THE PATH TO PERFECT FAIRWAYS

By KENNETH WELTON

THERE is an increasing demand throughout the United States for better fairway turf and I am sure this applies to Canada also. On many courses there must be a decided improvement in fairway turf to keep up with the high standard set by the putting greens.

The demand of the golfers for a uniformly thick, colorful, and weed-free turf on fairways will in time result in the development of means of obtaining such turf under almost all conceivable conditions, and ten years from now golfers may be as fussy about the condition of the fairway turf as they have become about putting green turf. However at this time there are still many clubs that welcome clover and low growing weeds on their fairways, as without them there would be much bare ground. There are entirely too many clubs compelled to resort to the use of winter rules in the fairway even during some of the best golfing months of the year.

Until recent years the majority of clubs considered that the condition of the fairways was governed mostly by the weather conditions. There was also a belief that it took a great many years to finally obtain a decent ground cover. Granting that the weather is an important factor, those interested in fairway improvement have not been content to sit back and leave the fairways to the mercy of the weather but have found there are certain ways in which we may help the grass survive poor weather conditions and take the maximum advantage of good weather. It has also been demonstrated in a convincing manner that in this country it is very disappointing to wait for age to improve fairways. And it has been repeatedly shown that turf may be close to perfect the first year.

Table Number 1 shows the average turf ratings on a number of gardens planted in various sections of the country. We will refer in more detail to this table later but at this time I wish to point out that two of the plots received higher ratings the first year after planting than any of the plots received during the four following years. The table shows that these plots rated higher the first year than any plot the fifth year, and higher than the five-year average of any. These results contradict the idea some have that it takes many years to obtain a good fairway turf. These results also show clearly that the fertilized plots are much superior to the unfertilized.

Another point which should be referred to here is that the two complete mixed fertilizers and the sulphate of ammonia rate first, second and third the first year, and since the complete mixed fertilizers obtain their nitrogen from sulphate of ammonia and ammonium phosphate it is indicated that readily available nitrogen is necessary for the best development of the turf during the first year. The two complete mixed fertilizers contain available phosphorus and this is no doubt responsible for placing them well above the sulphate of ammonia which contains none.

Time of Seeding Important

Most golf clubs are handicapped in respect to fairways during the construction period. Many fairways get a poor start because they are seeded at the wrong time of year. Spring has until comparatively recent years been considered the best time to seed northern fairways but observations and experimental results have shown conclusively that fall planting is to be preferred. Most root growth is made in the late fall and early spring which enables the grass to make rapid growth in the early spring and form a thick turf to compete with spring and summer weeds and to withstand the heat of summer. Too frequently fairways are seeded without any intelligent effort having been made to rid the soil of weeds, to improve its structure, and to supply the necessary plant food elements in which it may be deficient. Lime and phosphorus are two very necessary elements both at planting time and later for the best development of grass. They do not readily enter the soil once it is firm and in turf, so it is advisable to apply them at construction time when they may be mixed with the soil.

Before planting, the soil should be brought up to neutral in reaction if possible. This would provide a supply of cal-

It is not too early to begin thinking about the fall fairway improvement program. This article is the first of two by Mr. Welton; the second will appear in our August issue.

cium for years. According to some results it is advisable to apply at least 200 pounds of superphosphate or its equivalent at planting time and on soils running less than 75 pounds per acre of available phosphorus as determined by the Truog method, two or three times this amount could be applied to advantage. Plenty of nitrogen should be applied at construction time. As much as 1,000 to 2,000 pounds per acre of a fertilizer running from 5% to 7% nitrogen should be applied. If organic fertilizer is being used, it is advisable to also apply several hundred pounds of some inorganic nitrogen fertilizer such as sulphate of ammonia, so that there is sure to be a supply of soluble nitrogen for the seedlings. If the soil is low in phosphorus, ammonium phosphate could be substituted for sulphate to advantage.

Will Soil Support Thick Turf?

I should like to impress upon those that are interested in planting fairways the fact that no effort or expense should be spared in order to procure a heavy dense stand of grass immediately following seeding. Many fairways are planted on poor waste land and if a uniform thick catch is not obtained when the fairways are planted it may require extreme methods to obtain a uniform and weed-free turf later. Some soils such as clays and silts quickly settle into a more or less puddled condition and it becomes increasing difficult to get new grass started in the thin and bare areas. If plenty of fertilizing materials are incorporated in the soil before planting a heavy catch may be obtained on even the poorest soils. Once a poor soil has a dense ground cover and plenty of food for the immediate use of the young plants the turf prevents erosion, weed invasion, and is able to hold and build up the organic matter of the surface soil by the return of the clippings and by root decay.

