

Understanding a Plant Tissue Report

Tissue testing can be a valuable tool for evaluating current nutrient levels in crops. Plants need certain nutrients in large amounts (macronutrients) and other nutrients in smaller amounts (micronutrients or trace elements). By combining tissue test results with a soil test taken at the same time, you will have valuable information to apply toward effective crop nutrient management.

Tissue test results show the nutrient concentration in plant tissue at the time of sampling. It's important to sample plants at the right growth stage and to collect the right plant part. Refer to technical bulletins, [Plant Tissue Sampling Guide](#), which describes tissue sampling techniques for field crops, or the [Specialty Crop Tissue Sampling Guide](#) for other crops, for help determining when to sample each crop and how much tissue is needed.

Tissue testing provides crop-specific sufficiency ranges of nutrients for good plant growth. Values above the range likely won't increase crop growth and could even be toxic to the crop. But if tests show results that are below the range it can help you identify when a nutrient deficiency is occurring that isn't yet visible in the plant. Often, by the time symptoms of nutrient deficiency become visible, the quality and yield of the crop might already have been affected.

Parts of the Lab Report

The tissue test lab report is divided into three main sections, as shown on the sample Tissue Analysis Report. These are

- information about the client and the sample
- analytical results of the plant tissue test
- interpretation of the results

Client and Sample Information

Submitted By – Includes customer name and address provided to the lab. The first time you submit samples to AgSource you will be assigned an account number like BN00997. This account number remains the same and should be used when submitting samples in the future.

Submitted For – This is the name of the farm or the grower provided on the plant tissue submittal form.

Date Received/Date Reported – These are the dates AgSource processed and reported the sample.

Sample ID – This is the identification of the sample you provided on the submittal form.

Plant Part – This identifies the plant tissue that was submitted and is used to identify the correct growth stage for the interpretive ranges.

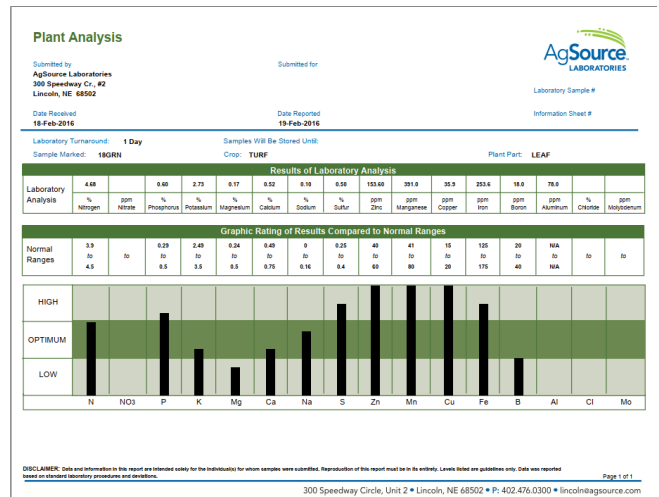
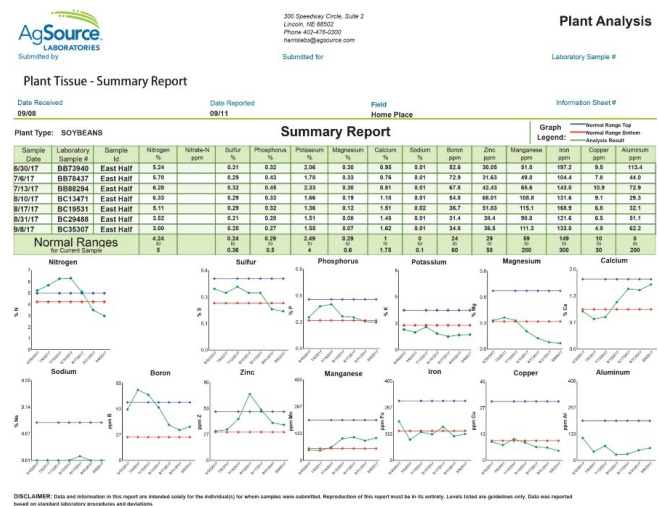
Crop – This identifies the type of crop that was submitted.

Stage – Reports the crop growth stage of the tissue that was provided on submittal form. (Used in corn, soybeans, wheat)

Lab Sample No. and Information Sheet No. – These are assigned by AgSource to an individual sample for tracking and recording in the laboratory.

Results of Laboratory Analysis

In the middle section of the report the results for each nutrient are presented above a display of the normal ranges expected for that sample. These ranges are derived from published data for the crop, plant part and growth stage of the sample, as indicated on the submission form.



