

# Illustrated Guide to Sampling for Plant Analysis

Plant analysis is the second tool, after soil testing, that is critical to improving crop nutrition and yield. Only plant analysis can identify the actual nutrient status of a plant or crop. While soil testing identifies the nutrients offered to the crop or plants, plant analysis identifies how well the plants utilized the soil and applied nutrients. Plant analysis allows the crop or plant to tell us what nutrients it needs.

**It is critical that the correct plant part and stage of growth be sampled, and that the lab be clearly informed of this.** The normal nutrient concentration differs between the various plant parts. Also, the normal nutrient concentration of each plant part changes as the plant matures. Plant analysis is calibrated to these norms, so correct identification of which nutrients are low or high depends on accurate information. Call the Lab if you have a plant not listed.

## How to Take Plant Samples

See back page for more information.

### 1. Where to Take Samples

- A. In Uniform Fields:** Where plant growth is uniform over the entire area, one composite sample, taken from at least 10 widely scattered areas in the field. *One plant sample is necessary. One soil sample is recommended.*
- B. In Problem fields:** These are where the growth or appearance of one area differs from the rest of the field. Plant analysis can often determine the cause of these differences and indicate the best method to correct the problem. Sample when abnormalities are discovered. *Two plant and two soil samples are required.* This includes collecting soil and plant samples from the normal area.

**All Plant samples taken from abnormal areas should be taken from just inside of the abnormal area.** Soil samples should be taken throughout the abnormal area. **A separate Plant Analysis History must be completed for each sample taken.**

### 2. When to Take Samples

Crops can be sampled during much of the season. The following tables list the preferred plant parts and growth stages to sample for many crops.

### 3. Amount of Plant Material

*All plant analysis requires at least a rounded double handful (softball size) of plant tissue.* We cannot analyze a sample that is too small. See the tables on the following pages for the proper number of plant parts to sample.

### 4. Preparing Samples for Shipping

Use a large, clean paper bag or clean plastic bucket to collect the sample. Remove any dust or residue from the leaf surface with a clean dry soft bristle brush. Do not wash the sample. Improper washing can affect the nutrient content of some elements. Samples should be dry to the touch, and strongly wilted before shipping. Wilting is not as critical if overnight shipping is used.

### 5. Completing the History Form

Perhaps the most important part of a plant sample is its accompanying Plant History Form. This form is available with a plant analysis kit or can be downloaded from [www.spectrumanalytic.com](http://www.spectrumanalytic.com) **It must be complete to permit a meaningful interpretation.** Be sure to indicate if more than one sample is being sent at the same time. Make a copy of the history for your files.

### 6. Mailing the Sample

Place the dry, wilted plant tissue sample in the large paper envelope supplied with the "kit". **Do not send fresh samples or put them into plastic bags. They will decompose during shipment, making them useless for analysis purposes.** The History Form goes in the small envelope which is then placed inside the large envelope containing the dried sample. The sample must not decompose in transit! It is strongly recommended that either 2-day, or next-day delivery service be used.

**IMPORTANT:** Accurate Analysis and meaningful interpretation require properly taken samples. Follow these and all directions carefully and correctly.

