TURF CULTURE

A Bulletin from

UNITED STATES GOLF ASSOCIATION

EXECUTIVE OFFICES ·· 73 East 57th Street ·· NEW YORK CITY

Vol. 1, No. 5 **TURF CULTURE** August, 1936

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THE USE OF SOIL ANALYSES

IN recent years various agricultural scientists have given much attention to the testing of soils to determine plant food requirements. For years the Green Section has been using several methods for testing soils in an effort to help clubs select the most effective and economical combinations of fertilizers for their particular needs. There is still much confusion as to what can and cannot be expected from laboratory tests of soil samples.

The Green Section is always glad to test samples of soil from member clubs, report results and offer recommendations based on these tests. To make this service most useful it is necessary for the club official to cooperate fully in sending good representative samples and in furnishing some information concerning them. The taking and shipping of samples is described in this issue.

Laboratory tests of soils serve only as guides. In some cases overzealous individuals have given the impression that all that is necessary is to put a sample of soil through a complicated chemical test and, presto! the whole complicated problem of turf fertilization could be figured out to the nth degree. Agricultural chemists years ago learned that this could not be done with farm crops, and notwithstanding all the showmanship on the part of some soil testers the fact remains that soil tests have in themselves only limited values for turf work.

It is well recognized by those who are best informed in methods of testing soils that the actual results of these tests as an aid in turf culture represent not more than 20 per cent. of the value, whereas the interpretation of these laboratory results represents fully 80 per cent.

A club official will send in a report occasionally of a complete chemical analysis of soil which he has had made by competent chemists.

After going to this great expense this club official has found he is unable to interpret the results and has submitted the report for a Green Section interpretation. In some instances even though the chemical work may have been entirely satisfactory no interpretation can be made of the analysis that could reasonably be expected to justify the expenditure for even the postage stamp used in forwarding the report.

Tests of soil samples with laboratory methods offer a valuable guide in the diagnosis of turf disorders or in determining the amount and kind of materials that should be applied to turf. They should be considered as no more than this.

To understand the value and limitations of soil tests, they may be compared with the taking of temperatures in human ailments or the making of urine analyses. When a physician examines a patient he invariably first takes his temperature. He may find a high fever. This in itself is important but the most important part of the diagnosis is the physician's interpretation of this temperature. It may represent a minor disorder or a serious chronic ailment.

In order to determine what is wrong and be able to suggest remedies the physician makes other tests. He counts the pulse and may have urine, blood and various other tests made. In some cases he can directly locate the source of illness by these tests. In the big majority of cases, however, his diagnosis is based on information he obtains from the patient, or someone well acquainted with his case, as to his various aches or pains, what he has been eating or drinking, when he first noticed any ailment, etc., through a whole series of questions to determine the history of the case and all symptoms relating to it.

The science of turf culture is in its infancy as compared with medical science. Yet there are individuals who register their disappointment when they fail to have their turf problems solved by a soil analysis. We occasionally receive from clubs some samples of soil without even a postal card in reference to them. We often receive samples with letters something to this effect, "We are sending you some samples of our soil. Will you please examine them and let us know what is wrong with the turf?" After examining the soil we may no more be able to diagnose the turf ailment than a physician would be able to diagnose an ailment merely by an examination of urine, blood, temperature, etc., without a collection of other odds and ends of information collected from the patient. Since we cannot obtain this miscellaneous information from the soil samples, it is necessary to ask the club officials furnishing the soil to cooperate in supplying it.

An examination of urine may show albumen in sufficient quantities to quickly guide the physician to a diagnosis of his case. Likewise an examination of soil may reveal grubs or layers of sand, clay or peat which provide definite leads to the disorders. Just as an extremely high blood pressure may give the physician a valuable clue, an excessive acidity of the soil as indicated by soil tests may give a definite clue to turf disturbances. However, in both the cases of blood pressure and soil acidity there is a wide range of tolerance that, except in extreme cases, makes these tests unreliable unless correlated with other symptoms. In the large majority of cases the physician finds that the test he has at his disposal does not in itself definitely locate the disturbance. The same applies to the diagnosis of turf ailments.

