Turf Nutrition

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THERE are at least 16 chemical elements considered essential for the growth of good turf. Most of these nutrients are required in such small amounts that a soil can normally supply them. Of these 16 or so essential nutrients, the three that are required in amounts usually exceeding the capability of the soil to fully supply are nitrogen, phosphorus and potassium. These major elements are supplied to the turf plant through timely applications of a complete fertilizer.

NITROGEN ranks first in importance for optimum turfgrass growth. The most noticeable effect of low nitrogen is a pale green color together with a reduced growth rate.

Nitrogen's effect on leaf color is related to its role as an essential part of the chlorophyll molecule — the green molecule that converts light energy to chemical energy or food for plant growth. When the nitrogen supply is low, there are fewer chlorophyll molecules in the leaf, and the leaf loses its dark green color. With the reduction of chlorophyll molecules the total food production in the turf plant is lower. The plant becomes weak and may even die.

Nitrogen may be supplied to the turf plant in any of four basic forms; nitrate, amonia, organic, and molecular nitrogen. Molecular nitrogen, or the nitrogen present in the air, cannot be used directly by the turf plant for growth but can be fixed or stored in the roots of plants such as legumes. When a legume dies, this nitrogen becomes available for use by other plants. But because legumes are not normally grown with turf grasses, this source of nitrogen is not important.

Nitrogen is absorbed by the turf plant roots in the nitrate, ammoniacal or the organic form. Of the three forms of nitrogen, ammonical has a greater relative availability for plant metabolism. But, fertilizer high in ammonia can burn turf easily. A given amount of ammonia nitrogen will produce more lush growth than the same amount of nitrate nitrogen. Because of ammonia's tendency to produce lush growth, it is not usually recommended as a fall fertilizer.

PHOSPHORUS, the second element contained in a complete fertilizer, is found in smallest amounts in the grass leaf. Phosphorus is involved in photosynthesis, enzyme systems and has a very important role as a carier of energy. It is said to stimulate root growth. If a plant is deficient in phosphorus, fertilization with phosphorus usually increases the yield of roots more than that of the above-ground parts.

Phosphorus is involved in translocation of food to the roots for storage. Therefore, if phosphorus is deficient, less food is translocated to the roots and the storage organs (roots) tend to be smaller.

Phosphorus, released in soluable form in soils from the weathering of phosphorus bearing minerals and from fertilizers, recombines primarily with the clay fraction of the soil. The phosphorus percentage of the soil usually increases as the clay content increases.

Soluble phosphate fertilizers react rapidly with soils so that most of the added phosphorus will not leach from the point of addition. The availability of phosphorus is strongly dependent on soil pH with an optimum availability at pH 6.0-6.5.

POTASSIUM is another essential element and is second only to nitrogen in the amount required for plant growth. Potassium is the most active of the essential plant nutrients. It is easily leached from the soil and may even be leached from plant leaves during a rain or during irrigation.

A potassium deficient plant is said to have a lower disease resistance. The plant is more susceptible to winter-kill and may be more susceptible to insect damage. Potassium deficient plants suffer high water loss, thus require more water than those not deficient in potassium.

When high amounts of nitrogen, relative to potassium, are supplied to a turf plant, the plant produces a lush succulent type of growth. This type of growth is easily winter-killed, more susceptible to insects and disease and requires more water to keep it alive. Even though this is a fast growth rate, it is not necessarily a desirable growth rate.

The adverse effect of a high nitrogen supply may be tempered by potassium when it is supplied in large enough quantities. This interaction betwen nitrogen and potassium is perhaps the most important interaction in turf nutrition. The

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Table I. Percent Nutrients Found in Tifgreen Bermudagrass Leaf Tissue

Figure	Treatment	%N	%P	%K	Dry Weight (grams)
1	Complete Nutrient Solution	2.80	0.19	1.17	32.70
2	No-N	1.50	0.24	1.60	1.77
3	No-P	2.70	0.05	1.80	13.47
4	No-K	3.17	0.32	0.38	3.77
5	No N-P-K	1.60	0.12	0.97	1.80