# Proper Plant Tissue Sampling Technique

CROP	GROWTH STAGE	PLANT PART TO SAMPLE	QUANTITY
AGRONOMIC and FORAGE CROPS			
<b>Alfalfa</b>	At or prior to 5% bloom	Entire above ground portion of plant or top 6", whichever is smaller.	15 to 20 plants
<b>Barley, Oats, Rye, Wheat</b> (other small grains <i>except rice</i> )	a) Feekes Stages 3 through 9	Entire above ground portion of plant.	30 to 40 plants, depending on size
	b) Feekes Stage 10	Uppermost mature, or Flag leaves.	30 to 40 leaves
<b>Canola</b>	Seedling to Vegetative	Whole plant	20 to 30 leaves
	At or prior to full bloom	Fully developed leaves on upper portion of plant	20 to 30 leaves
<b>Corn</b> (Field, Pop, and Silage)	(a) Seedling (6" to 12") tall (< V6)	Entire above ground portion of plant.	15 to 20 plants
	(b) Prior to tasseling, (V7-VT)	First fully developed leaf below whorl.	10 to 15 leaves
	(c) Silk initiation to brown silk stage (R1-R5)	Ear Leaves.	10 to 15 leaves
<b>Cotton</b>	(a) Seedling, 6" to 12" tall	Entire above ground portion of plant	15 to 20 plants
	(b) Prior to or at first bloom	Youngest fully mature leaves from the main stem of plant. <u>Discard the petioles.</u>	15 to 20 leaves
	(c) When first squares appear		
<b>Cotton</b> (Petioles)	When first squares appear to full maturity	Petioles from the youngest fully mature leaves on the main stem of plant.	30 to 50 petioles
<b>Grasses</b> (Hay, Forage or Pasture)	Prior to heading	Entire above ground portion of plant or top 6", whichever is smaller.	25 to 30 plants
<b>Peanuts</b>	(a) Seedling stage	Entire above ground portion of plant.	15 to 20 plants
	(b) Vegetative to pegging stage	Youngest fully mature leaf. No petioles.	20 to 30 leaves
<b>Rice</b>	(a) Seedling stage	Entire above ground portion of plant.	15 to 20 plants
	(b) Tillering	Entire above ground portion of plant.	15 to 20 plants
	(c) 1 <sup>st</sup> Joint-Panicle Initiation	Y Leaf / Flag Leaf	20 to 30 leaves
	(d) Panicle differentiation	Y Leaf / Flag Leaf	15 to 20 leaves
	(e) Flowering-Heading	Y Leaf / Flag Leaf	20 to 30 leaves
<b>Soybeans</b>	(a) Seedling stage (V2 - V5)	Entire above ground portion of plant.	15 to 20 plants
	(b) Vegetative to early pod fill (> V5)	Youngest fully mature leaf. No petioles.	20 to 30 leaves
<b>Sugar Beets</b>	(a) Seedling stage	Entire above ground portion of plant.	15 to 20 plants
	(b) Vegetative stages	Youngest fully mature leaf in the whorl.	10 to 20 leaves
<b>Sugar Cane</b>	2 Months to Mature	Second fully mature leaf without sheath.	15 to 25 leaves
<b>Sunflowers</b>	(a) Seedling stage	Entire above ground portion of plant.	15 to 20 plants
	(b) Vegetative to full bloom	Youngest fully mature leaf. No petioles.	15 to 20 leaves
<b>Tobacco</b>	(a) Seedling (transplants, 2 wks.+)	Entire above ground portion of plant.	15 to 20 plants
	(b) Vegetative stages	Youngest fully developed leaf from top.	10 to 20 leaves

