Understanding A Plant Tissue Analysis

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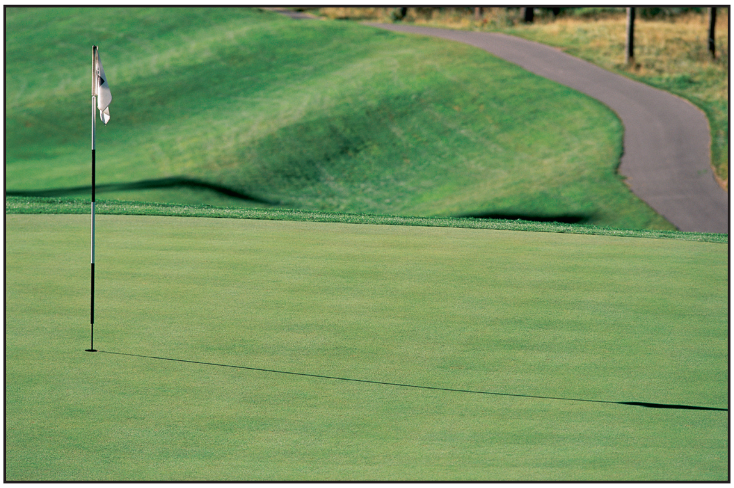
Plant tissue analysis offers a precise measurement of the nutritional status of a plant at the time the sample was collected; a snap shot in time. This information allows a manager to determine if a specific nutrient is lacking before a deficiency symptom becomes apparent. It also provides information on the relative health of the turf grass and interrelationships between all essential plant nutrients. When tissue testing is used in conjunction with a soil analysis, it can provide information of what nutrients are most critical and how best to correct them. One example of this is if pH is at a critical level, a foliar application of an iron compound might be preferable to a soil application.

Because a tissue analysis is not predictive it is suggested to collect multiple samples throughout the growing season. This will allow the charting of plant nutrients over the growing season, providing information for making seasonal fertilizer adjustments. It can help you determine: when a specific nutrient should be applied. At the very least it can be used to better prepare a fertilizer plan for the next growing season. In the case of manganese a soil analysis is a weak tool for evaluating actual needs. In this situation if a tissue sample was tracked over the growing season as low, then the chances of getting a positive response to manganese next year will be high.

Keep in mind that a plant analysis can be only as good as the sample that is collected. In most situations samples are taken from the clippings during regular mowing cycles. While this type of sampling will work it is important that samples be devoid of fertilizer, lime and sand contamination. It is suggested to wait a minimum of 2 weeks from an actual application before samples are collected. For more specific information and how to collect an appropriate sample please refer to our "Plant Sampling Guide" from our web site.



On each report a sufficiency level is printed for each essential nutrient. To interpret tissue reports, compare the result of a specific nutrient to that of the nutrient range. If the comparison is in the optimum or high range then the uptake for that specific nutrient is in adequate supply (at that point in time). An illustration of this is in; potassium levels for Bentgrass greens. The optimum level for potassium is 2.2 to 3.5 %. If the value printed on your report is 3.7%, you would interpret potassium as adequate. For your convenience Harris Laboratories provides a graphic display of how data compares to the optimum range.

Optiumum nutrient ranges for various turf grasses:					
	Bent Grass	Bermuda Grass	Blue Grass	Fescue Grass	Bahia Grass
Nitrogen %	4.0 – 5.0	2.5 – 3.5	4.0 – 4.5	3.4 – 4.5	1.5 – 2.5
Phosphorus %	0.3 – 0.6	0.2 – 0.5	0.3 – 0.5	0.3 – 0.5	0.2 – 0.5
Potassium %	2.2 – 3.5	1.0 - 3.0	2.5 – 3.5	2.5 – 3.5	1.0 – 3.0
Magnesium %	0.2 – 0.4	0.2 – 0.5	0.2 – 0.5	0.2 – 0.5	0.2 – 0.5
Calcium %	0.2 – 0.8	0.5 - 1.0	0.4 – 0.8	0.4 – 0.8	0.5 – 1.0
Sulfur %	0.2 – 1.0	0.2 – 0.5	0.2 – 0.4	0.2 – 0.4	0.2 – 0.5
Zinc ppm	20 – 70	20 – 125	40 – 60	40 – 60	20 - 125
Manganese ppm	25 – 100	25 – 100	30 – 200	30 – 200	25 - 100
Copper ppm	5 – 15	5 – 30	14 – 30	5 – 20	5 – 30
Iron ppm	30 – 300	20 – 250	50 – 300	50 – 300	20 - 250
Boron ppm	3 – 20	5 – 20	30 – 80	30 – 80	5 – 20

Mineral nutrients are classified as major, secondary and minor elements. This classification describes the relative amounts of each element present in plants. It is not intended to reflect its importance. No one essential nutrient is more or less important than any other. All essential elements are necessary for proper turf grass growth; major and secondary elements are just needed in greater quantities than minor elements.

Following is a list of essential elements with their special role they play in plant nutrition.

