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Leaf Sampling Guide with Interpretation for Arizona Pecan Orchards

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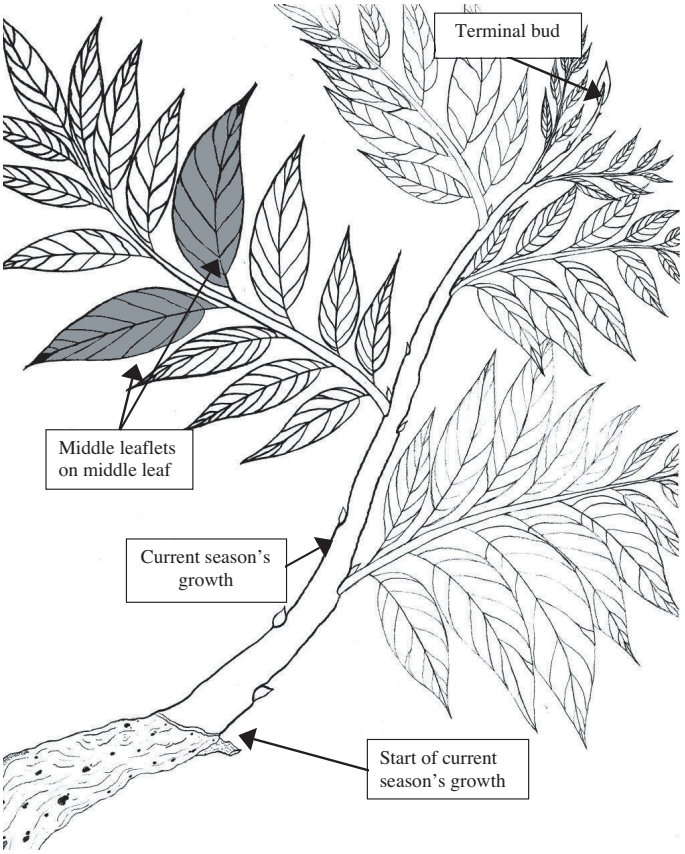

Figure 1: Pecan Leaf Sampling Diagram. Collect middle two leaflets from leaves located in the middle of current season's growth. Illustration by Corey Shemroske.

Introduction

Leaf analysis is an excellent tool for evaluating the current nutritional status of pecan trees and for diagnosing nutrient disorders. When conducted over multiple years, changes in tree nutrition can be tracked, effectiveness of fertilizer management programs measured, and fertilization strategies modified.

For leaf analysis to be a useful tool, several basic steps should be followed. Leaf samples must be properly collected. Leaf composition can vary depending on pecan variety, soil conditions, fruit load, and even position of the sampled leaflet within the leaf and on the tree. Leaf composition changes monthly and seasonally, so the timing of sample collection is important. Leaf samples should be properly handled after they are collected and sent to a laboratory for analysis. The analysis will determine nutrient levels in the leaf tissue, which is an indication of how well the tree has been supplied with nutrients. To make the analysis data meaningful, standard values are used to interpret leaf analysis results and to evaluate pecan tree nutritional status.

What to sample

- Collect the middle pair of leaflets from the middle leaf of the current season's growth (see Figure 1).
  - Collect approximately 50 pairs of leaflets (a total of 100 leaflets) from several trees per block. To sample an area, take two pairs of leaflets from each of 25 trees selected at random.
  - Collect leaflets from healthy, nut-bearing branches located on all sides of the tree(s) if possible; otherwise non-bearing shoots can be sampled.
  - Collect only leaves that are fully developed or expanded.
  - Avoid leaves that are damaged or have visible insect feeding.
- Sample the same trees in subsequent years for multiple year comparisons. Sample individual varieties separately.
- Collect separate samples from areas with distinctly different soil properties.
- To diagnose 'problem' areas or trees, sample nearby 'healthy' and 'unhealthy' trees separately. Compare analysis reports from 'healthy' and 'unhealthy' trees to diagnose nutritional problems.

When to sample

- Leaf samples can be collected at any time during the growing season, but evaluation standards ('low', 'normal', 'high' designations) are usually based on samples taken from late July to early August in Arizona. Samples collected outside this sampling window can still be useful, but it is more difficult to interpret the analyses or to correctly diagnose tree nutrient status.

Table 1. Pecan leaf nutrient concentration ranges based on leaf samples from high yielding trees in Arizona orchards. Samples were collected from late July through early August. From Pond et al. 2006. Leaf Nutrient Levels for Pecans. HortScience 41(5):1339-1341.

Nutrient	Low	Normal	High
Nitrogen (%)	1.15 – 2.05	2.05 – 2.96	2.96 – 3.85
Phosphorus (%)	0.03 – 0.10	0.10 – 0.16	0.16 – 0.23
Potassium (%)	0.45 – 1.00	1.00 – 1.59	1.59 – 2.15
Calcium (%)	0.72 – 1.57	1.57 – 2.43	2.43 – 3.26
Magnesium (%)	0.18 – 0.39	0.39 – 0.59	0.59 – 0.80
Sulfur (%)	0.07 – 0.14	0.14 – 0.20	0.20 – 0.27
Boron (ppm)	4 - 74	74 - 147	147 - 217
Copper (ppm)	3 – 6	6 - 10	10 - 13
Iron (ppm)	6 - 43	43 - 81	81 - 118
Manganese1 (ppm)	50 - 104	104 - 674	674 - 1227
Nickel (ppm)	2.8 – 8.5	8.5 – 14.3	14.3 – 20.0
Zinc[1] (ppm)	20 - 48	48 - 257	257 - 423

[1]'Low' ranges for Mn and Zn were taken from orchard surveys from New Mexico and Sonora, Mexico.

How to handle collected leaf samples

- You can store leaf samples in plastic bags on ice or in a refrigerator prior to drying, but do not store for more than one day.
- Gently wash fresh leaves in a dilute (2%) phosphate-free detergent solution for approximately 30 seconds, then rinse three times in distilled water and blot dry.
- Dry leaf samples in a 150° F (65° C) oven overnight or until crisp. Do not heat leaves to temperatures above 175°F (79° C).
- Send dried leaf samples to an analytical laboratory (see "Laboratories Conducting Soil, Plant, Feed or Water Testing", University of Arizona College of Agriculture and Life Sciences Publication AZ1111, available at: http://cals.arizona.edu/pubs/garden/az1111.pdf, for a list of Arizona laboratories).

Evaluating leaf analysis results

- For leaf samples collected in late July to early August, analyses can be interpreted with the values in Table 1.
  - **Low:** These trees have lower than normal nutrient levels. Deficiency symptoms and/or yield reduction is possible.
  - **Normal:** Normal values for Arizona trees. Nutrients in this range should not limit nut yield.
  - **High:** These values are higher than normally seen in Arizona orchards. Toxicity symptoms and/or yield reduction is possible.
- Leaf samples collected at other times during the growing season should not be interpreted with this guide, but adjacent or nearby 'healthy' and 'unhealthy' trees can still be compared to diagnose nutritional problems.

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