Graphic Rating of Results Compared to Normal Ranges

On the lower section of the report is a graphical display of the individual elements with lines indicating the Low, Optimum and High sufficiency ranges for each element. In the Summary Report the elemental displays represent the trends of the nutrient content over the time period that the samples were collected.

Tissue Test Results

AgSource tissue analysis provides a complete overview of the nutritional status of the plant macronutrients: N, P, and K; secondary nutrients: Ca, Mg, S and Na; and micronutrients: Zn, Mn, Cu, Fe, and B; as well as Al. The role and deficiency symptoms of each nutrient will be described in more detail below, along with potential concerns about any toxicity effects. There are also known relationships among nutrients that should be considered when reviewing analysis results. The following table shows some common interactions.

Table 1. The Relationship Between Excess Nutrients and Induced Deficiencies

Visible Deficiency	Possible Causative Excess Nutrient
Potassium	Nitrogen, calcium, magnesium, sodium
Magnesium	Potassium and/or calcium
Nitrogen	Chlorine
Sulfur	Chlorine
Calcium	Magnesium, potassium
Boron	Calcium
Iron	Phosphorus, manganese, molybdenum, nickel, nitrogen, zinc, bicarbonate
Manganese	Phosphorus, iron
Copper	Phosphorus, molybdenum
Zinc	Phosphorus

N – Nitrogen (%)

Test results show the percentage of nitrogen in the tissue sample. Nitrogen is the first of three macronutrients, which are required in large amounts.

Nitrogen facts

- Nitrogen is critical for seed-forming processes, seedling strength and plant growth
- The amount of N is a moving target with many environmental factors affecting uptake and concentration in the plant
- It has a major effect on crop yield and quality

N deficiency symptoms

- Light green-yellow leaves (showing up first in old and then young leaves)
- Short stems
- Plant weakness and poor growth

P – Phosphorus (%)

Test results show the percentage of phosphorus in the tissue sample. Phosphorus is the second of the three macronutrients, which are required in large amounts.

Phosphorus facts

- Phosphorus is important for seed germination and root development. Fields with low phosphorus soil test levels may not have well-developed root systems leading to plant stress during droughts
- Important for vegetable, fruit, and grain maturity and quality
- It improves nitrogen absorption
- It takes 12-18 lbs of P_2O_5 to increase soil test phosphorus by 1 ppm

P deficiency symptoms

- Dark green leaves
- Red and/or purple coloring of older leaves
- Stunted growth
- Reduction in flower and seed production
- Delayed maturity

K – Potassium (%)

Test results show the percentage of potassium in the plant tissue sample. Potassium is the third of the three macronutrients, which are required in large amounts.

Potassium facts

- Potassium is important for growth, movement of water through the plant, over-wintering ability, disease resistance and it affects the taste and color of fruit and vegetables
- It is important for legumes because on soils with low potassium the bacteria can't fix as much nitrogen for the plant
- It takes 5-7 lbs K_2O to increase soil test potassium by 1 ppm
- Levels of soil K can decrease much more quickly than levels of P because crop removal of K is higher

K deficiency symptoms

- Shows symptoms on older leaves
- Yellowing around the leaf margin
- Dead tissue forms between veins and at the leaf tip
- Increased disease problems

Ca – Calcium (%)

Test results show the percentage of calcium in the plant tissue sample. Calcium is a secondary nutrient and is taken up by the crop in amounts similar to phosphorus.

Calcium facts

- Calcium is important for cell wall formation and improves root and fruit crop quality
- Calcium is important for cell wall formation and improved quality of root and fruit crops
- It improves plant absorption of other nutrients

Ca deficiency symptoms

- Symptoms show on young leaves
- Deformed or dying terminal buds
- Bitter pit, hollow heart and blossom end rot
- Associated with acidic soil

Mg – Magnesium (%)

Test results show the percentage of magnesium in the plant tissue sample. Magnesium is a secondary nutrient.

Magnesium facts

- Magnesium is important for plant photosynthesis and enzyme activity
- It helps legume nodules fix nitrogen
- It helps move phosphorus within the plant
- It helps prevent livestock disorders such as grass tetany and milk fever in cattle

Mg deficiency symptoms

- Symptoms show on older leaves
- Cupped leaf tips and margins
- Yellowing and dying leaves turning red
- Stunted growth

S – Sulfur (%)

Test results show the percentage of sulfur in the tissue sample. Sulfur is a secondary nutrient along with Ca and Mg.