When soil tests are used merely as a guide to the solution of turf problems they serve a useful purpose. When overemphasized they can lead to waste and confusion. When recommendations based simply on soil analyses are sent out from any laboratory (regardless of its supposed rating) which assume to describe definite turf feeding or management procedure with hair-splitting differences for the various fairways and putting greens, they should be regarded with suspicion. Quackery is by no means a stranger in the field of turf culture.

COLLECTING AND SHIPPING SOIL SAMPLES

A GOOD sample of soil for analysis represents the area in question. The ideal sample from an area of 1,000 square feet of turf should consist of five or more small plugs removed at random. In established turf the surface soil to a depth of 1 or 2 inches is of most importance for an analysis of a chemical nature, such

as the determination of pH or phosphorus. The plugs can be cut approximately 1 inch square with a knife or by means of some other device. Approximately one-quarter of the plug taken with a hole-cutter serves as a convenient sample.

A method for collecting soil samples which is convenient and provides good samples is the following: Procure a piece of ¾-inch steel pipe and cut it approximately 6 inches long. Then sharpen one end and bore a hole through the pipe ½ inch from the other end. The pipe may be driven into the soil and when withdrawn will be filled with a plug to the depth desired. A tenpenny nail put through the hole at the end of the pipe will assist in withdrawing it from the soil. The plug can then be pushed out of the pipe by means of a rammer.

Each plug should be wrapped in clean waxed paper to prevent crumbling and to preserve the sample in its original condition. The type of wrapping used for coins is approximately what is desired.

If the sample is to represent a pile or bed of compost, topsoil, sand or humus it must be a thorough mixture of several individual samples taken from different places. For most purposes a small sample is satisfactory since a pint is enough for a series of tests.

Many times samples are shipped without information as to what location they are from and the kind of trouble that the soil may be causing. It is helpful if data are sent on the following points: Is the area in shade or open sunlight? Does the soil dry easily or does it tend to remain wet and soggy? What humus material has been incorporated with it? What fertilizing and liming program has been followed in recent years? Is the soil artificially drained with tile? How long has the soil been used for turf purposes?

Where testing is desired as an aid to general fertilizing or liming of all fairways or greens it usually is unnecessary to sample each one. Only the typical or representative greens or fairways on each different type of soil need be sampled. One group of plugs from each such green or fairway is sufficient. It is interesting to keep a record of tests of soil from the same areas over a period of years.

When poor areas are sampled either a composite of the poor and another of the adjoining good area should be sent, or if the injury has a definite margin the sample may be taken at a place which will include half of the one and half of the other turf. The latter type of sample may be cut out to fit a cigar box for convenience in shipping. As the healthy grass may become brown and almost completely rotted during transit, a paper marked "good" or "bad" should be pinned into each side of the sample so that there can be no uncertainty when it is inspected.

Samples are of no value unless properly labeled, securely packed and properly addressed with the return as well as the sending addresses.

At this season of the year when clubs are interested in soil tests as a guide for fall fertilizing programs the Green Section often receives many samples. These are tested in the order in which they are received and unfortunately with our limited staff some delay is unavoidable. Clubs will help us materially by having samples forwarded to us well ahead of the time information concerning the samples is required for the purchase of fertilizers. The principal reasons for wanting tests made of the soil should be stated, as, for instance, thin stand, excess of clover, excessive drying in patches, yellow, unthrifty growth, etc. Any general observations similar to the above may serve to aid the person who is testing the soil in making tests other than the regular routine tests and will be of much help in interpreting results and formulating recommendations.