Nitrogen: An essential part of all living matter is Nitrogen. Nitrogen containing compounds make up about half of the living and reproductive substances of plant cells. It is the basis for amino acids that combine to form proteins. Nitrogen is associated with vegetative growth and density of turf, as well as its deep green color. Nitrogen deficiency is noticed in turf that has turned a light green or yellow. When deficiency occurs, it is first noticed on the older blades since nitrogen is easily moved from the older to the newer growth. The blades start dying at the tip until the entire leaf is necrotic.

Phosphorus: This is the key nutrient in seedling development since it contributes so much to initial root and seed formation. It provides the plant with a mechanism for using and transforming energy. Phosphorus is used to manufacture in the breakdown of sugars and proteins. Deficiency symptoms appear as dull green with a purple shade; leaf blades are narrower and have a tendency to roll. The reddish tinge or purple color is an indication that the plant has ample food supplies (sugars) but not enough energy to convert it into proteins. Phosphorus is mobile in tissue, so older blades are the first to be affected.

Potassium: Potassium is required by the plant in relatively large quantities, plant tissue may contain up to 4 to 5%. Its role is that of a regulator of plant processes because 46 enzymes require potassium to function properly. Contrary to some statements it is not directly used in cell wall or plant strength development. A likely function is that it affects the shape of enzyme proteins which has a direct affects on the enzyme functionality. Some of the 46 enzymes are ones that affect carbohydrate form and storage and those that regulate the use of nitrogen in its role of reforming proteins. Potassium is a mobile nutrient; as a result deficiency symptoms will appear first on older tissue; resulting in leaf tip burn and a gradual thinning of the turf stand. A light chlorosis (yellow color) may also be apparent.

Calcium: Calcium is an important constituent of plant cell walls. It is the cement that binds the adjacent cells together giving rigidity to total plant. It is also essential for root development and may serve to neutralize some toxic compounds present in the plant. Calcium is immobile in the plant meaning that it is not transported from one plant part to another. As a result, deficiency symptoms will be detected in the newer leaf blades; deformed leaves, chlorotic and eventually becoming necrotic. In addition, root growth and development are also affected. The end result, slow growth and patchy dead spots of turf.

Magnesium: Magnesium is an integral part of the chlorophyll molecule, which means it is essential for the process of photosynthesis. It also serves as a catalyst for several enzyme reactions essential for the phosphorus energy transfer and the process of photosynthesis. Magnesium is mobile in plant tissue deficiencies will develop in the older tissue and move to the young immature leaves. Since chlorophyll is affected, symptoms will include pale green and advance to interveinal chlorosis from the edge to center of the leaf.

Sulfur: It is an integral part of certain amino acids, proteins and chlorophyll. As both nitrogen and sulfur are associated with chlorophyll development deficiency symptoms resemble each other. The difference is that sulfur will not produce the firing of the leaf tip back to the leaf color. Sulfur is not mobile in plant tissue so younger leaves exhibit a light-green color. Eventually, the leaf tips turn brown and curl. Deficiencies are almost always associated with soils low in organic matter.

Zinc: Zinc is used primarily as a catalyst for oxidation processes in cells and utilization of carbohydrates. These processes regulate energy production of chlorophyll, formation of axons (growth hormones) and promote the absorption of water. Zinc is a non-mobile compound so deficiency symptoms will be most apparent on new plant tissue. Leaf blades will appear chlorotic and eventually leading to necrosis. With it involved in growth hormones, plants may exhibit a rosetting affect on new tissue.

Manganese: As with most of the micro-nutrients, manganese is mainly used as a catalyst (it is needed to activate a chemical process). Its use is in the oxidation of carbohydrate into carbon dioxide and water (plant respiration). Other enzymatic processes affected include metabolism of nitrogen, synthesis of chlorophyll. Manganese is immobile; deficiency will first appear in the youngest leaves. Deficiency symptoms appear as graying blotches near the base of the leaf blade, progressing to a yellow to a bright yellow-orange color.

Copper: It is used to increase oxidase activity to influence metabolic reactions; formation of iron porphyrin, needed for chlorophyll. Essentially it is needed for the formation of chlorophyll but is not part of the chlorophyll molecule. Severe deficiencies for copper is extremely remote, but will appear as yellowing of the youngest leaf blades.

Iron: Iron also acts as a catalyst which is essential for the formation of the chlorophyll molecule. In addition it is an activating element in enzymes known as a coenzyme. This elemental coenzyme is used as an oxygen carrier for plant respiration. Iron is mainly immobile where chlorotic mottling will appear on the youngest leaf tissue.

Boron: Boron functions in plant development is not fully understood but is recognized to be involved with; the metabolism of protein, regulate water, and energy producing mechanism (ATP). In addition it is essential for proper development of apical growing points (active cell division). Deficiency symptoms are varied but are usually described as stunted and misshaped/distorted plants. Symptoms also include leaf tip dieback and necrosis of the entire leaf.

For more information about plant tissue analysis contact Harris Laboratories.

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