Concentrate Care On Heavy Play Areas

Having stressed the importance of proper fertilization and care at construction time we may now consider the maintenance of fairway turf. There are certain areas of the fairways from which the greatest number of shots are played and if a club can not afford to give its complete fairway area the required treatments it may find it possible to at least treat the areas where the treatments will be most effective from a playing standpoint. The rough should be left as poor as possible since the less fertilizer applied to the rough the less grass there is to cut and the less expense for maintenance. Weed control in the rough should be done where necessary with weed control chemicals of little or no fertilizing value. The rough should of course be sufficiently smooth and free of obstacles for the type of play but the thinner the grass the more likely it is to exact a fair penalty and the easier it is to find a ball in. The area for 125 to 150 yards in front of the tee should be kept as rough.

The fairways should be tested at least every few years and if it is discovered that they are becoming too acid or too low

TABLE 1—FAIRWAY FERTILIZER RATINGS

	% Perfection Year After Planting	% Perfection Five Years After Planting	% Perfection Five Years' Average
6-12-4	78	69	69
12-6-4	74	67	66
Activated sludge	62	69	65
Bone meal	60	66	63
Sulphate of ammonia	65	56	57
Manure	51	54	51
Lime	45	54	49
Check (no fertilizer)	40	46	44
" " "	41	41	41
" " "	44	35	40

in phosphorus these elements should be applied. In areas where perennial northern grasses such as Kentucky bluegrass fescue and colonial bent make up the fairway turf, it is safest generally speaking to keep the pH from dropping below pH 6. But there are some soils such as the black loams around Chicago which show a neutral or slightly alkaline reaction and yet give a decided stimulation to grasses during drought where lime has been applied. Therefore it is good practice to apply lime at the rate of one ton per acre to one or more parts of the course as a check area, and if over a period of time good results are obtained the whole course could be limed to advantage. Because it is difficult to get lime into the soil it is best to apply it during the winter so that it may enter the soil while the soil is cracked and heaved due to frost. In areas where the frost does not affect the soil to this extent the fairways could be disked with a straight disk in order to allow the rain to wash the lime into the soil.

Results of tests indicate that phosphorus should be supplied if the soil tests less than 75 pounds of available phosphorus per acre. Although phosphates, such as may be got in the form of superphosphate or with nitrogen as ammonium phosphate, are soluble still these phosphates become insoluble in the soil and seldom seep into turf-covered soil more than an inch or two before they become fixed in an insoluble form. Therefore if the soil requires building up in phosphorus and it is decided to apply phosphates it would be advisable to aid its entry into the soil and hence its contact with the roots by cutting the fairway in several directions with the straight discs or spiking machines.

Nitrogen Is Major Turf Need

Nitrogen is required for grass growth more than any other fertilizer. It is required for all green growth of the plant such as the leaves and stems and is also used in the roots and other parts of the plant. Analyses of grass blades have shown more than twice as much nitrogen than any other fertilizing element. Nitrogen being soluble is continually being lost from the soil not only by the plant requirements but by leaching away in the drainage water. It cannot be stored up in the soil for years ahead like the insoluble minerals such as phosphorus and calcium.

Potash is also necessary for grass growth but as most northern clay or silt soils seem to contain all of this element necessary for the luxuriant growth we will not consider it here.

Before leaving this discussion of the necessary fertilizing elements for grass growth I would like to make it perfectly clear how none of these elements may be lacking for maximum turf production. If nitrogen alone is fed and the grass lacks phosphorus or lime it will for a time grow tall and green but the development of new shoots and new plants will be much restricted so that in time the turf becomes thin even though the remaining plants will be dark green in color and will require frequent mowing. If phosphorus, lime or potash alone are applied or all three, but no nitrogen, the grass may grow well for a short time but probably before the season is over it will become thin and starved and clover and weeds will replace the grass and ruin th turf.