The Green Section is planning a series of meetings to be held in different parts of the country for general discussions of turf problems. These meetings will be sponsored by local golf associations as well as greenkeeper and professional organizations. The schedule of meetings for the next few weeks is as follows:

Cincinnati, Ohio—Date of meeting and place to be announced by the Cincinnati Golfer's League.

Chicago, Ill.—August 31 at Mill Road Farm Golf Course, Lake Forest.

Lincoln, Neb.—September 2 at The Country Club.

Denver, Colo.—September 4 at Denver Country Club.

San Francisco, Cal.—September—Date of meeting and place to be announced later by Northern California Golf Association.

Santa Barbara, Cal.—September 14 at Valley Club of Montecito.

Los Angeles, Cal.—September 16 at Bel-Air Country Club, Beverly Hills.

Phoenix, Ariz.—September 19 at Phoenix Country Club.

Tulsa, Okla.—September 22 at Southern Hills Country Club.

Kansas City, Mo.—September 24 at Mission Hills Country Club.

St. Louis, Mo.—September 25 at Westwood Country Club.

Indianapolis, Ind.—September 28 at Highland Golf and Country Club.

Pittsburgh, Pa.—September 30 at Allegheny Country Club.

The plan in most cases is to invite all in the district who are interested in turf maintenance to assemble for lunch or dinner. Immediately afterward Dr. Monteith of the Green Section will give a talk on some phase of turf maintenance, which will be followed by a general discussion of course upkeep problems, especially those of local interest. During the afternoon the course where the meeting is to be held will, in most instances, be open to play to all who attend. The details concerning the various meetings may be obtained by consulting the local associations sponsoring them, the club at which the meeting is to be held or the Green Section office in Washington.

All who are interested in the growing of turf are invited to attend.

Dr. Monteith will spend from one to four days in each of the above districts, during which time he will visit as many courses as time will permit and discuss with representatives of clubs any turf questions in which they are particularly interested. If any club that is a member of the United States Golf Association wishes to have Dr. Monteith make such an inspection of its course during the trip, please communicate with him directly at the Washington office or make arrangements through your local organization.

PURCHASE GRASS SEED ON A BASIS OF QUALITY

THE extended drought this year has killed considerable fairway turf, making it necessary to reseed. This is the time to check up on the amount of seed that will be needed. Orders should be placed soon in order to have the seed on hand for each planting so as to take advantage of the full growing season this fall.

There may be a question as to whether to fertilize an area in order to force the surviving grass into a quick recovery or to reseed. Usually fertilizer is preferable if a scattering of plants is alive. If large patches are dead it is advisable to reseed. It is well to remember that tender seedlings have a slight chance to survive where established plants have been struggling along only half covering the soil. It is a good rule to try the fertilizer method first if there is any doubt as to the proper manner to improve turf. In many instances best results are obtained by using both seed and fertilizer.

There are State laws governing the sale of seeds and they require that the quality of the seed shall be shown upon a label attached to the container. Such information as the purity and germination percentages, the percentage of weed seeds, and the date the seed was tested are invariably required by law. If one multiplies

the purity (per cent. of seed named in relation to total weight) by the germination (per cent of seed named which will grow) the product is a figure somewhat much more useful than either number alone.

Suppose there are two samples of Kentucky bluegrass to choose from; the first is 80 per cent. pure and germinates 70 per cent., and the other is 90 per cent. pure and germinates 60 per cent., and both are priced the same. Which is the better one to purchase? The product is 56 per cent. for the former and 54 per cent. for the latter, making the former slightly the better buy unless the weed seed content is greater.

Assume that the 56 per cent. sample was priced at 24 cents and the 54 per cent. one at 20 cents a pound. Which one is the cheaper? By dividing 24 by 56 one gets 43 cents a pound for the pure seed that will grow in the first case and the 20 divided by 54 equals 37 cents, the real price of the seed in the second. Obviously the latter seed is the better one to purchase.

