

Evaluating Perennial Fruit Crop Nutrition with Plant Analysis

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Perennial crops are ideally suited to evaluating nutritional needs by plant analysis. Fertilizer programs can be monitored by sampling leaves midseason and making nutrient adjustments the following year. Plant analysis can also be important for the diagnosis of acute nutritional problems that may occur during the growing season. It is also a useful and sometimes the only tool for evaluating the adequacy of elements for which no good soil test exists (i.e. N, Fe, Cu).

Plants require sixteen elements for growth (C, H, O, N, P, K, Ca, Mg, S, B, Zn, Fe, Mn, Cu, Cl, Mo). In Wisconsin soils, usually the elements N, P, K, Ca, Mg, S, B, Zn, Fe, Mn and Cu may be of concern depending on soil type, and crop grown. Growth is normal if all elements are present in adequate levels and correct proportions. Growth is restricted when there is not enough, too much or an imbalanced supply of one or more nutrients. Plant analysis is the quantitative chemical determination of many of these essential elements. Results from lab analyses are compared to known levels in plant populations of known yields to determine adequacy. The actual concentration of nutrients is a “snapshot” and reflects all the cultural and environmental factors that have influenced growth up to the date of sampling. In some respects, therefore, plant analysis is more “precise” than a soil test for determining nutrient availability. A soil test gives an index of the amount of nutrient that is potentially available to the crop. However, a plant analysis tells how much of that “potentially available” nutrient actually got taken up by the plant.

If leaf nutrient concentrations are low or deficient, a fertilizer application or increasing current fertilizer application rates will probably give substantial plant response (Table 1.). Decreasing fertilizer applications is suggested when nutrient levels are above sufficiency levels. However, factors such as seasonal conditions, irrigation, plant vigor, crop load, pruning, etc. need to be considered when making these decisions.

The analysis and interpretations are of little value without the use of standard, consistent sampling procedures. Time of sampling during the growing season and plant part sampled can greatly affect mineral content. In general, sample perennial fruit crop leaves at midseason. Table 2 lists several diagnostic plant parts and number of plants to sample for the most reliable results. Do not include plants affected by insect, disease, or pesticide damage. If an area is showing acute problems, sample healthy and unhealthy plants separately at any time during the growing season.

Soil testing can help supplement leaf analysis for nutrient evaluation. Soil tests can confirm low nutrient levels and indicate that additional nutrients will be beneficial. If soil tests are high while leaf nutrient levels are low, other problems are likely limiting plant uptake. Low nutrient levels in plant tissue may be the secondary result of insect or disease damage, soil compaction or low soil pH.

Plant analysis may not be the best approach for every field on every farm, but for trouble shooting, monitoring, and confirming suspected nutrient deficiencies, it can be an important tool.

Table 1. Nutrient concentrations for cranberry shoots

Element	Plant Nutrient Status		
	Low	Sufficient	High
	-----%-----		
N	<0.90	0.90-1.00	>1.00
P	< 0.14	0.14-0.18	>0.18
K	< 0.50	0.50-0.90	>0.90
Ca	< 0.30	0.30-0.60	>0.60
Mg	< 0.15	0.15-0.20	> 0.20
	-----ppm-----		
Fe	<40	40-80	>80
B	<10	10-20	>20
Cu	<5	6-10	>10
Zn	<15	15-30	>30
Mn	<10	10-200	>200

Table 2. Plant tissue sampling for perennial fruit crops.

Crop	Stage of Growth	Plant Part	Number of Plants to Sample
Apples, Cherries Pears, Plums	current season's shoots July 15-Aug. 15	fully developed leaves at midpoint on new shoots	4 leaves from each of 10-20 trees
Cranberries	current season's shoots Aug. 15-Sep. 15	newest terminal growth	35-50 leaves
Raspberries	midseason	youngest mature fully developed leaves on laterals or "primo" canes	2 leaves from 20-40 plants
Strawberries-new planting	current season's shoots Aug. 15-Sep. 15	youngest mature fully developed leaf blade and petiole	2 leaves from 10-20 plants
Strawberries-old planting	May 25-June 5, before picking Aug. 15-Sep. 15 after picking	youngest mature fully developed leaf blade and petiole	2 leaves from 10-20 plants

NOTES