Don't Fear Clover Domination

At this point I should refer to the fear of some that applications of lime and phosphorus will ruin fairways by bringing in clover and weeds. This fear has been created because in agricultural practice clover is stimulated by applications of lime and phosphorus. Also tests, where either lime or phosphorus alone have been applied to turf year after year, have resulted in the ruin of the turf and a great increase in clover and weeds. But it must be realized that clover is a legume and as such has the ability to absorb nitrogen from the air to convert to its needs. Grass cannot take nitrogen from the air and hence is dependent upon the supply in the soil which it must absorb through its roots. Hence if the grass growth is restricted by lack of nitrogen the clover having all the nitrogen it requires, and if given in addition ample lime and phosphorus, will supersede the grass. Tests especially of more recent date have shown that when an abundance of nitrogen is present, there is no danger from either clover or weeds from the use of phosphorus or lime and the grass makes it best growth with all three elements present and is able to compete with and even crowd out clover and weeds.

What Test Plots Showed

In Table 1 the sequence of fertilizers has been arranged in order of the five-year average. The results of this experiment have been given in the Green Section "Bulletin" and GOLFDOM but I use them again here to illustrate some important

points. The gardens were cared for the same as the fairways on the courses on which they were located and monthly reports were made out over a period of five years. The fertilizers were applied on a nitrogen basis spring and fall at the rate of about 900 pounds per acre for a fertilizer containing 6% nitrogen, which makes a total of approximately 108 pounds of nitrogen per acre per year. A few of the gardens were planted on soil deficient in phosphorus and this may have given the 6-12-4 fertilizer, which contains four times as much phosphorus as the 12-6-4, the slight improvement shown. It is however interesting to note that the comparatively small amount of available phosphorus supplied with the 12-6-4 was sufficient for the immediate needs of the grass. Soil analyses of these plots showed that the plots receiving 12-6-4 in most cases showed no loss in available phosphorus and in some cases showed considerable gain. A reserve supply was being built in the 6-12-4 plots as these showed as much as 300% increase in available phosphorus.

It will be noted that the turf on the two complete mixed fertilizers and the sulphate of ammonia plots which are the only three inorganic nitrogen plots in the series has become worse during five years fertilizing whereas the organic fertilizer plots all show an improvement. A possible explanation of this may be found in the fact that these three inorganic plots all received their nitrogen from sulphate of ammonia and ammonium phosphate. These ammonia salts gradually deplete the soil of lime and increase its acidity. A soil test was made of the plots in this test to discover if the lack of lime had anything to do with the behavior of the inorganic fertilizer plots. The test showed that the two complete fertilizers and the sulphate of ammonia plots had become more acid dropping to an average of pH 5.5 while the average of the check plots was pH 6 and the organic plots ran pH 6 and above. The acid condition and loss of lime brought about by the steady use of sulphate of ammonia and ammonium phosphate is no doubt responsible for the considerable drop in perfection shown in the five years these plots were fertilized.

Apparently ammonium nitrogen stimulates rapid growth and was responsible for the high ratings of these plots the first year, but due to the decreasing lime supply the grass was unable to maintain its original high state of perfection. Therefore when these fertilizers are being used it is necessary to determine the soil acidity occasionally. Theoretically the acidity developed in the soil through the use of sulphate of ammonia would be equivalent to about 100 pounds of hydrated lime to every 100 pounds of sulphate of ammonia but in practice the lime requirement seems somewhat less than this. If clubs will check on the lime requirements of their fairways from time to time and supply this material when needed the danger from continued use of ammonium fertilizers would be removed. However on courses where it is unlikely that a close check will be kept on the condition of the fairway soil it is probably safer to use mostly organic fertilizers from year to year.

Balance of Mr. Welton's authoritative article on fairway fertilization will appear in our August issue.

Cites Arsenate Control of Webworm Menace

By BONNY WEAVER
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IOWA greensmen were having a tough tussle with webworm recurrence and most of them quit chemicals for the less costly but less effective kerosene emulsion. In last season's disastrous drouth the parched plants would soak up our emulsion like rain and, while the worms retreated, the bent shriveled and died. With water scarce we couldn't soak the greens before each application and I, for one, got pretty fed up with the situation. Experimenting on some sections at Keokuk, I found our previous experience with arsenate was mechanically at fault. We'd used 5 pounds to 1000 sq. ft. and let it soak. The webworms seemed to just wait for the solution to seep down before they scurried through it to feed on the clear three inches of bent and topsoil.

I aim to saturate the surface and permit seepage to cover only the first three inches. Before an application, my green is watered enough to carry for three days' play. Then the poison is sprayed on—three pounds per 1000 sq. ft. in solution—and the surface goes white. The stored water prevents the solution from soaking deep and it has routed the worms upward. Four days show a complete kill and vigorous turf. The infrequent applications cut maintenance costs considerably and play is not interrupted.