**See Pictorial Guide For More Information.**

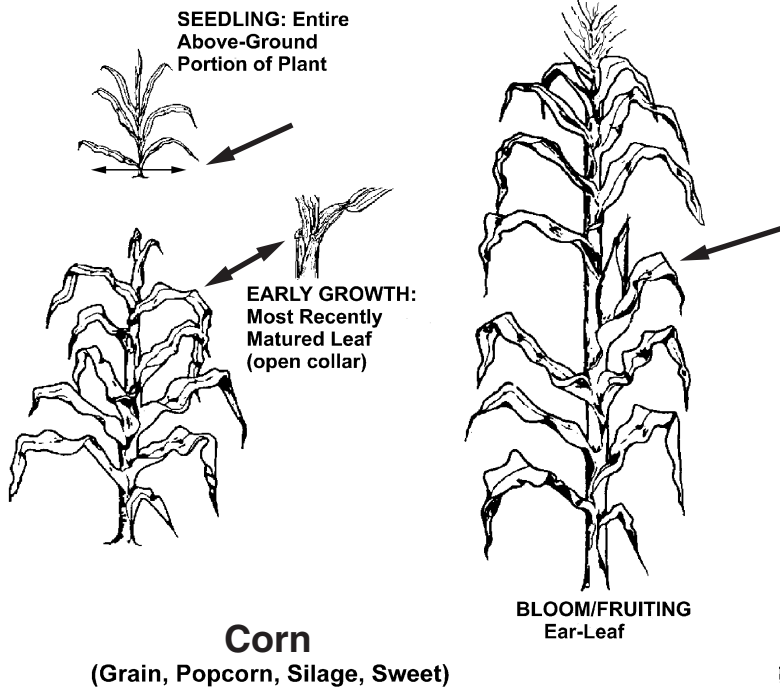
CROP	GROWTH STAGE	PLANT PART TO SAMPLE	QUANTITY
<b>VEGETABLE CROPS</b>			
<b>Asparagus</b>	(a) Spears (b) Ferns	Entire above ground portion of plant. Youngest mature frond (top 24 inches).	10 to 20 spears 10 to 20 fronds
<b>Beans</b> (Field/Dry, Snap, Lima, etc.)	(a) Seedling stage (b) Vegetative to early pod fill	Entire above ground portion of plant. Youngest fully mature leaf. No petioles.	20 to 30 plants 20 to 30 leaves
<b>Beets, Table</b>	Vegetative stages.	Innermost mature leaf in the whorl.	25 to 50 leaves
<b>Broccoli, Cabbage, Cauliflower</b>	(a) Seedling stages (b) Vegetative to heading stages	Entire above ground portion of plant. Mature fully expanded wrapper leaf.	20 to 30 plants 15 to 20 leaves
<b>Carrots</b>	(a) Seedling stages (b) Vegetative stages.	Entire above ground portion of plant Innermost mature leaf in the whorl.	20 to 25 plants 25 to 50 leaves
<b>Celery</b>	Vegetative stages	Petiole of youngest mature leaf.	20 to 25 petioles
<b>Collard, Kale, Mustard, Turnip</b>	Vegetative stages	Youngest mature leaf.	15 to 20 leaves
<b>Eggplant</b>	Vegetative to full bloom stage.	Youngest mature leaf on main stem.	25 to 35 leaves
<b>Lettuce, Spinach, Endive</b>	Vegetative stages	Youngest mature leaf.	20 to 30 leaves
<b>Melons</b> (cantalope/ muskmelon, watermelon)	Vegetative to fruiting	Youngest fully mature leaf. No petioles.	15 to 20 leaves
<b>Onion, Garlic, Leek, Shallot</b>	(a) Seedling stages (b) Vegetative stages	Entire above ground portion of plant. Entire above ground portion of plant.	30 to 50 plants 25 to 30 plants
<b>Peas</b> (Field/sweet etc.)	(a) Seedling stage (4-17 nodes) (b) Vegetative to early bloom	Entire above ground portion of plant. Youngest mature leaf. No petioles.	20 to 30 plants 25 to 35 leaves
<b>Peppers</b> (Chili, Sweet)	Early Vegetative to Fruiting Stage.	Youngest mature leaf on main stem.	25 to 35 leaves
<b>Potato, sweet</b>	(a) Seedling stages (b) Vegetative to full bloom stage.	Entire above ground portion of plant. Youngest mature leaf on main stem.	20 to 25 plants 25 to 30 leaves
<b>Potato, white</b>	(a) Seedling stages (b) Vegetative to full bloom stage.	Entire above ground portion of plant. Youngest mature leaf on main stem.	20 to 25 plants 25 to 30 leaves
<b>Radish</b>	(a) Seedling stages (b) Vegetative stages.	Entire above ground portion of plant. Innermost mature leaf in the whorl.	20 to 25 plants 40 to 50 leaves
<b>Sweet Corn</b>	(a) Seedling (6" to 12") tall ( <V6) (b) Prior to tasseling (V7-VT) (c) Silk initiation to brown silk stage (R1-R5)	Entire above ground portion of plant. Youngest mature leaf below whorl. Ear Leaf.	15 to 20 plants 10 to 15 leaves 10 to 15 leaves
<b>Squash, Pumpkins</b>	Vegetative, bloom, fruiting	Youngest mature leaf. No petioles.	15 to 20 leaves
<b>Tomato</b> (Field - See Pic)	(a) Seedling stages (b) Vegetative, bloom, fruiting	Entire above ground portion of plant. Youngest mature leaf on main stem.	20 to 25 plants 20 to 30 leaves
<b>Tomato</b> (Greenhouse) See Pictorial	(a) Early Flowering (b) 1st to 6th Cluster	Leaf Tip Terminal leaf or leaflet next to most recent fruiting cluster (identify cluster)	20 to 25 plants 50 to 70 leaves