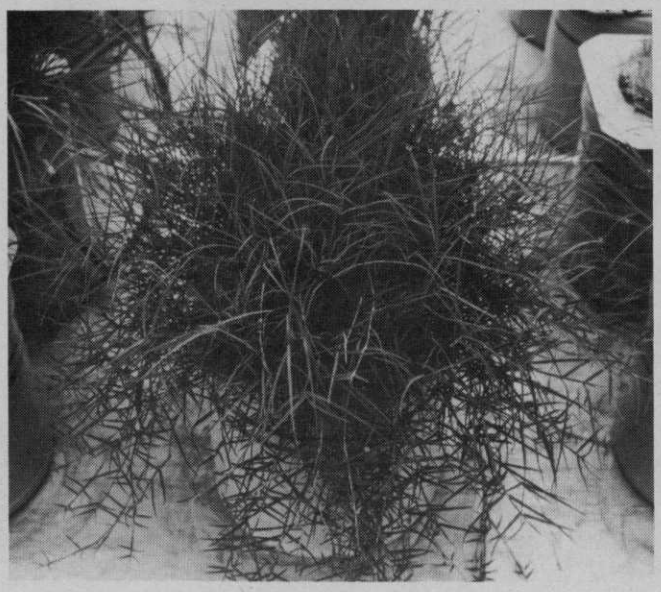

Figure 1, complete nutrient solution.

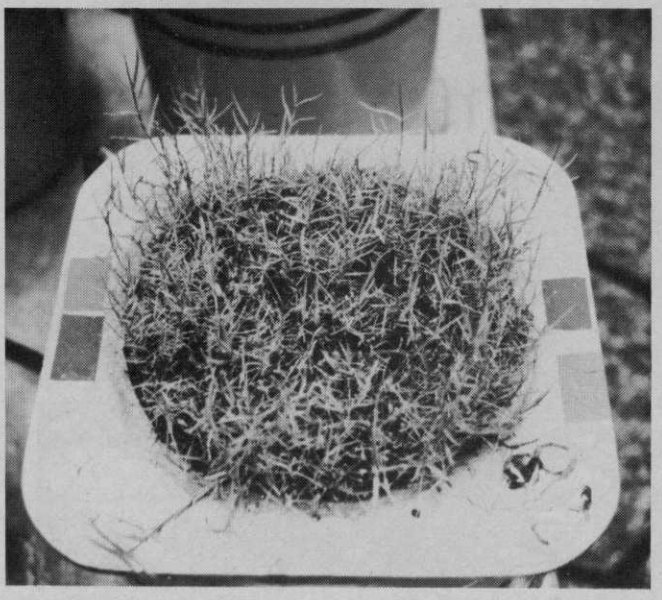

Figure 2, minus nitrogen.

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value of a good potassium level in the soil and plant cannot be overemphasized.

The relative nutritional needs of the turf plant are easily determined when nutrient solution culture techniques are used. In a University of Florida study, Tifgreen Bermudagrass was fed a solution containing all esential nutrient elements (figure 1). the N-P-K nutrient levels in grass leaf tissue are listed in Table I.

When nitrogen was withheld from the nutrient solution (figure 2), there was a marked reduction in plant growth as reflected in lower dry weight yield as well as in the nitrogen level of the plant.

The smallest reduction in dry weight yield and in the phosphorus level in tissue occurred when phos-

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Arborist Assn. Offers Expanded Home Study Course

The National Arborist Association is now offering an expanded Home Study Program to members and non-members.

The program consists of an educational study course designed to provide professional arborists and their staff members with increased technical and practical proficiency.

Originally compiled by the Forestry Department faculty members of Michigan State University, the course consists of two series of eight individual study sessions each.

Subjects for the first series include: General Introduction to Commercial Arboriculture, Anatomy and Physiology of Trees, Soils, Pruning of Shade and Ornamental Trees (two sessions), Identification and Selection of Trees, Fertilizing and Watering Shade and Ornamental Trees.

The second series of the HSP includes such subjects as: Diagnosis of Shade and Ornamental Tree Problems, Non-Parasitic Injuries of Shade and Ornamental Trees, Insect Problems of Shade and Ornamental Trees, Disease Problems of Shade and Ornamental Trees, Pollution Damage to Trees and Ornamental Plants, Spraying Techniques for Shade and Ornamental Trees, Bracing, Cabling and Tree Surgery of Shade and Ornamental Trees, Safety Equipment Care and Maintenance—Shade and Ornamental Trees.

HSP non-member enrollment fees are $75 per enrollee for each series of eight sessions, while costs for NAA firms are $50 per HSP recipient.

For enrollment applications and any other information concerning the HSP, please circle (719) on the reply card.

Phase II Guidelines For Nurserymen

Phase II economic stabilization guidelines are now available for nurserymen.

Under the new regulations, retailers must post in their retail outlets a 22" by 28" sign indicating the base prices for 40 Phase II-covered items having the highest dollar sales volume or which account for 50% of total sales. Base prices are calculated as highest prices charged customers during the freeze base period of July 16 to August 14, 1971.

The regulations also specify that no retailer may raise his prices on any covered item until the sign showing his 40 base price products is displayed.

