Plant Tissue Sampling

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Background

- Plant analyses are useful to diagnose nutritional problems and to monitor the fertilization program. Tissue testing is most effective when used together with soil testing [12].
- Nutrient concentrations change as plants grow and also differ between plant parts [5]. It is therefore important to sample specific plant parts at a particular growth stage (Table 1). For information on optimal nutrient concentrations at different growth stages, see the fertilization guidelines for the different crops (http://apps.cdfa.ca.gov/frep/docs/Intro.html)
- Archiving the results from the analyses allows tracking changes in the same field over time [5]. Plant analyses together with soil analyses and nutrient budgets allow evaluating the fertilization program on the long term [3].

General Sampling Instructions

- When plant development differs within a field, the field should be divided into different management areas with similar characteristics and a sample from each area should be taken. To facilitate interpretation, fields are best divided into the same areas as is done for soil samples.
- Randomly select plants throughout the field or management area and sample the correct plant parts [3, 12]. For plant parts and number of plant parts to sample, see Table 1.
- Collect the specific plant parts and place them into a clean paper bag [12]. Do not use plastic bags to avoid decay of samples. Do not use metal containers, because they may contaminate the samples and affect micronutrient results [3, 13].
- Do not collect samples during the hottest part of the day, particularly in summer [13].
- Do not take samples from dead, diseased, insect damaged, or mechanically injured plants [5, 12]. Also avoid plants from unusual areas in the field, including border areas and places where plants are under water stress or where nutrient availability is atypical [5].
- Dust or soil covered plant parts should also be avoided, especially when the samples are used for micronutrient analysis [5].
- Small amounts of dust can be removed by gently brushing the samples with a soft brush [12]. Alternatively, the samples may be cleaned with a damp cloth, but should not be rinsed or washed to prevent leaching of nutrients from the sample [12, 13].
- Deliver the samples immediately to the lab or use a one-day delivery service [12, 13]. If immediate delivery is not possible, air-dry the samples in the shade by placing the open bag in a clean, dust-free area [2, 3, 13]. Mix the samples frequently to avoid decay.
- Clearly label the bag, and provide the information required by the test lab [3].
- Follow the laboratory instructions for packaging and shipping.
- To determine the cause of visual symptoms or a suspected deficiency in one part of the field, two samples may be taken; one from the plants of interest, the other from adjoining normal plants in the same field or management area [5].

Table 1: Sampling procedure for major field crops and vegetables.

Crop	Growth stage	Plant part to sample	Number of plants to sample
Field Crops			
Alfalfa	10% bloom	stems in the middle third of the plant	40-60 stems from at least 30 plants
Corn	Early season (6-16 inches)	Whole plant	20-30
	Midgrowth (3-6 feet)	First fully developed leaf; third leaf from top	15-25
	Tasseling, silking	Leaf opposite and below primary ear	15-25
Cotton	Early squaring to late season	Third to fifth petiole from the terminal on the main stem	30-40
Rice	Early stages	Most recently fully expanded leaf (Y-leaf)	50
	Later stages	Most recently fully expanded leaf (Y-leaf)	30-60
Tomatoes	First bloom to 10% of fruits showing red color	Fourth leaf from the growing tip	40
Wheat and barley	3-4 leaf	Whole plant	50-100
	Tillering, jointing, booting	Top 3-4 leaves	50-100
	Early heading (hard red wheat N only)	Flag leaf	50-100
Vegetables			
Broccoli	First buds to heading	Recently matured leaf, typically 3-4 nodes down from the growing point	20-60
Cauliflower	Head initiation, preharvest	Recently matured leaf, typically 3-4 nodes down from the growing point	20
Lettuce	Early heading to pre-harvest	Youngest wrapper leaf	20-60
Berries			
Strawberry	Preharvest, main harvest	Young mature leaves	30-40

Sources: Alfalfa [8,11] , corn [5], cotton [1, 10], rice [9], tomatoes [6, 7], wheat and barley [5] , broccoli, cauliflower and lettuce [4, 5], strawberry [14] .

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