**See Pictorial Guide For More Information.**

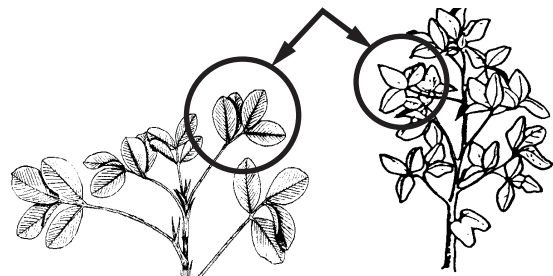
CROP	GROWTH STAGE	PLANT PART TO SAMPLE	QUANTITY
<b><i>FRUIT, BERRY and NUT CROPS</i></b>			
<b>Almond</b>	Mid-season (6-8 weeks after bloom)	Terminal leaflets from mature leaves on terminal shoots.	25 to 40 leaflets
<b>Apples</b>	Mid-season (4-8 weeks after bloom)	Youngest fully mature leaves from mid-terminal (non-bearing spur, if spur type).	20 to 30 leaves
<b>Apricots</b>	Mid-season (4-8 weeks after bloom)	Youngest fully mature leaves of current years growth.	20 to 30 leaves
<b>Blackberry Raspberry (other brambles)</b>	Mid-Season (2-6 weeks after bloom)	Mature leaves from mid-section on non-fruiting “primo” canes.	20 to 30 leaves
<b>Blueberry</b>	Mid-season (4-6 weeks after bloom) Post-harvest (July 15-August 15)	Median leaves, non-fruiting branches. Youngest fully mature leaves.	40 to 60 leaves 40 to 60 leaves
<b>Cherry (sweet, tart)</b>	Mid-season (4-8 weeks after bloom)	Youngest fully mature leaves from mid-terminal on a non-bearing spur.	20 to 30 leaves
<b>Citrus</b>	(a) Vegetative stages (b) Fruiting stages	Fully mature leaf - spring cycle growth. Fully mature leaves adjacent to fruit.	20 to 30 leaves 20 to 30 leaves
<b>Cranberry</b>	Late August early September, <u>ONLY</u>	Upper 2 inches of “uprights” from the current season’s growth. Include stem.	50 to 100 uprights
<b>Grape Leaves</b>	(a) Vegetative stages (b) Fruiting stages	Youngest fully mature leaf.( Remove Petioles) Leaf opposite basal fruit cluster.	15 to 25 leaves 15 to 25 leaves
<b>Grape Petioles</b>	(a) Vegetative stages (b) Fruiting stages	Youngest fully mature leaf Leaf opposite basal fruit cluster.	50 to 75 petioles 50 to 75 petioles
<b>Peaches</b>	Mid-season (4-8 weeks after bloom)	Youngest fully mature leaves near base of current years growth.	20 to 30 leaves
<b>Pecans</b>	Mid-season (6-8 weeks after bloom)	Middle leaflet pairs from mature leaves on terminal shoots.	25 to 40 leaflets
<b>Plums</b>	Mid-season (4-8 weeks after bloom)	Youngest fully mature leaves near base of current years growth.	20 to 30 leaves
<b>Strawberry</b>	Vegetative to fruiting stages	Youngest fully mature tri-foliolate leaf.	50 to 60 leaves
<b>Walnut, Black</b>	Mid-season (6-8 weeks after bloom)	Middle leaflet pairs from mature leaves on terminal shoots.	25 to 40 leaflets
<b>Walnut, English</b>	Mid-season (6-8 weeks after bloom)	Terminal leaflets from mature leaves on terminal shoots.	25 to 40 leaflets
<b><i>ORNAMENTALS, TREES and TURF</i></b>			
<b>Ferns</b>	Vegetative growth	Youngest fully expanded mature frond	15 to 30 fronds
<b>Flowering Annuals</b>	Vegetative to full bloom	Uppermost mature leaves on main stem.	20 to 40 leaves
<b>Herbaceous Perennials</b>	New season vegetative growth	Youngest fully developed leaves of the current year’s growth.	20 to 40 leaves
<b>Roses</b>	All stages	Upper three leaflets from youngest fully mature leaves.	30 to 40 leaflets
<b>Trees, Shrubs (Conifers)</b>	Vegetative growth, mid season	Current season’s “lateral”, fully hardened.	15 to 20 “laterals”
<b>Trees, Shrubs (Deciduous)</b>	Vegetative growth stages	Youngest fully developed leaves of the current year’s growth.	20 to 50 leaves
<b>Turf</b>	Vegetative growth	Leaves, preferably clipped by hand.	1 pint clippings

