

MEASURE AND MANAGE

Plant Sampling and Testing

Information

Soil testing indicates the level of essential plant nutrients in the soil. The plant itself is an indicator of the supply of nutrients available to it. There is a long history of plant analysis that has determined the critical levels of nutrients needed for desired growth. With both a soil test and a plant tissue test, a complete diagnosis of the soil and plant production system can be made. The combined interpretation can lead to maximum profits by assessing production and fertility.

Uses of Plant Analysis

- Plant testing is useful in the following ways:
- To verify observed nutrient deficiencies.
- To find "hidden hunger" or shortage of nutrients.
- Identifying toxicities or excess accumulation of nutrients that retard growth i.e. excessive Mn in potatoes on acid soils.
- Defining imbalances of nutrients, N:K, K:Mg ratios.
- To assess the impact of fertilizer applications on yield and quality.
- Use as a teaching or demonstration tool with clients to prove the need for certain nutrients.
- Part of the Diagnostic Process for trouble shooting production problems.

Diagnostic Approach

The plant is a dynamic living system influenced in its growth by a host of factors in its growing environment. Plant analysis is useful in determining if the plant has received an adequate supply of essential nutrients.

Limiting Factors

- When trouble shooting, one should look at 2 approaches:
 1. What is right with the growing process, what practices should be continued?
 2. What is wrong with the process and how do we prevent problems from limiting production?
- There are many possible reasons for poor growth. Nutrients can be outright deficient, or excessive or simply out of balance. the balance of nutrients is as important as nutrient level.
- Not all factors directly involve nutrient shortage. Other factors for poor growth are as follows:
 - Insufficient light energy

- Inadequate CO₂
- Extreme temperatures
- Shortage or Excess of water
- Physical damage from wind or hail
- soil compaction
- Poor drainage
- Erosion, loss of topsoil and nutrients
- Herbicide damage
- Improper soil pH
- Weed competition
- Insects
- Diseases
- Variety
- Cultivation damage
- Plant population, low or high
- Planting date
- Untimely operations: sprayer operations, fertilizer applications, excessive total salts

Take a Proper Sample


- There is a specific plant part required for sampling for each particular crop.
- The sample should be a leaf blade or a petiole of a recently matured leaf, 1/3 of the top of the plant or the whole plant itself.
- Sample the part specified in SAMPLING GUIDELINES
- There is a best time to sample. This usually comes when the plant is under stress from flowering to early fruit or seed stage.
- Obtain samples in a random fashion from all parts of the field and collect an adequate amount.
- Plants showing visual symptoms of suspected nutrient deficiencies should be sampled immediately.
- It is best to submit 2 samples, one from the affected plants and one from "good" or healthy plants for direct comparison.
- Avoid dusty or soil contaminated plant parts. Brush or wash with distilled water, all plant parts collected.
- **Do not sample dead tissue!**





Sample Preparation and Packaging:

- 1. Send plants to Agri-Food Laboratories ASAP**
- 2. Pack loosely in paper bags. DO NOT USE PLASTIC BAGS.**
- 3. Fill in Submission Forms.**
- 4. Enclose samples in box, with submission form and send via courier.**

Sampling Guidelines

Field Crops | Vegetable Crops | Ornamentals & Flowers | Fruit & Nut Trees

FIELD CROPS				
	CROP	PLANT PARTS	LOCATION/SAMPLING TIME	NUMBER OF PLANTS
	ALFALFA	leaf blade	mature leaf blades 1/3 of the way down the plant at 1/10 bloom stage or before	45-50
	CANOLA	leaf	fully developed leaves from top of plant, prior to seed set	60-70
	CEREAL GRAINS	all above ground or leaves	all above ground portion at seedling stage OR four uppermost blades from top, prior to heading	50-70 or 30-40
	CLOVER	leaf blades	mature leaf blades 1/3 of the way down the plant	50-60
	CORN	all above ground or leaves	all above ground portion at seedling stage OR the first fully developed leaves from the top prior to tasseling OR the leaves below and opposite the ear from tasseling to silking	25-30 Or 15-20
	FLAX	above ground portion or leaves	above ground portion at seedling stage OR youngest mature leaves prior to heading	50-60

	HAY, FORAGE OR PASTURE GRASSES	leaf blades	four uppermost blades at seedling stage OR mature leaves prior to heading	50-60
	PEANUTS	leaf	fully developed leaves from top of plant before or at bloom stage	45-50
	SOYBEANS	all above ground OR leaf	all above ground portion at seedling stage OR first fully developed leaves from top of plant prior to or during initial flowering	20-30
	SUGAR BEETS	leaf	fully mature leaves midway between the younger center leaves and the oldest whorl on the outside, midseason	30-35
	SUNFLOWERS	leaf	mature leaves from top of plant prior to heading	25-30
	TOBACCO	leaf	top fully developed leaf before bloom	8-12