The arithmetic may seem cumbersome but it offers a way to decide a somewhat difficult choice at times. This is another reason why it is much the safest policy to purchase the seeds as individual kinds rather than the fancy-sounding branded mixtures. The State laws seldom compel the seedsman to state the proportions of a mixture and there continues to be a practice of substituting a large percentage of temporary grass for the more expensive permanent grass seed in these mixtures. If a mixture of 95 per cent. Kentucky bluegrass and 5 per cent. colonial bent is desired, then buy the seeds separately and mix them or have the seedsman do it for you.

Nurse grasses are usually much less of a benefit in late summer than in spring plantings; in fact, it is highly doubtful whether ryegrass and redtop are desirable in a fairway mixture for August and early September planting.

The best test of what the mixture should contain is to find out what kinds of permanent grass the fairway contains now. If it is impossible to identify the grasses personally, someone who can do this should be found. Samples of the various grasses will be identified by the Green Section. Kentucky bluegrass is usually the major grass in the North except in New England and New York. Fescue also may be found and, if so, it should be included. A small proportion of colonial bent has been found to be beneficial in practically all northern fairway mixtures, and in New England it is the mainstay.

A fairway mixture that is widely adapted is Kentucky bluegrass from 90 to 95 per cent., and colonial bent from 10 to 5 per cent. A good mixture is Kentucky bluegrass 75 per cent., Chewings fescue 20 per cent., and colonial bent 5 per cent.

Dry knolls difficult to cover with grass should be spiked or disked in order to prevent the seed from being washed or blown away and to provide better conditions for germination. Although the spiking is by no means a perfect method, it is helpful in placing the seeds where they would be expected to find moisture and where they will not easily be washed away. A seeder similar to the grain drill but with less space between disks would probably give the best results.

VACUUM MACHINE FOR HARVESTING BUFFALO GRASS SEED

WESTERN CLUBS where Buffalo grass is used on fairways and lawns will be interested in a report of improved methods of harvesting the seed. The seed of this grass has been difficult to obtain and is in great demand for the planting of abandoned wheat land as a means of controlling erosion by wind and rain.

Buffalo grass has demonstrated resistance to sun and wind and the ability to make a quick comeback when conditions are favorable. Buffalo grass leads the list of grasses which can best be used to regrass this idle and eroding land. It is also the best grass for lawns and fairways in the Great Plains territory where it is adapted.

The seed is found only on female plants and grows close to the ground among the curly leaves. Harvesting with grass seed strippers, or by cutting and threshing later, as is done with other grasses, is out of the question in the case of Buffalo grass.

A new suction machine built like a powerful vacuum sweeper has been developed by the Kansas State College and the Experiment Station at Hays. It has collected as high as 95 per cent. of the seed, or an average collection of about 64 per cent.

The collecting nozzle in the most successful models is about 6 feet long and 4 inches wide. A light chain dragging ahead of the nozzle loosens the seed from the stems or from the dirt where it may be slightly imbedded. Best results are obtained when the grass is closely clipped before the seed is collected. The most seed can be collected in the late summer or fall.

Buffalo grass also may be propagated vegetatively by scattering pieces of sod. The method of propagating Buffalo grass by this latter method is described in The Bulletin of the United States Golf Association Green Section, Vol. 13, p. 144.

SEASONAL REMINDERS

Fall Fertilizing: August is the month to make plans for fall fertilizing programs. Orders for fertilizer should be placed in sufficient time to have the material delivered ready for distribution in early September. Kentucky bluegrass and the other permanent turf grasses grow vigorously during the fall months if they are provided with ample food and moisture. Some clubs are able to supply both the food and moisture for fairway turf but most clubs are still dependent on nature for fairway irrigation. The drought this summer has done much damage to turf and if it is possible to purchase fertilizer it should be applied early in September so as to take full advantage of the fall rains. Expenditures for fertilizer this season will prove to be money well spent on practically any course.