**See Pictorial Guide For More Information.**

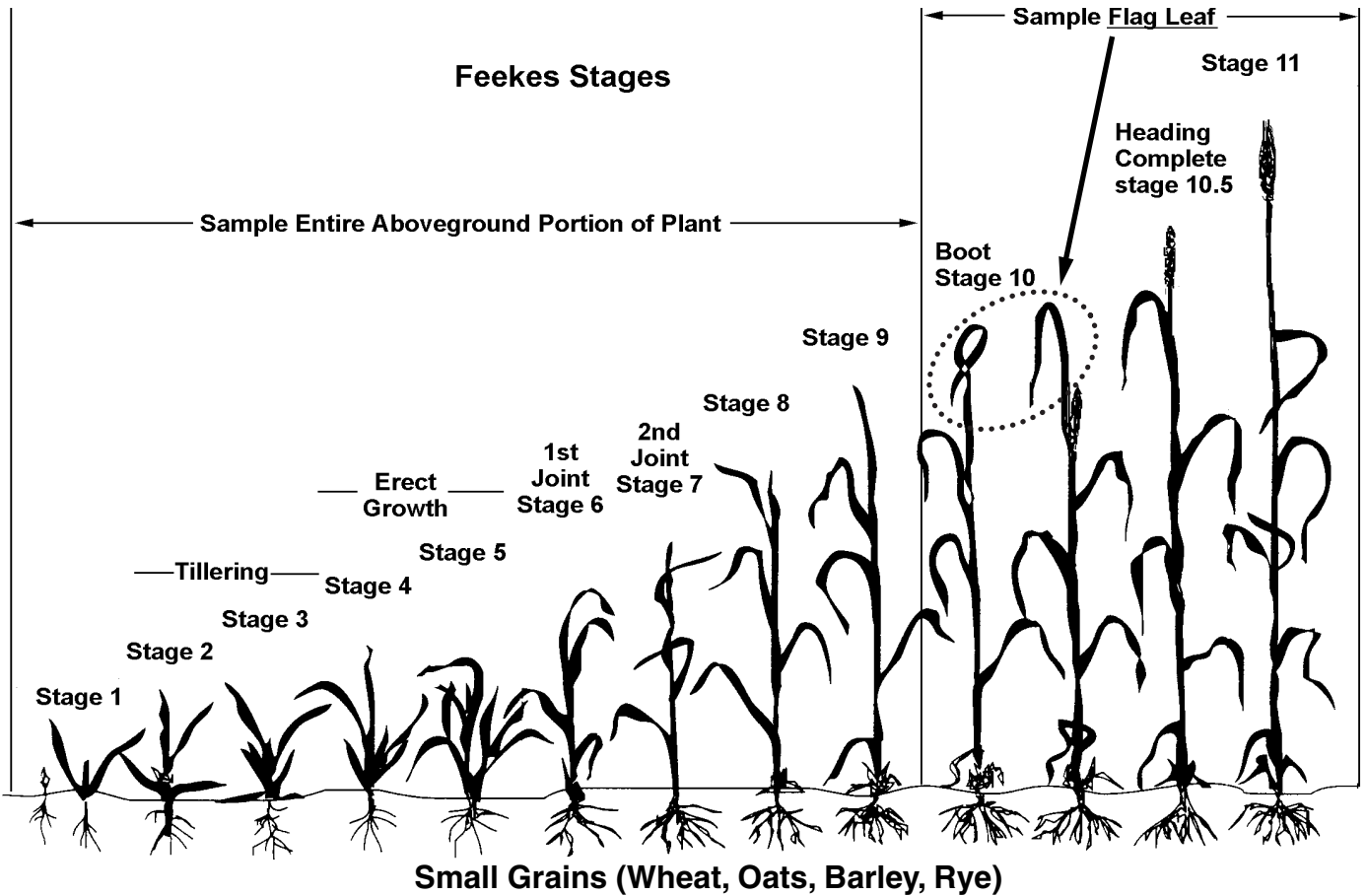
# Pictorial Plant Sampling Guide



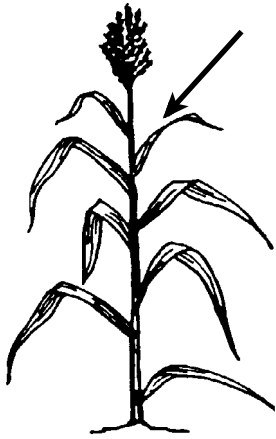
**Alfalfa, Legume Forage and Pasture Grasses**  
Sample the upper 6" of plants before bloom.