SELECTED VEGETABLE CROPS

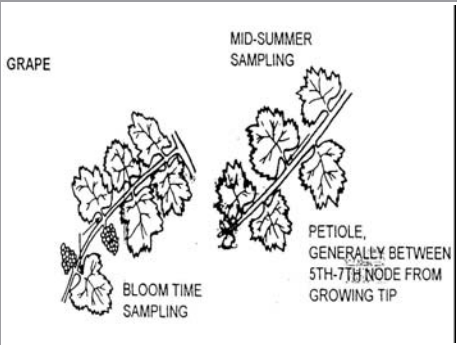
	CROP	PLANT PARTS	LOCATION/SAMPLING TIME	NUMBER OF PLANTS
	ASPARAGUS	top 12" of fern	in September or when growth is rapid	
	BEANS	leaf blade	first fully expanded matured leaf blade, when plants in 5-30% bloom	25-30
	BROCCOLI	leaf and midrib	first fully expanded leaf before buttoning	
	CABBAGE	leaf	wrapper leaf at heading	10-20

	CARROT/RADDISH	leaf and petiole	first fully expanded matured leaf midway between younger new growth and outer old growth at midgrowth or when root begins to enlarge	25-35
	CAULIFLOWER	leaf	first fully expanded matured leaf at buttoning	10-20
	CELERY	leaf and petiole	first fully expanded leaf at midgrowth stage or when plants 10-15" tall	20-30
	CUCUMBER, MELONS, SQUAH, PEPPERS	leaf blades	first fully expanded leaf at early bloom	20-30
	LETTUCE	leaf	wrapper leaf at heading	30-50
	ONIONS	leaf	leaves midway from old and new leaves at bulbing	25-35
	PEAS	leaf blade	first fully expanded matured leaf blade taken at 3rd node from top of plant, when plant is 5-30% bloom	30-50
	POTATO	leaf and petiole	first fully expanded matured leaf located at 3-5 leaves from growing point at early bloom or early tuber set	20-30
	SPINACH	leaf	first fully expanded matured leaf at midgrowth stage	20-30
	SWEET POTATO	leaf	first fully expanded matured leaf at start of vine running	20-35
	SWEET CORN	leaf	first developed leaf below whorl at tasseling time	20-25
	TOMATO (field)	leaf	third or fourth leaf from growing point, before or during early bloom stage	20-25
	TOMATO (greenhouse)	leaf	young plants: leaves from 2nd and 3rd cluster old plants: leaves from 4th to 6th clusters. before or during fruit set	20-25
ORNAMENTALS AND FLOWERS				
	CROP	PLANT PART	LOCATION/SAMPLING TIME	NUMBER OF PLANTS

	CARNATIONS	leaf	4th or 5th leaf pair from base of the plant in unpinched plants or 5th and 6th leaf pair from top of primary latents	20-30
	CHRYSANTHEMUMS	leaf	top leaves on flowering stem, before or during early flowering	20-30
	ORNAMENTAL TREES AND SHRUBS	leaf	fully mature leaves from current year's growth	30-75
	POINSETTIAS	leaf	most recently mature fully expanded leaf, before or during early flowering	15-20
	ROSES	leaf	upper leaves on the flowering stem during flowering	25-30
	TURF	leaf blades	leaf blades during growing season: avoid soil contamination	2 cups of material

FRUIT AND NUT TREES

	CROP	PLANT PARTS	LOCATION/SAMPLING TIME	NUMBER OF PLANTS
	APRICOT	matured leaves including petioles	First fully expanded leaves on non-fruiting spurs, or first fully expanded matured leaves near base of current year's growth DO NOT sample both ways but choose one method depending on the age and condition of trees From June to July 15	75-100
	APPLE, CHERRY	matured leaves including petioles	Same as for apricot except sample from June 15 to July 15	75-100
	PEACH, NECTARINE	matured leaves including petioles	first fully expanded matured leaves near base of current year's growth from June 15 to July 30	75-100
	WALNUT	matured leaves including petioles	terminal leaflet from a terminal leaf from July 15 to August 15	30-40

	<p>GRAPE</p>	<p>petioles only</p> <p>for later sampling, sample petioles from the most recently matured leaf</p>	<p>petioles from matured leaves adjacent to fruit clusters at bloom time or after full bloom in midsummer, samplings may be used when potassium level is low at first sampling for confirmation of deficiency symptoms</p>	<p>75-100</p>
<p>STRAWBERRY</p>		<p>leaf</p>	<p>youngest fully expanded mature leaves, midseason</p>	<p>50-70</p>

