CROP SERVICES NEWSLETTER

SGS AGRICULTURAL SERVICES

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PLANT TISSUE TESTING

HOW TO EFFECTIVELY TAKE A SAMPLE

Plant tissue analysis is an excellent diagnostic tool used to verify nutrient deficiencies and excesses in plants and crops. A plant test can determine if the soil fertility level is sufficient to meet the crop's requirements for growth and production. If the fertility level falls short, additional fertilizer can be applied to ensure better yield. Plant tissue analysis can be used to spot check a field when soil sampling is not an option or in conjunction with the soil test that determined the applied fertilizer.

The first step (and arguably the most important) is tissue sampling. The analysis is only as good as the sample tested. The rule of thumb is to select upper mature leaves of several plants that are showing the same symptoms. A composite of several plants will give results that are a good reflection of the problem in the crop. One plant only gives an indication of the problem in that specific plant and not in the entire field.

If the entire field is showing the same symptoms, sample plants from different areas of the field and composite. If only a portion of the field is deficient, take samples from this bad area (label the sample "bad") and then take a separate sample from the good portion of the field (label this sample "good"). By taking two samples from the same field, one bad and one good, a comparison can be made between the two samples that will help to determine the nutrient deficiencies in that field for that crop. The good sample provides a "yard stick" for comparison. Please be sure to label your samples.

The number one problem we see at the lab is that the sampler did not take enough of a sample. Please remember to take leaves from several (10-12) plants. The smaller the plant, the smaller the leaves, and the more plants you must sample in order to get an adequate amount for testing. Study after study shows that a composite sample is a more accurate indicator of the population (field or crop) being evaluated.

When sampling plant tissue, contamination of the plant sample should be avoided. The most common contamination is soil. Please keep the sampled tissue free of soil and other foreign substances. Avoid sampling plants that are infested with disease or insects, or that are physically damaged (broken).

Do not sample plants that have been under prolonged stress. If you have applied a foliar material, please indicate this on the paperwork. Anything that will affect the analysis should be indicated on the paperwork that accompanies the tissue sample.

Once the leaves are taken from several plants, place them in a paper bag (do not use plastic). A paper bag allows the leaves to dry and therefore discourages any molds or fungus growing on the leaves in transport.

If delivery to the lab exceeds 12 hours, place the tissue in a cool dry place (refrigerator is adequate, however DO NOT freeze the plant samples). The sooner you get the sample to the lab, the faster we can get the results back to you, and the sooner you can apply necessary supplemental fertilizer. Label your samples with the sample ID (i.e. Field X, good Field X. bad) and plant stage.

Plant tissue analysis is a great tool that you can use to manage your fields and increase your production.

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IDENTIFY NUTRIENT DEFICIENCY SYMPTOMS

Plant tissue analysis determines the essential elements necessary for plant growth. The essential elements are divided into two categories: major elements (Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium and Sulfur) and micronutrients (Boron, Chlorine, Copper, Iron, Manganese, Molybdenum and Zinc). The difference between major elements and micronutrients lies in the concentrations of these elements needed for healthy plant growth. The concentrations of major elements required are several times that of the micronutrients.

Identifying nutrient deficiencies and rectifying the problem is key to profitable crop production. Plant tissue analysis is just one more tool that a grower can use to maintain the fertility of the crop.

There are several charts and books that illustrate the various symptoms of essential elemental deficiencies. These are an excellent start to identifying the problem. However, visual observation alone can be confusing since many of the nutrient deficiencies can exhibit similar characteristics. Plant tissue analysis can be useful in confirming the initial visual examination and determining proper steps to take.

