

# Putting Tissue Tests to Work

by Dr. Henry Indyk

**A**thletic field turf is composed of a mass of complex organisms striving collectively and individually to grow and thrive in what all too often becomes a hostile environment. The job of the sports turf manager is to create and maintain conditions which support the positive elements of that environment, and to reduce or eliminate the negative elements. Tissue testing is a diagnostic tool which provides important data on the nutritional status of the turfgrass plant in its struggle for growth, health, vigor, persistence and survival. On the other hand, soil testing identifies key elements in grass plants' growing media by quantifying soil acidity, nutritional levels and the salt index.

Tissue testing quantifies the levels

of major and minor nutrients in the plant. Tissue testing doesn't replace soil testing, but works in conjunction with it. Tissue test results compared to soil test results reveal what is happening between the soil and the plant. When discrepancies occur between the results of the two tests, the sports turf manager must investigate the cause of those discrepancies.

It's important to know what is in the soil before an attempt is made to grow grass plants. Soil testing at this initial stage gives the sports turf manager data to work with in adjusting the levels of acidity, salts and nutrients to create conditions which match plant needs as closely as possible. Without this initial step, grass plants might not survive long enough to produce sufficient tissue for testing.

On established fields, annual soil testing done late in the growing season is generally sufficient to provide the necessary data. However, when difficulties arise in turfgrass growth, more frequent testing may be necessary.

Once the grass plants are growing, tissue testing is a good way to monitor what the plant is actually getting from the soil. Tissue testing is needed more frequently than soil testing, and should be done monthly throughout the turf's active growth period when turf is performing well. When poor turf performance occurs, despite adequate maintenance procedures, "normal" field use and "normal" weather conditions, additional tissue testing is beneficial.

For accurate test results, the procedures for taking samples and preparing them for delivery to the testing facility must be followed properly. Tissue testing should not be taken right after fertilization. For general tissue testing, random samples from the entire field are used. When problems occur in isolated spots, samples from the problem areas and controls from areas performing adequately should be taken separately and submitted for testing. Samples for tissue testing should be as fresh as possible when delivered to the testing facility.

Soil test results produce quantitative figures that can be compared to acceptable standards set for the particular kind of soil being tested. Tissue test results also produce quantitative figures, and they can be compared to the adequate range for each component of the testing. Each test has its own strengths and weaknesses. For example, tissue testing is the more reliable method for determining Nitrogen levels. For this reason, discrepancies may occur between the results of the two tests. In this case, the first step is to repeat testing to assure the veracity of those results.

A soil testing may confirm that acidity and salt levels are appropriate and nutritional levels are within the acceptable range, but tissue testing of

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the same turf may indicate a nutrient deficiency.

The problem may be a function of the root system, a result of soil conditions, a result of an imbalance between certain elements in the soil, or the result of other influences on the plant's growing environment or on the plant itself. A "gut" reaction might be to fertilize immediately to augment the deficient element. However, this can be a big mistake if the cause of the problem has not been identified.

The first step should be an investigation of what is occurring between the adequate supply of nutrients in the soil and the uptake by the plant. Field conditions must be assessed. Compaction may be restricting the supply of oxygen and nutrients to the root system. Areas saturated with water may be restricting the performance of the root system. Insects or disease organisms may be affecting plant vigor and reducing the plant's ability to absorb and process nutrients. Physical damage to the roots, plant crown or leaf tissue of the grass plant may be limiting the efficiency of the plant's growth functions. Such environmental factors as extreme temperatures and inadequate moisture supply may be affecting nutrient absorption. These are easy to identify, but there

are many additional factors to consider.

For example, there may be a nutritional imbalance in the soil. An element of imbalance may be introduced temporarily through the water supply, either in natural rainfall or through irrigation. Changes in field use patterns, especially in specific areas of the field, may be increasing stress levels on the turf in those areas to the degree that their ability to absorb and process nutrients is reduced. In any of these situations, general fertilization, without regard for the nutritional status of soil and/or the turfgrass plant, may force plant response that will increase plant stress levels and add to the problem rather than reducing or eliminating it. Certain minor elements which the grass plant requires in minimal amounts, such as iron, may be applied in a form that can be absorbed by the leaf tissue without stimulating overall plant growth and increasing stress levels.

An additional factor to consider in relation to tissue testing results is the optimum level of nutrients needed for an athletic field. The sports turf manager must assess the condition of the turf during its active growth and high use periods to gauge how the plant performs. At higher levels of the rec-

ommended range, if the plant is too lush and soft, excessive tissue damage may occur as a result of increased susceptibility to wear from athletic activities. At lower levels, sufficient nutrients may not be available to meet the greater needs of the plant, and growth may be restricted. Generally, the preferred maintenance practice is to tailor the fertilization program to the mid-level of the recommended range, and to adjust nutrient levels up or down according to plant performance.

Fertilization should be based on plant needs according to tissue test results. It should not follow a rigid, pre-determined schedule. Used correctly, tissue testing is a very important tool in being attuned to the needs of the grass plant. It can help develop strategies to provide for those needs using precise, well-defined measures. □

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