Tissue Ranges

Crop	Range	N	S	P	K	Mg	Ca	Na	B	Zn	Mn	Fe	Cu	Al	Mo	
Field Crops		Percent (%)							Parts per Million (ppm)							
Alfalfa/Clover	from	3.00	0.25	0.25	2.5	0.30	1.0	0.01	25	25	30	50	8	40	1.00	
	to	4.50	0.35	0.45	3.80	0.80	2.50	0.04	80	70	100	250	20	300	2.50	
Canola	from	2.70	0.49	0.34	2.58	0.40	1.19	0.10	15	25	60	100	4	90		
	to	3.20	0.55	0.40	3.20	0.50	1.40	0.30	20	45	110	200	12	150		
Corn	from	2.50	0.14	0.15	1.20	0.10	0.30	0.01	2	14	15	50	2	20		
(at tasseling)	to	3.50	0.50	0.40	3.00	0.50	0.70	0.03	20	50	100	250	20	300		
Grasses	from	2.00	0.20	0.30	2.00	0.20	0.40	0.02	10	25	30	50	5	25		
(forage)	to	3.00	0.50	0.60	4.00	0.40	0.80	0.15	20	60	200	300	20	250		
Small Grains	from	2.00	0.20	0.10	1.00	0.15	0.25	0.01	3	10	15	35	3	20		
	to	3.50	0.30	0.50	3.00	0.40	0.45	0.03	20	50	60	120	15	300		
Soybeans	from	4.00	0.25	0.15	1.20	0.10	0.50	0.01	20	12	14	50	4	50	0.50	
	to	5.50	0.60	0.50	3.00	0.60	2.00	0.03	60	50	100	150	20	200		
Sugar beets	from	3.00	0.30	0.30	3.50	0.50	0.60	0.01	30	30	40	80	10	50		
	to	4.50	0.90	0.70	6.00	1.20	1.30	0.05	60	60	100	200	20	200		
Sunflowers	from	3.40	0.25	0.26	2.50	0.37	1.10	0.01	25	20	50	60	6	50		
	to	4.00	0.35	0.35	3.20	0.90	1.50	0.02	40	35	100	200	10	100		
Tobacco	from	3.00	0.25	0.25	2.50	0.40	2.20	0.01	20	30	50	100	9	20		
	to	5.00	0.80	0.60	5.00	0.80	4.00	0.10	40	50	200	250	30	200		
Wheat	from	4.00	0.20	0.24	2.00	0.20	0.28	0.01	6	22	32	36	6	20		
(high yield)	to	5.00	0.30	0.36	3.00	0.30	0.42	0.03	10	34	48	54	10	300		

Crop	Range	N	S	P	K	Mg	Ca	Na	B	Zn	Mn	Fe	Cu	Al	Mo
Vegetable		Percent (%)							Parts per Million (ppm)						
Asparagus	from	2.40	0.25	0.30	1.50	0.15	0.40	0.01	25	20	10	50	10	20	
	to	3.80	0.50	0.75	2.40	0.50	1.00	0.10	75	60	180	300	50	200	
Beans	from	4.00	0.25	0.15	1.20	0.10	1.00	0.01	10	14	14	50	4	20	
	to	6.00	0.70	0.70	4.00	1.00	3.00	0.05	70	60	100	200	30	250	
Brussel Sprouts	from	2.50	0.20	0.25	2.50	0.25	3.00	0.01	70	40	200	125	10	20	
	to	5.00	0.50	0.50	3.50	0.40	5.00	0.10	100	80	500	200	25	150	
Celery	from	3.00	0.60	0.40	4.00	0.30	1.50	0.01	25	30	50	60	8	20	
	to	4.80	1.20	0.80	6.00	0.50	4.00	0.25	50	80	150	200	20	300	
Cucumbers	from	3.50	0.30	0.30	2.50	0.60	1.25	0.01	25	30	50	50	10	20	
	to	5.00	1.00	0.70	6.00	1.50	5.00	0.20	80	70	200	200	25	200	
Head Crops	from	2.50	0.30	0.40	3.50	0.30	1.50	0.01	25	25	50	50	5	20	
	to	4.50	1.50	1.00	5.00	0.50	2.50	0.10	50	45	100	200	10	200	
Leaf Crops	from	3.50	0.30	0.40	3.50	0.30	1.25	0.01	25	30	25	60	6	50	
	to	6.00	0.75	1.00	8.00	1.00	2.50	0.20	50	50	40	200	20	150	
Melons	from	2.00	0.30	0.20	2.50	0.50	2.00	0.01	25	20	50	60	5	20	
	to	6.00	1.00	0.80	5.00	1.00	3.50	0.20	75	80	100	120	20	150	
Peas	from	4.50	0.20	0.30	1.80	0.35	1.10	0.01	15	40	40	50	10	10	
	to	6.00	0.60	0.60	2.50	0.80	1.80	0.20	45	80	70	150	30	80	
Peppers	from	3.00	0.30	0.40	4.00	0.40	0.75	0.01	30	30	60	100	15	50	
	to	6.00	0.60	0.80	6.50	1.00	2.50	0.50	75	60	200	250	50	200	
Potatoes	from	4.00	0.25	0.30	3.50	0.50	0.70	0.01	25	30	60	100	10	50	
	to	6.00	0.50	0.70	6.50	1.10	2.00	0.15	60	70	200	200	25	250	
Root Crops	from	3.50	0.30	0.25	3.00	0.25	1.50	0.01	20	25	50	75	5	20	
	to	6.00	0.75	0.80	7.00	1.00	4.00	0.20	80	60	200	250	20	300	
Tomatoes	from	3.00	0.50	0.30	2.50	0.50	2.00	0.01	40	35	100	100	8	20	
	to	6.00	0.90	0.80	5.00	1.00	6.00	0.10	60	50	200	200	20	200	
Crop	Range	N	S	P	K	Mg	Ca	Na	B	Zn	Mn	Fe	Cu	Al	Mo