Fertilizers should be purchased primarily on the basis of their plant food content. Fortunately for golf clubs, the day is rapidly passing when fertilizers are purchased without regard to the analysis. It should be remembered that all experimental work to date on turf has shown that nitrogen is the most important plant food to be considered in the purchase of fertilizers. In most golf course formulas, therefore, the nitrogen component should lead by a big margin. Phosphoric acid and potash, which are of great importance in many agricultural crops, are of less relative importance in golf turf fertilization.

Soil Samples: August is a good month in which to sample soils for testing as an aid in deciding upon the best fertilizer programs. If laboratory tests have not been made recently it would be well to have some made before deciding on the fall fertilizing program. The Green Section will be glad to make such tests for any club that is a member of the United States Golf Association. Samples should be collected and shipped as directed elsewhere in this publication. Examinations will be made as promptly as possible, and as complete reports and recommendations as are justified from the samples will be submitted to the club. We promise no elaborate tests nor exaggerated deductions.

Use of Lime: This is the best season to determine the need for lime in turf. Laboratory tests will serve as a useful guide in determining whether soil is ex-

cessively acid. There are, however, several distinct symptoms of excessive acidity which should be used in determining the need for lime. Some soils with a neutral or alkaline reaction may need lime. On the other hand, an application of lime to soils that are distinctly acid might simply prove to be another means of wasting money. In this connection, it would be well to read the discussion of soil acidity in The Bulletin of the United States Golf Association Green Section, Vol. 12, pp. 190-195.

Filling Low Pockets: At this season when there is much repairing to be done on greens it is well to be on the lookout for low pockets where water collects. Where grass has been killed in low places it should not be replaced with fresh sod until the depression has been filled with soil or other provisions made for adequate surface drainage. It is surprising how often this apparently obvious precaution is neglected.

Improving Soil in Putting Greens: After the heavy summer play is over and before the fall growing season arrives is a good time to remove sod from greens and do the necessary remodeling and soil improvement work that is necessary to reduce the turf injuries that have resulted from poor construction methods. Grass will recover quickly in early fall and a true surface can be obtained quickly by heavy top-dressings. If such work is contemplated it would be well to refer to the discussion of this subject in The Bulletin of the United States Golf Association Green Section, Vol. 9, pp. 142-151.

New Seeding: August is the month to get areas graded and prepared for new seeding so that the seed may be planted late in August or early in September, according to the latitude. In the northern states August plantings usually give best results.

Algae in Turf: Algae are minute green plants that grow to form a scum on turf that has been injured by disease or other causes wherever there is sufficient moisture. Scums of algae have not been as troublesome this year as in wet seasons. However, in low, heavily watered areas they are always troublesome. Thick growths should be raked with an iron rake or spiked to break up the scum. The affected areas should then be treated with corrosive sublimate and top-dressed.

Weeds in Soil Beds and Compost Piles: At this season some of the most troublesome putting green weeds are beginning to produce their seed. Therefore it is particularly important to check up on the compost piles and soil beds to make sure none of these weeds are going to seed there. This job is too often neglected on golf courses due to the rush of what is considered as more important work. Remember that a few hours spent this year in destroying weeds on and near the compost pile and soil bed may save dozens of hours' work next year in weeding putting greens.

Controlling Grubs: Grubs of May or June beetles, Japanese beetles and oriental beetles wherever they are numerous are now causing injuries to grass. Grub injury appears first as a wilting of the grass in irregular areas. The turf becomes loose as a rug and may be easily lifted from the ground since the roots are cut just below the surface. The grass dies and turns brown. Treatments to check these grubs should be made as soon as possible. Arsenate of lead applied at the rate of 5 pounds to 1,000 square feet is the most effective remedy for grubs. On some soils, particularly of a heavy clay nature, heavier rates of 10 or even 20 pounds to 1,000 square feet are needed to accomplish complete control.