Sulfur facts

- Sulfur is important in protein and chlorophyll formation
- Sensitive crops include alfalfa, clover, wheat and oats

S deficiency symptoms

- Symptoms show on young leaves
- Pale green to yellowing of whole plant
- Shows up first on soils with low pH and poor aeration

Na – Sodium (ppm)

Test results show the amount of sodium in the plant tissue sample. Sodium is a secondary nutrient. Sodium isn't an important plant nutrient, but it's still used by plants in small amounts.

Zn – Zinc (ppm)

Test results show the amount of zinc in the plant tissue sample. Zinc is a micronutrient, used in very small amounts.

Zinc facts

- Zinc is important for root development and
- It affects the rate of maturation of both seed and stalks
- Crops that respond highly to zinc are corn, beans, onions, and spinach

Zn deficiency symptoms

- Symptoms show in the younger tissue with thick leaves and shortened stems or stalks
- Yellow streaks on either side of the mid-rib or leaves can appear bleached
- Dead spots appear on older leaves
- It can be tied up and unavailable to the crop when soil levels of phosphorus are high.

TIP: Remember to fill out [sample submission forms completely.](#)

Mn – Manganese (ppm)

Test results show the amount of manganese in the plant tissue sample. Manganese is a micronutrient.

Manganese facts

- Manganese increases seed germination rates
- It reduces time to harvest because it increases P and Ca availability
- Crops that respond highly to Mn are beans, cereals, soybeans, and vegetables

Mn deficiency symptoms

- Young leaves may turn yellow, red or purple
- Veins in leaves appear small and green
- Dead spots increase, covering the leaf
- Manganese available to plants can be reduced by high soil organic matter and high pH
- Deficiency in soybeans may occur if the field has high pH, heavy clays and low Mn soil test levels

Cu – Copper (ppm)

Test results show the amount of copper in the plant tissue sample. Copper is a micronutrient. Copper is an important nutrient for all animals too, except sheep, where it is toxic even at low levels.

Copper facts

- Copper is important for energy transfer and enzyme activity in plants
- It is also important in pollen and fruit formation
- Crops that respond highly to Cu are alfalfa, grain, lettuce, onions, beets, spinach, blueberries and tomatoes
- Some animal manures have high levels of Cu from copper foot baths
- Toxic effects from too much Cu can last for years

Cu deficiency symptoms

- Young leaves may show signs of wilting
- Spotty white areas appear on the leaves
- Leaves may spiral and bend over at right angles
- Copper levels are usually lower in soils that are sandy or have low organic matter
- High soil pH levels and high levels of P, Zn, and Fe will decrease Cu uptake in plants

TIP: Remember the analysis is only as good as the sample!
See [Plant Tissue Sampling Guide](#) for instructions.

Fe – Iron (ppm)

Test results show the amount of iron in the plant tissue sample. Iron is a micronutrient.

Iron facts

- Iron is an important part of the chloroplasts in all plants
- It is also important for nitrogen-fixation in legume crops
- Crops that prefer acid soils such as blueberries, as well as strawberries, grain, soybeans, and cole crops respond to Fe

Fe deficiency symptoms

- Young leaves appear yellow with green veins
- Plants are slow to develop and have shortened and weak stems
- Iron levels are usually adequate in the soil even though it has low crop availability

B – Boron (ppm)

Test results show the amount of boron in the plant tissue sample. Boron is a micronutrient. Boron moves easily in the soil (leaches) so fields with low boron levels should receive annual applications when growing sensitive crops.

Boron facts

- Boron is important in cell formation and elongation of growing plant tissue
- It is important in reducing nutritional disorders that affect crop marketability
- It is also important in pollen tube growth and seed formation
- Crops that are sensitive to B include the root vegetables and coles
- Boron can be toxic to peas, beans and cucumbers
- Boron is most available to crops at a pH of 5 to 7
- Plant tissue tests can indicate B availability better than soil tests

B deficiency symptoms

- Plants exhibit stunting with shortened stalks and inter-nodes
- There is also a decrease in the number of flowers
- Other symptoms include cracked fruit, hollow heart, bitter pit and spotted fruit

Al – Aluminum (ppm)

Test results show the amount of aluminum in the plant tissue sample. Aluminum is not a plant nutrient, but it is included in the plant tissue analysis as an indicator of soil contamination during sampling and analysis. High aluminum from adhered soil can indicate if other elements such as iron or calcium might be elevated because of soil contamination as well. If needed, a quick rinse of the plant part with distilled water can be used to remove contaminating soil from plant tissue surfaces. Be sure to remove all excess water before shipping the sample to the laboratory.