

Petiole Analysis and its Importance in Viticulture

Ruchitha T.

Ph.D. Scholar, Department of Fruit science, College of Horticulture, Bengaluru, Karnataka

SUMMARY

Grapevines are dependent on soil mineral nutrient uptake and assimilation to support optimal growth, physiological function, and crop production. Mineral nutrient deficiencies limit plant growth and metabolism, while excessive amounts of some nutrients can result in toxicity. Nutrient management is important to sustain vine health and productivity over the lifespan of the vineyard. Tissue sampling is an important tool to assess the vineyard nutrient status. Therefore, it is important to quantify vine nutrient status to evaluate and correct vine nutrient levels so optimal vine growth is maintained.

INTRODUCTION

Nutrients are the essential elements involved in the development of grapevines, photosynthetic functioning and metabolic pathways which are required in certain amount to ensure healthy growth and performance. The perennial fruit crops are unique from seasonal ones in their nutrient requirement because of their size, density, growth rate and rooting pattern. Soil testing in perennial grapevines has not been found very useful in making nutrient recommendation due to their specific root distribution and low vine density. Leaf is the principal site of plant metabolism, hence the changes in nutrient supply are reflected in the composition of leaf/petiole. These changes are more pronounced at certain stages of development and the leaf nutrient concentration at specific growth stages are related to crop performance. In grapevines, petioles are more sensitive to the changes in nutritional status and their nutrient composition helps in taking correct decision for nutrient management. A slender stem that attaches the leaf blade to the shoot is referred to Petiole. Apart from petiole, leaf blade and rachis are also used to diagnose visible grapevine disorders/ deficiencies. Grape petioles are sampled twice *i.e.*, during bud differentiation and full bloom stages for regular monitoring of grapevine nutrient status. Petiole analysis seems to be the best method for identifying the nutrient need of the plant/vine.

Significance of Petiole analysis

- It helps to understand the internal function of nutrients in plant.
- To investigate the toxicity level of nutrients.
- To ascertain the presence of applied nutrients in plant system.
- To distinguish the nutrients which cause similar deficiency and toxicity symptoms.
- To identify mineral imbalance in the absence of a visible symptoms.
- To confirm the deficiency detected by visual symptoms.
- To identify interaction or antagonism between nutrients.
- To identify whether hidden hunger is affecting plant performance and yield/quality.

Practical application of petiole analysis

- To manage nutrients at bud differentiation stage for getting optimum yield in next year and at bloom stage for quality grapes.
- To develop a nutrient guide for recommendation of manures and fertilizers for economic yield.
- To determine whether the supply of one or more nutrients is adequate or unnecessarily high.

Precautions before Sampling

- Sampling should be done preferably in the morning hours.
- Samples should represent vines which are planted on the same soil type, cultural practices, same age, variety and rootstock.
- Select leaves from healthy shoots that are well exposed to sunlight (*i.e.* not damaged or diseased).
- Do not sample vines on the border of block or near dusty roads.

Sampling procedure**Site selection**

- Select vineyard with same variety, rootstock, age, vigour and health on a uniform soil area. To assist diagnosis of problem, take two samples-one from the problematic area and another from a healthy area.
- Take samples from across the selected area in X or W pattern to obtain a representative sample.

Time of sampling

- Sample during flowering, i.e., when **50– 80%** of the flower caps have fallen off.
- Preferably sample before 10 am to avoid moisture stress and nutrient translocation.

Petiole selection and Sampling

- Maintain cleanliness during sampling.
- Petioles should be collected approximately 40-45 days after foundation pruning from recently mature leaf which is generally 5th leaf from the base.
- Collect at least 100 petioles from across the selected area. If the petioles are small, additional petioles should be collected.
- Place the collected petioles in a paper bag and seal it. Label the bag with name, collection site and date.
- Wash the sample in water containing a small amount of detergent (0.2 %) having neutral pH (e.g. Teepol) followed by N/10 HCl and three distilled water.
- Some nutrients/ elements like K, Na, and Cl are easily leached from necrotic or dead tissue during the course of washing. Therefore, sample washing should be completed quickly (in less than a minute) and excess water should be removed from the tissues.
- Leaf blades, in particular, should be dried quickly to avoid mold formation. A forced-air or well-ventilated oven at 70 to 80°C is ideal for sample drying.

Factors influencing nutrient content of soil

- Type of vegetation cover. e.g. with legume cover there could be higher N etc.
- Application of manures and fertilizers.
- Application of soil amendments.
- Inheriting status of soil.

Factors influencing nutrient content of leaf

- Fertilizers input
- Type of vegetation cover; e.g. with legume cover there could be higher N, etc.
- Factors inherent in the cultivar, rootstock; genetic make-up, age of crop, time of sampling; seasonal variation, age of leaves, position of leaves, yield of crop etc.

CONCLUSION

In the perennial fruit crops, need based application of nutrients for current fruit production as well as for vegetative growth which persist for several years is essential. Hence for proper recommendation of nutrients to grapevine there is a need for petiole/leaf blade analysis which plays a vital role in efficient nutrient management and helps in maintaining soil health.

REFERENCES

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