**Field/Green Beans, Peanuts and Soybeans**  
Sample uppermost mature tri/trta-foliolate leaf, without petiole.



# Pictorial Plant Sampling Guide



**Sorghum**



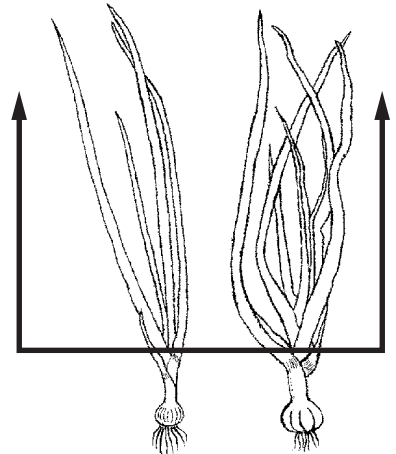
**Tobacco**



**Beets**

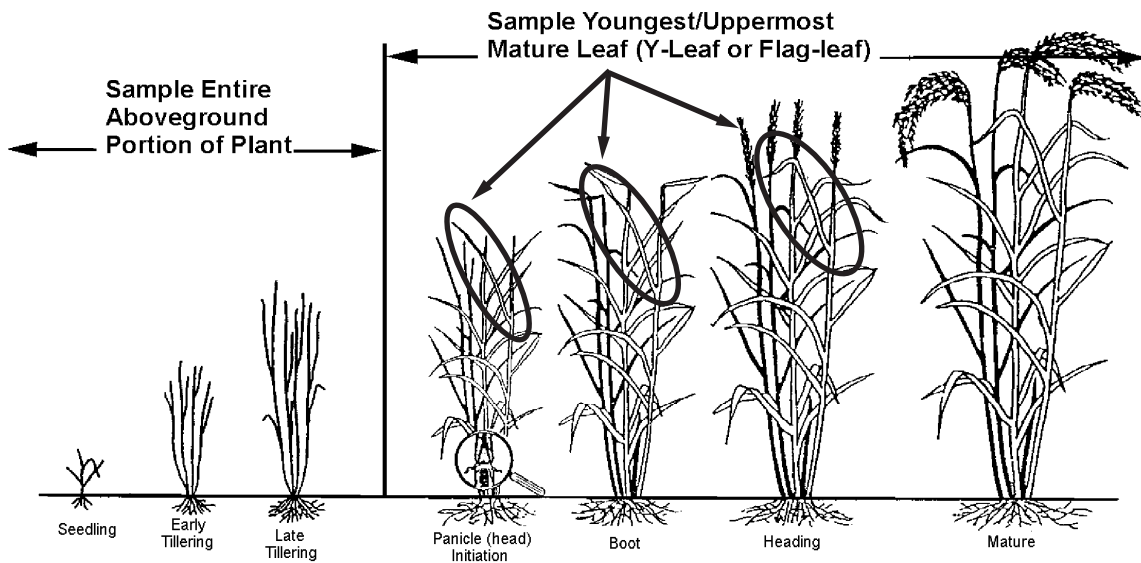
(sugar, table)