In calculating a possible price increase the retailer must abide by the regulations indicating a firm may not increase its prices beyond that amount which would bring its net profit rate before taxes (as a percentage of sales) to a level greater than that of the base period. (This base period is defined as the average of any two of the past three fiscal years of a firm, ending prior to August 15, 1971.) Within that range, a 2.5% price increase guideline was announced by the Price Commission in an attempt to reduce inflation to no more than 2 to 3% by the end of 1972.

Retailers are permitted to apply their customary percentage markups to the amount of the import surcharge (10%) paid on a product entering the United States.

Also, the Wage Board's 5.5% general wage and salary standard applies to a retailer's employees.

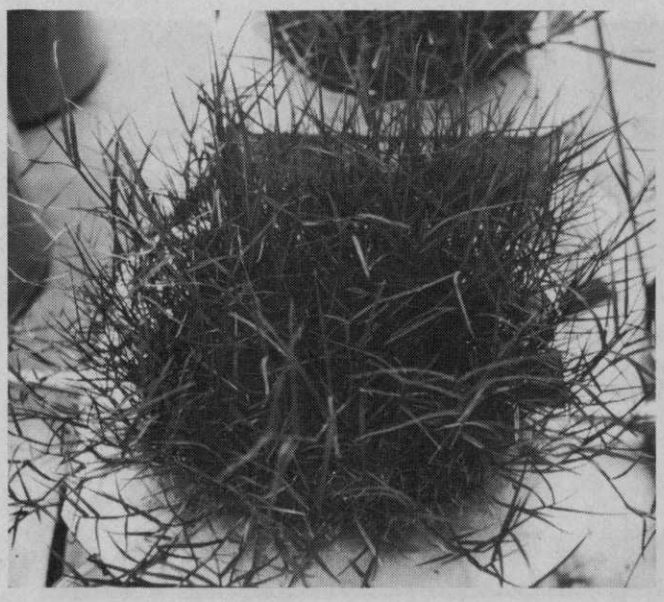

Figure 3, minus phosphorus.

Figure 4, minus potassium.

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phorus was omitted from the nutrient solution (figure 3).

Potassium's absence (figure 4) from the nutrient solution caused a reduction in K tissue levels and in dry weight.

When N, P, and K (figure 5) were all removed the dry weight yield was nearly the same as when only nitrogen was removed indicating a high dependence on nitrogen for vegative growth.

This study indicated that when one required nutrient element is omitted from a fertilizer program, there may be a somewhat abnormal increase in other nturients in the plant.

For example, when potassium was omitted nitrogen levels became higher (3.17%-N) than they were when the plant was fed optimum levels of all necessary nutrients

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Figure 5, minus nitrogen, phosphorus and potassium.

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(2.80%-N). Phosphorus levels were also higher (0.19%-P vs. 0.32%-P).

These results indicate the important interactions involved in the uptake of fertilizer nutrients by turf plants. When the wrong fertilizer ratio or rate is used it can affect the uptake of all nutrients, not just those present in the fertilizer.

Michigan To Study Highway Environment

Urban and suburban Detroit areas have been chosen as initial sites for research in improving the environment along Michigan highways.

The project on highway tree ecology was proposed by Michigan State University scientists and has been funded through a grant from the state legislature to the Michigan Agricultural Experiment Station.

"The major aim is to find the tree species best adapted to survive air and water pollution problems that are common to many stretches of major highways in Michigan," says Dr. Harold Davidson, MSU horticulturist and landscape tree expert. "Major emphasis will be on tree resistance to pollution, especially salt damage that can arise from snow removal. We will also look for trees that have potential for reducing noise and dust problems along highways in residential areas."

Selection of the first research site was made during a recent meeting between MSU scientists, Representative Bill Huffman, Jack Burton of the Michigan Department of Highways, Madison Heights City Manager Estol Swem, and Hazel Park City Manager Vance Fouts.

Selection of an appropriate site for experimental tree plantings in the City of Detroit is expected in the near future.

On a long-term basis, other research sites are planned for stretches of other major highways in both rural and urban locations.

Toro Dealers Go Back To School

Good service, the key to consumer satisfaction is the theme stressed by The Toro Company in a series of Dealer Service Schools.

The annual training program for Toro dealer personnel began Dec. 15 and will continue through April 1. The schools are being sponsored in cooperation with Toro distributors.

According to Ross E. Nelson, Toro's manager of customer service, each school will consist of three sessions running simultaneously for 2 to 2½ hours. Sessions will cover maintenance of riders / tractors, mowers, snowthrowers (where applicable), the Whirlwind Rider and the Shredder-Bagger, both new products for 1972; and policy and dealer operations, warranty programs; engine diagnostics, and gearbox teardowns.