Influence of the Chemical Composition of Soils Upon the Maintenance of the Turf on Lawns and Golf Courses

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ABSTRACT

A smooth, dense and uniformly green turf is desired by all who are interested in attractive lawns. If such a type of lawn is to be created and maintained, a great deal of careful planning and good management must be put into the enterprise. In a great many cases the condition of the soil may be far from ideal and the turf may suffer from malnutrition and lose many of its desirable qualities. None of the species of lawn grasses commonly used will produce a satisfactory turf on soils which are either too acid or too alkaline and which have any considerable deficiency of the essential plant food elements, nitrogen, phosphorus and potassium. The construction of a lawn is often faulty, and a lack of uniformity in the soil, more especially the surface soil, is frequently the cause of unsatisfactory turf. A lawn soil profile should have at least a depth of four inches of surface loam made up of uniformly rich black soil, and all stones, gravel and other compact or solid material should be at least 20 inches below the surface. Golf course fairways have not usually been disturbed by building operations and are as a rule more uniform from the soils standpoint than are lawn soils.

Some research work was conducted on soils taken from the University of Illinois campus lawn and the University golf course fairways. The object of this work was to determine if there were differences in chemical composition between soils which were growing a desirable turf as compared with those which were growing an undesirable turf. The desirable turf might be described as one which is smooth, uniformly dense, relatively free of weeds and of a deep green color. The undesirable turf is almost the opposite of this.

The soil samples were collected to a depth of approximately six inches from areas of lawn upon which the turf was apparently desirable and in like manner from areas where the turf was undesirable. In addition to this, a number of areas of lawn were studied by taking soil samples from the surface two-inch depth (0-2) and a second set of samples from the same areas at the two- to four-inches depth (2-4). Chemical analysis consisting of the determination of the hydrogen ion concentration, total nitrogen, soluble phosphorus and replaceable potassium were made on the air-dry samples of soil and the quantitative results reported in pounds per two million pounds of soil.

DISCUSSION

There was found a distinct difference in the average chemical composition of the soils from areas having a desirable turf as compared to the areas having an undesirable turf. The undesirable condition of the turf in the majority of cases (75 per cent) was apparently due to improper reaction of the soil or a deficiency of some one of the essential elements, nitrogen, phosphorus and potassium, or an improper balance among these factors. The undesirable condition of the turf on the soils studied may have been due, in a number of cases, to causes other than those discernable by chemical analysis of the soil. This is illustrated by the fact that six of the 24 comparisons (25 per cent) gave little relative evidence of a relationship between the composition of the soil and the undesirable condition of the turf.

The analytical results indicate that the addition of lime to these soils, especially the undesirable areas, is of far less importance than the addition of some forms of nitrogen and available phosphorus in order to maintain a desirable turf. The desirable range for bluegrass is given as pH 5.6 to 7.4. The reaction of the soils from the areas of desirable turf averaged pH 6.4 and 6.5, and the undesirable areas averaged pH 6.0 and 6.5 indicating that the reaction of most of the soils come within the desirable range. Approximately 60 per cent of the areas of undesirable turf were low in available phosphorus, approximately 20 per cent were low in nitrogen, and about 12 per cent were low in available potassium.

The undesirable turf areas on the golf course fairway soils, are in need of moderate amounts of lime (pH 4.9 to 5.3) and show a need of additional nitrogen, phosphorus and potassium. The soils of the desirable turf areas on the fairways are apparently well supplied with these fertility elements.

There was an accumulation of nitrogen, phosphorus and potassium in the surface two-inch layer of soil on both the lawns and fairways. In the fairway soils this was probably due largely to the decomposition of grass clippings which accumulated during the many years of care given the fairways. This indicates that the grass clippings are of considerable value in maintaining the fertility of the soils on lawns and golf courses.