*Leaf* for complete nutrient analysis  
*Petioles* for nitrate monitoring

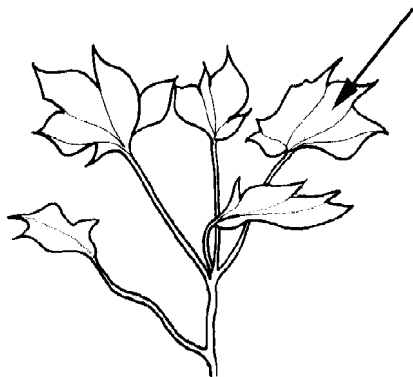


**Onions And Garlic**

Sample entire above ground,  
green portion of plant.



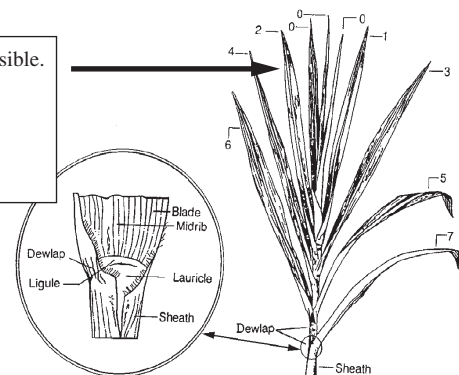
**Rice**



**Cotton**

Sample youngest mature leaf or petiole.  
*Leaf* for complete nutrient analysis  
*Petioles* for nitrate monitoring only

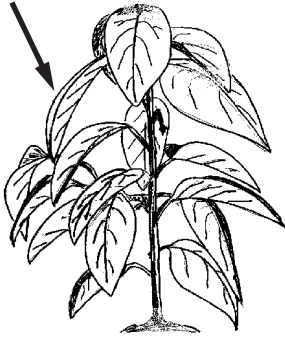
Mature leaf = Dewlap or ligule is visible.  
0 = immature leaves  
1 = first fully mature leaf  
2 = second mature leaf  
3 = Third mature leaf  
etc.



**Sugar Cane**

Midseason to mature  
Sample second fully mature leaf.

# Pictorial Plant Sampling Guide



## Most Vegetables

Sample uppermost mature leaf.



## Potatoes

Sample uppermost mature leaf or petiole.

**Leaf** for complete nutrient analysis

**Petioles** for nitrate monitoring only



## Tomatoes

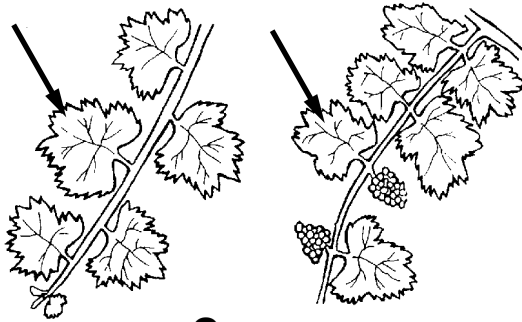
### Field

Sample uppermost mature leaf or main stem



### Greenhouse

Sample terminal leaflet or leaf next to most recent fruiting cluster



## Grapes

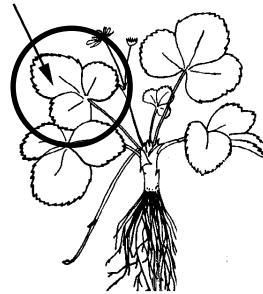
(Leaves or Petioles)

**Vegetative:** Sample youngest fully mature leaf.

**Fruiting:** Sample leaf opposite basal fruit cluster.

**Leaf:** for complete nutrient analysis

**Petioles:** for nitrate monitoring only



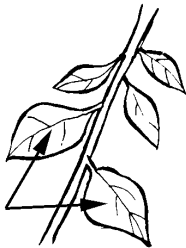
## Strawberries

Sample youngest fully mature leaf.