Symptoms of deficiencies in major elements:

Nitrogen: Nitrogen deficiency results in slow-growing, weak and stunted plants. Older leaves are chlorotic (light green to yellow in color); younger leaves are light green.
Phosphorus: Lack of phosphorus results in slow-growing, weak and stunted plants. The older leaves are often dark green with a purplish tint.
Potassium: Yellowing and scorching along the outer edge of older leaves is an indication of potassium deficiency. Plants easily lodge and are susceptible to disease. Ammonium toxicity can also result.
Calcium: Growing tips (terminal buds and root tips) of plants deteriorate and die. Curling of leaves and browning of the leaf margins occurs when there is a calcium deficiency.
Magnesium: Plants deficient in Magnesium exhibit chlorosis (light green to yellow coloring) between the veins in the older leaves. When severe, younger leaves also show this interveinal chlorosis.
Sulfur: Sulfur deficiency causes young leaves to turn light green to yellow (chlorosis). Lack of Sulfur may be confused with lack of Nitrogen since the symptoms are very similar.

Symptoms of deficiencies in micronutrients:

Boron: Plants are often stunted and growing tips are dead.
Chlorine: Younger leaves are chlorotic and wilt.
Copper: Young leaves are chlorotic and are prone to wilting.
Iron: Interveinal chlorosis of young leaves which spreads to older leaves with severity.
Manganese: Stunted growth with leaves turning a yellowish gray or reddish gray with green veins. Cereals exhibit gray spots, and legumes exhibit dead areas on the cotyledons.
Molybdenum: Young leaves wilt. Chlorosis occurs in the older leaves resembling Nitrogen deficiency. Necrosis (plant tissue death) occurs along the leaf margin.
Zinc: Interveinal chlorosis of young leaves with pronounced banding.

As you can see, many of the deficiencies have similar symptoms. Plant analysis verifies which element is critical.

IDENTIFYING NUTRIENT EXCESS SYMPTOMS

Most plant testing focuses on elemental deficiencies. However, excessive essential elements can also be a determent to overall plant health. Large amounts of nutrients can cause toxicities and even lead to other elemental deficiencies. Nutrients need to be in a balance in order for the plant to fully benefit from the applied fertilizer. Too much of one can cause an adverse effect in the uptake and benefits of another.

A visual inspection of the plant will give the grower a stepping-off platform, however actual tissue testing is necessary to confirm the problem. Too often, symptoms are duplicated or masked by deficiencies or excesses of nutrients.

The essential elements are divided into two groups: major nutrients and micronutrients:

Symptoms of major nutrients in excess:

Nitrogen: Too much Nitrogen causes the plant to turn dark green and tender. This tenderness makes the plant easily susceptible to insect infestation which leads to disease and drought stress. The vascular tissue (xylem) breaks down and can no longer transport water and nutrients efficiently. This causes lodging and magnifies the drought stress. Transport shuts down causing the nutrients to remain in the leaves and stem, thereby causing poor fruit and grain quality.
Phosphorus: An excess of Phosphorus will cause a decrease in either Iron or Zinc.
Potassium: Potassium excess will cause a decrease in Magnesium and most likely Calcium.
Calcium: An excess of Calcium will cause a deficiency in Magnesium or Potassium.
Magnesium: Magnesium excess does not cause toxicity per se. However, an imbalance occurring between Potassium, Calcium and Magnesium can be detrimental to the plant.
Sulfur: High levels of sulfur can cause the leaves to die prematurely.

Symptoms of micronutrients in excess:

Boron: Boron in excess causes the tips of the leaves to become chlorotic (light green to yellow) and eventually necrotic (dead) and fall off.
Chlorine: Chlorine contamination causes chlorosis in leaves. Other symptoms include burning of the tips and the margins.
Copper: Root growth is inhibited. Copper excess can also cause iron deficiency leading to chlorosis.
Iron: For a majority of plants, Iron does not become toxic until it reaches levels of several hundred parts per million. Leaf bronzing and tiny brown spots typically occur with Iron toxicity.
Manganese: High levels of Manganese cause the appearance of measle-like lesions on older leaves (brown spots with a yellowish ring around the perimeter.)
Molybdenum: High moly levels do not adversely affect most plants. However, animals that consume the plants will show signs of moly poisoning.
Zinc: Excessive Zinc levels will affect plants that are Iron-sensitive. The Iron sensitive plant will turn yellow in the presence of high Zinc.

Many manifestations of elemental excess can mimic those caused by deficiencies. In order to fully grasp the problem, plant tissue analysis is essential. ■

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