Plant Tissue Analysis

Nutrient elements required for plant growth are termed "essential." Healthy plants contain predictable concentrations of these elements. Major elements (N, P, and K) are required in larger amounts. Secondary elements (calcium, magnesium, and sulfur) are required in smaller amounts. Micronutrients (iron, manganese, zinc, copper, boron, molybdenum, and chlorine) are required in even smaller amounts. If these elements are present in inadequate levels, then the plant suffers from a nutrient deficiency. In some cases, if these nutrients are present in higher concentrations than required, the plant will suffer from a nutrient toxicity. In either case, the plant is not healthy and therefore is not removing nutrients from the soil at its fullest capabilities. Plant analysis can be used to distinguish between nutrient deficiency and toxicity as compared to sufficiency.

Applications

A plant analysis has three main applications:

(1) When visual symptoms are present, confirm a suspected nutrient deficiency or toxicity.
(2) Monitor plant nutrient status in an effort to achieve optimum yield and quality while protecting the environment.
(3) Serve as a basis, along with a soil test, for fine tuning fertilization programs.

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You should consider plant analysis if you see indications that your crops are not healthy. These indications include leaf yellowing or spotting, wilting (even with sufficient moisture), and reduced growth or plant death.

By using plant analysis, you can confirm a suspected deficiency before applying a corrective treatment. Numerous cases can be described where incorrect diagnosis of a crop problem led to crop failures, as well as to costly, ineffective corrective treatments.

The monitoring role of a plant analysis offers the opportunity to maintain high-quality production with maximum efficiency and a minimum of nutrient deficiency problems. To provide a means of noting changes in nutrient content, sample each year or on a regular basis and compare test results from one sample to the next. To identify a potential nutrient deficiency, excess, or imbalance, carefully study upward or downward trends along with previous manure or fertilizer inputs. Corrective treatments can be applied before significant losses in yield or quality occur.

Visual observations, knowledge of the site, a soil test, and the plant analysis results provide an effective means of evaluating the nutrient status of the soil-plant environment. However, a plant analysis result may not solve every problem or uncover all unseen nutrient deficiencies or toxicities. When a nutrient deficiency is confirmed by a plant analysis or an unseen deficiency is uncovered, a corrective treatment may not always be applicable to the sampled crop. Treatments may be specified for future growing seasons, or additional plant and soil samples may be needed to fully evaluate the suspected deficiency.

A plant analysis may indicate that a nutrient deficiency or toxicity does not exist. Therefore, a factor other than nutrition may be responsible for poor plant growth or visual symptoms. This information is invaluable in problem solving. To use the plant analysis technique effectively, take care when collecting, preparing, and sending plant tissue to the lab.

A recent soil test result can be helpful when interpreting a plant analysis. When visual symptoms of a suspected nutrient deficiency are present, take a soil sample at the same time from the root zones of the plants sampled. In this way, an evaluation of the soil in the affected area can be made along with the plant analysis result. Sampling healthy plants, unhealthy plants, and their respective soil is very effective in problem solving.

Information regarding sampling instructions, information sheets, and shipping envelopes can be obtained at county CES centers or from Certified Crop Advisors.

How can plant analysis be a predictive and diagnostic tool?

Additional nutrient applications may be needed based on nutrient deficiencies indicated in a plant analysis report. Repeated plant analyses, during the growth cycle of a plant or from one season to another, can show changes that occur with time as a result of applied fertilizer treatments. These analyses can provide a guide for corrective treatments. Supplemental treatments can be scheduled based on a series of analyses. Such analyses and the maintenance of leaf analysis result logs are invaluable. Base supplemental applications of N on a plant analysis, particularly when there is a suspected or anticipated N deficiency. If assistance is needed, contact a technical specialist or Certified Crop Advisor prior to making additional manure applications based on the results of a plant analysis.

Another tool that helps with plant nutrient monitoring is chlorophyll testing. Chlorophyll content and N content in the plant leaf are closely related, so monitoring chlorophyll levels can assess if N is sufficient or deficient. A hand-held chlorophyll meter is used to take plant leaf readings, and tables, charts, and experience are used to determine if supplemental N is required for optimum plant growth. Using this tool can help the manager maximize the efficiency of manure utilization.

Nitrate poisoning in animals is an increasing problem on livestock farms due to the high levels of N applied to forages, which can result in levels of nitrate above what is normally considered safe. Many factors affect pasture and forage quality, including type of species, stage of maturity, soil condition, climate, storage, and handling. Lab analysis is the best way to determine a forage's nutrient content and the potential for nitrate toxicity. Producers should periodically monitor the quality of their pastures to ensure that animal nutrient requirements are being met and fertilization practices are appropriate. Forage sampling differs from plant analysis used to determine nutrient status for crops. Forage sampling is a test to help determine if there are potential problems with using a crop for animal feed.

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How to sample pastures for feed testing

(1) Use a plastic freezer bag or one supplied by a lab to hold the collected tissue. Be sure no contaminants are on your hands or on the collected tissue.

(2) Walk the pasture much the same way you would for soil sampling or insect scouting. Take a sample of grazeable vegetation by plucking or grabbing a few leaves between the thumb and index and middle finger. Snap the leaves at the same height as the animals are grazing, especially if you want to know what is being consumed at the time.

(3) Follow the instructions in the kit for filling the bag, completing the form, and shipping the sample.