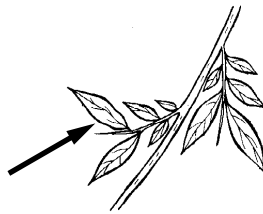
## Cranberries

Sample top two inches of stems and leaves from current seasons uprights



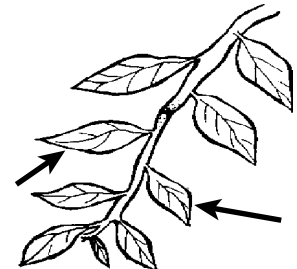
## Apples, Pears, Cherries

Sample youngest fully mature leaves.



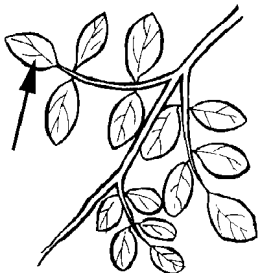
## Peaches, Nectarines, etc.

Sample youngest fully mature leaves near base of current year's growth.



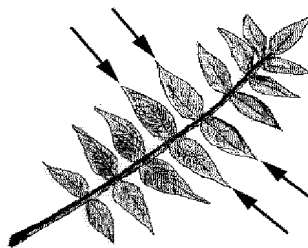
## Citrus

Sample 4 to 6 month old, spring-cycle leaves from non-fruiting terminals.



## English Walnuts

Sample terminal leaflet from a mature leaf.



## Pecans, Black Walnuts

Sample leaf pairs from middle of terminal shoot.



## Conifers

Sample current season's fully hardened lateral.

## Effective Uses for Plant Analysis

1. Confirm visual deficiency symptoms.
2. Reveal hidden nutrient stresses.
3. Check up on the effectiveness of a fertility program.
4. Improve yield goals and fertilizer needs for future crops.
5. Improve quality of plants

A complete plant analysis from Spectrum Analytic includes the total amounts found of the nutritional elements, N, P, K, Ca, Mg, S, B, Cu, Fe, Mn, Na and Zn. Analyses for other elements can also be provided if requested. The status (Deficient, Low, Sufficient, etc.) for each nutrient tested is indicated numerically on the report and a colored bar graph. *A complete agronomic interpretation of the analytic results is also available.*

## Some Plant Analysis Do's and Don'ts

### DO

1. Collect a representative sample. Sample the field as you would if you were sampling the soil (10-20 sampling points.)
2. **Always** collect sufficient plant material (see "Quantity" tables). About the size of a softball when compressed.
3. Fill out the plant history questionnaire as completely and accurately as possible. The more complete the information the more reliable the interpretation.
4. **Always** identify the age and growth stage (seedling, bloom, Feekes, V/R, etc.) as accurately as possible.
5. **Indicate if foliar fertilizers or fungicides** have been recently applied. Identify them and record their application rates in the questionnaire. Again, it will make for a more reliable interpretation.
6. **Always** collect a soil sample from problem areas.
7. When in doubt, **Read the Instructions or call or email the lab.**
8. Make **PLANT ANALYSIS** a central part of your agronomic services program.

### DON'T

1. Sample dead plants.
2. Wash leaf tissue
3. Collect or ship samples in plastic bags or containers.
4. Use galvanized equipment in any way.
5. Sample severely insect damaged plants.
6. Sample severely mechanically injured plants.
7. Sample plants that are too old (see "Growth Stage" tables).
8. Sample during severe drought.
9. Include roots, branches or loose soil with any plant sample. (A soft brush can be used to remove soil particles.)

## How to Contact Us

If you have any questions about using plant analysis, please call Spectrum Analytic at 1-800-321-1562, or send an email to [info@spectrumanalytic.com](mailto:info@spectrumanalytic.com).