

LEAF SAMPLING GUIDE WITH INTERPRETATION FOR ARIZONA PECAN ORCHARDS

Leaf analysis is an excellent tool to evaluate the nutritional status of pecan trees and diagnose nutrient disorders. When conducted for 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 important steps must be correctly followed. Leaf samples must be properly collected. Leaf composition is dependent upon leaflet position within the leaf, and may vary by variety and by soil type. Leaf composition changes seasonally, even monthly, so timing of sample collection is important. Leaf samples must be properly handled after they are collected and sent to a reputable laboratory for analysis. Lastly, proper evaluation standards need to be used to interpret leaf analyses results to accurately diagnose pecan tree nutritional status.

What to sample

- Collect the middle pair of leaflets from the middle leaf of current season's growth (see Figure 1).
- Collect approximately 50 pairs of leaflets (a total of 100 leaflets) from several trees per block (combining samples from a large number of trees from a block into a composite sample will best represent the nutritional status of the block). Try to collect at least one composite sample per 10 acres.
- Collect leaflets from healthy, nut-bearing branches located on all sides of a tree if possible; otherwise non-bearing shoots can be sampled.
- Sample the same trees in subsequent years for multiple year comparisons.
- Sample individual varieties separately.
- Collect separate samples from areas with varying soil properties.
- Avoid leaves that are damaged or have excessive insect feeding.
- To diagnose problem areas or trees sample nearby 'healthy' and 'unhealthy' trees separately to compare results.

When to sample

- Leaf samples can be collected at any time during the growing season, but evaluation standards ('low', 'normal', 'high' designations) are based on samples taken from late July to early August in Arizona. Use of these values for samples collected earlier or later in the season may lead to incorrect diagnoses.
- Collect only leaves that are fully expanded.

How to handle collected leaf samples

- Store leaf samples on ice or in a refrigerator prior to drying. 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 subject 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

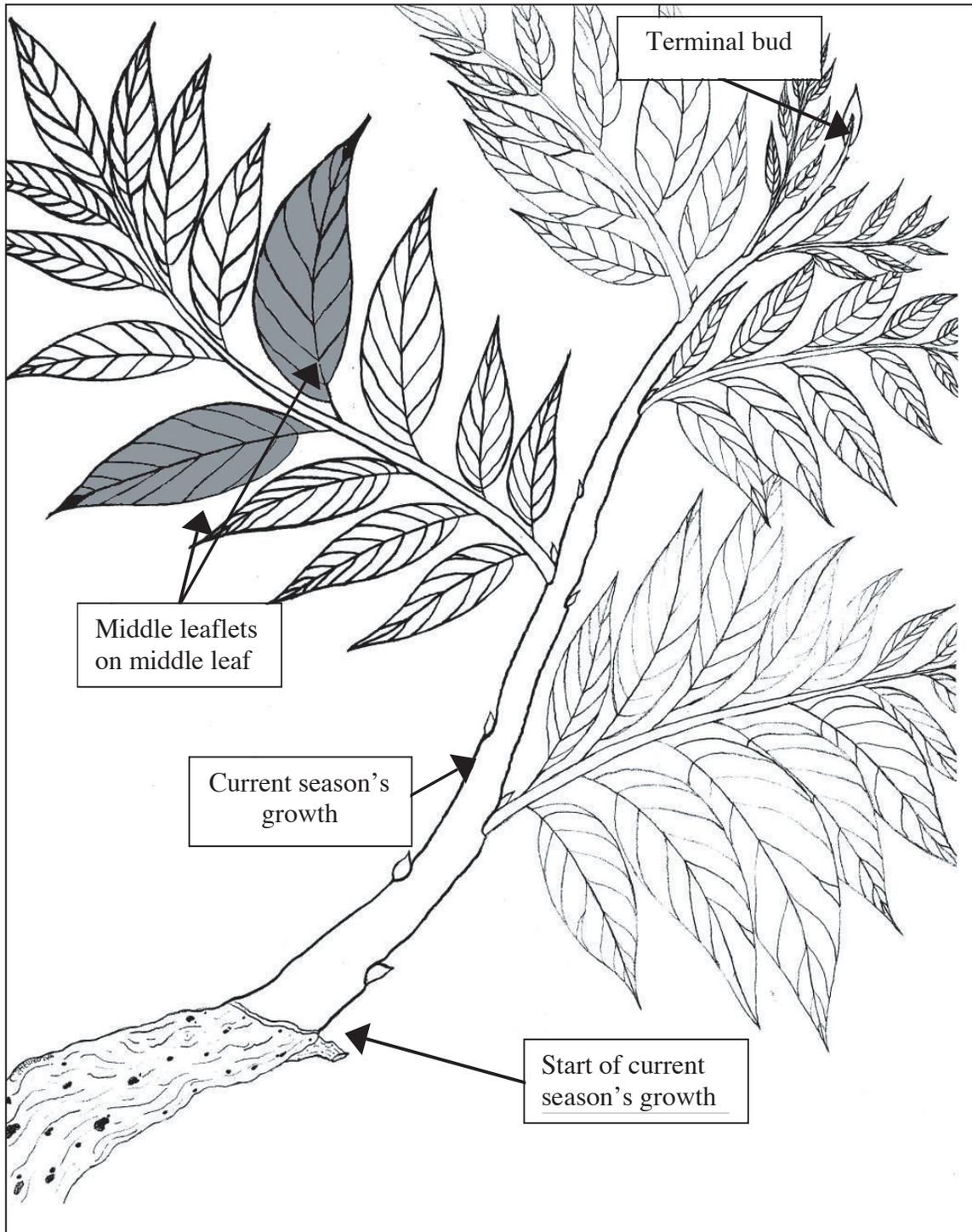
- For leaf samples collected in late July to early August, analyses can be interpreted with the values in Table 1.
 - **Low:** Trees with these values are lower than normally seen in Arizona orchards. Deficiency symptoms and/or yield reduction is possible.
 - **Normal:** Typical values for Arizona trees. 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.
- Compare analyses from adjacent or nearby 'healthy' and 'unhealthy' trees to diagnose nutritional problems.

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 (in press).

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
Manganese ¹ (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.

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.



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