutrition throughout the region. Petiole analysis performed on samples collected at veraison is regarded as a more reliable indicator of several nutrients, especially potassium and magnesium, than full bloom. While relying on full bloom as the primary time to collect and analyze petioles, veraison sampling could be employed when nutrient concentrations of selected elements are questionable. However, further work needs to be done to refine sample collection at this time.

Growers are vitally interested in having a good vineyard nutrition program. Not only could many of them save money on fertilizers, fruit quality could be improved and labor costs associated with pruning and canopy management practices could be reduced.

### **Impact**

Growers who participated in this study received written reports and recommendations based on the petiole analyses performed. Individual consultations were conducted with several regarding fertilizer application practices. Information collected from this study was used in some grower meetings.

A fact sheet concerning petiole analysis is in preparation. It is intended to give cover sample collection times and methods, sample preparation and interpretation of results. It is hoped that the availability of information specific to the Southeast will increase the adoption of petiole analysis as an important vineyard management tool.

