The A B C of Turf Culture

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TURF culture is affected by the same factors that control the growth of all plants. The excellent turf on fairways and greens of certain golf courses is not a matter of chance, but the result of intelligent management on the part of a painstaking greenkeeper, and the club possessing such a greenkeeper is indeed fortunate.

An understanding of the basic principles of plant growth, coupled with ability to apply these principles to local conditions, simplifies the problem of maintaining greens and fairways in good playing condition.

The growth of plants is dependent upon the following factors:

1—Suitable air temperatures.

2—Ample supply of water.

3—Sufficient light.

4—A fertile soil.

5—Protection of the turf from injury.

It is impossible to alter some of these factors, but others can be so modified as to improve the conditions for plant growth.

Author's Note: It has been my privilege to learn the theoretical side of turf culture, and after that to test that knowledge in practical field work on the farms and golf courses of the Middle West. The publishers of THE NATIONAL GREENKEEPER tell me that I can help the greenkeepers to a better understanding of their problems. I am willing to try, and if my readers are interested and want to ask questions about turf culture I shall be glad to answer them through the columns of the GREENKEEPER.

Air Temperatures Vary Greatly

The air temperatures at which different plants grow best vary greatly. Most of the best turf grasses prefer a moist cool climate, so it is generally difficult to maintain good turf where high average temperatures are the rule. In some sections the months of July and August are hot and dry, and under such conditions turf suffers badly.

While climate cannot be modified, varieties of grasses suited to local climatic conditions should be selected. Obviously, grasses adapted to cool climates are not generally suitable for use in warm climates, and modifying cultural and fertilizer practices does not adapt them to the new environment.

Water constituting from sixty to ninety per cent of the weight of growing plants, imparts rigidity to the plant structure and plays an important role in plant growth. The plant obtains its water from the soil, through its root system.

How Plants Evaporate Water

Most of the water taken into the plant is evaporated from the leaf surfaces, and as a result a stream of water passes through the plant. The evaporation helps control the temperature of the plant, just as the evaporation of perspiration aids in controlling our body temperature. Naturally greatest evaporation occurs during hot weather, but even so the temperature of plant surfaces is often ten degrees higher than that of the surrounding atmosphere.

Plants often wilt during hot, dry weather, because water is evaporated from the leaf surfaces more rapidly than it can be taken up by the root system. The plants' demand for water is considerable, some varieties evaporating as much as five thousand barrels of water per acre during a single growing season.

Turf grasses are among the first plants to suffer during periods of scant rainfall. The root systems of plants are proportional to the amount of top growth, and since the turf is kept short by constant cutting the root system is confined to a relatively thin layer of surface soil. During periods of drought the water of this thin soil layer is quickly exhausted and the turf soon suffers. It is folly to expect good turf, particularly on soils of low water holding capacity, without providing the turf with water during periods of low rainfall.

Leaf Becomes Manufacturing Plant

In the presence of sufficient light, the leaf of a grass plant becomes a manufacturing establishment, and builds a class of substances called carbohydrates (starch, sugars, etc.) from the simple raw materials, water and carbon dioxide gas. Light makes this synthesis possible by supplying the needed energy, just as steam furnishes the energy that propels the locomotive.

Carbohydrates are required by all living parts of the plant, and since they are only manufactured in the green portion of the plant, it is essential that sufficient quantities are produced to supply other parts of the plant, notably the root system. When manufacture exceeds the demand, the excess of carbohydrate is stored to supply the plant in time of need. Since manufacture is largely confined to the leaf the importance of maintaining an adequate leaf surface is evident.

Close clipping of fairways and greens late in the fall seriously restricts the leaf surface, and may result in depleting the carbohydrate reserves. This leaves the turf in such a weakened condition that severe winter-killing on greens, and a slow initial growth of the turf in the spring often results. If turf is permitted to make a longer growth in the late fall, possibly carbohydrate reserves can be built up sufficiently to insure an adequate supply for use in the early spring. A more extensive root system also accompanies longer top growth, and this increases the storage capacity of the roots for carbohydrates.

In the case of new fairway seedings probably a more vigorous turf will be obtained by encouraging a good leaf growth to promote rapid carbohydrate production, thus supplying the young expanding roots with sufficient carbohydrate to establish an extensive root system. This does not mean that young turf should be allowed to grow too long before initial cutting, for long delayed cutting results in a coarse tufted turf. Frequent clipping is essential to the development of side shoots, a prerequisite to the formation of dense uniform turf.

Fertile vs. Infertile Soil

That soils differ in their capacity to produce plant growth is generally recognized, but some of the factors which distinguish a fertile from an infertile soil are often over-looked. The soil acts as a support to which the plant anchors itself by means of the root system. It contains sufficient air to satisfy the root system's demand for oxygen, and furnishes the plant with moisture and the mineral plant food elements.

A fertile soil contains about fifty per cent solid material, twenty-five per cent moisture, and twenty-five per cent air (pore space). The solid portion consists mainly of small particles of minerals derived from the disintegration of rocks, and some organic matter derived from the decay of plant and animal residues.

Of the ten chemical elements required by plants to make normal growth, seven are obtained from the soil. These plant food elements enter the plant through the roots, and are available only when present in the soil water in the form of soluble compounds. Practically all soils contain sufficient supplies of four of these elements, but are often deficient in one or more of the elements, nitrogen, phosphorus and potassium, sometimes referred to as ammonia, phosphoric acid and potash.

While the soil water does not, at any one time, contain sufficient plant food to satisfy the entire demand of the plant, a fertile soil is one which contains these materials in a condition which enables rapid solution when the plant makes heavy demands.

Bacteria in the Soil

Fertile soils contain vast numbers of micro-organisms called bacteria. The numbers are so great that a thimbleful of soil contains millions of them. These micro-organisms are the scavengers of the soil, for they are responsible for the decay of plant and animal residues applied to the soil. During decay plant food materials are released in available form, and normal plant growth does not occur unless these organisms are present in the soil. When conditions are favorable they are tireless workers. These conditions are, an abundance of organic matter, proper temperatures for growth, and a sufficient supply of moisture and air in the soil, for the most beneficial bacteria require oxygen.

The soil is a manufacturing plant where the plant food elements it contains are converted into forms which the plant can utilize, and it is the business of the plant grower to make conditions favorable so the factory can produce sufficient food to satisfy the growing plant.

While the most important factors affecting plant growth have been discussed there are several others which deserve mention, although they are negative factors. Plants require protection from injury and on established turf this resolves itself into protection from mechanical injury and the ravages of insect pests and plant diseases such as brown patch, etc. The presence of toxic substance in the soil occasionally prevents plant growth.

It is evident that normal plant growth depends upon a variety of factors. This may be illustrated by the use of a barrel whose staves are of unequal length. Just as the capacity of the barrel to hold water is limited by the length of the shortest stave, so plant production may be limited or prevented by one deficient plant food element, or a single unfavorable condition. If the shortest stave of the barrel is lengthened, then the next shortest stave determines the capacity of the barrel to hold water. So with plant production, the elimination of one unfavorable factor increases plant production up to the point where another unfavorable factor may limit growth. It is only when all limiting factors are eliminated that maximum and normal plant growth results.

Since soil conditions and plant feeding are the factors most easily modified these will engage our attention in future articles.