Developing Fine Turf with Aid of Fertilizers and Chemicals

By O. J. NOER

(The second article of a series on fairway turf.)

Top-dressing fairways not necessary: Extensive top-dressing of fairways with soil is expensive and rarely justified. There is the added danger of introducing clover and objectionable weed seeds, especially crab grass. It is impossible to obtain weed-free soil in quantity.

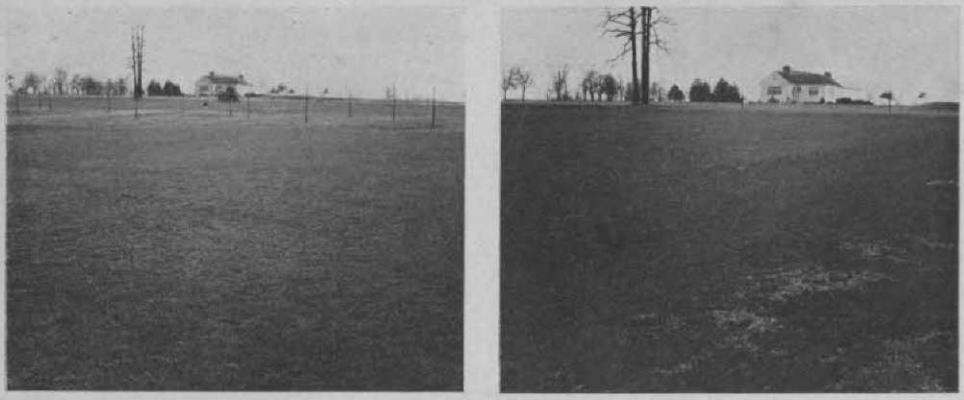
Turf is thin and usually in scattered patches on bad fairways. Players object to the uneven surfaces and suggest top-dressing to make them true. They are uneven because of the depressed spaces between the clumps of grass, and not because of inequalities at the soil level. The sole of turf above ground level makes the fairway seem rough. The objectionable "cuppy" depressions will disappear after a uniform turf coverage is obtained. Fertilization rather than top-dressing is the most effective and least expensive way to improve poor fairways.

Even on sandy soil, top-dressing is seldom justified. Increased waterholding capacity is not effectively improved by several inches of heavier soil. Irrigation is a more satisfactory answer and usually cheaper in the long run. However, supplementary fertilization every year is imperative; otherwise clover and weeds take possession.

Lime: At one time lime was blamed as the principal and often as the sole cause for clover and weeds. It came back into favor following the disastrous summer of 1928. Turf authorities now concede that soil can become too acid — even for the acid tolerant bent grasses and fescue.

Modern practice is to express soil reaction in terms of pH. Figures on the scale go from 0 to 14. The mid-figure 7 represents a neutral soil. Lower figures denote increasing acidity, and differ by multiples of 10. Thus 6 is ten times, 5 is one hundred, and 4 is one thousand times more acid than neutral.

Definite need for lime is indicated when soils are moderate to strongly acid. With borderline soils in the range of pH 5.8 to 6.0, no serious harm will result from delay until definite need is established by test strips across one or more fairways. The best plan is to establish two plots measuring 10′ x 100′ each. Lime applications of



These two adjoining fairways were Milarsenited and reseeded. Kentucky bluegrass was used on the one on the left at 125 lbs. per acre. It did not make a tight turf. Crabgrass came back. On the adjoining fairway at the right, 10% Astoria bent was used with bluegrass. The seeding rate was 125 lbs. per acre. Note the greater turf density and absence of crabgrass.

Corrugations in a watered fairway caused by excessive mowing speed. Crabgrass and clover become bad in the depressions. Tractor speed should be reduced and fairways should be cross mowed every other time to correct the conditions.

50 and 100 pounds, respectively are equivalent to 1 and 2 tons per acre.

Magnesium may be deficient on acid soil: Soils needing lime should be tested for available magnesium. When it is low by a dependable method, a finely ground limestone of high magnesium content should be used to eliminate the possibility of magnesium deficiency as a plant nutrient. The magnesium content of the limestone should be 20 to 30 per cent, reported as magnesium oxide. High magnesium limestones are called dolomite, or dolomitic limestone.

Secondary effect of lime: The direct effect of lime on growth is only one reason for using it. The turf on acid soil shows the effect of drought several weeks earlier than when the soil is above pH 6.0 in reaction. The development of localized dry spots in summer, especially on watered fairways is aggravated by excessive soil acidity. The use of lime will help grass resist drought and reduce the dry spots in amount and intensity.

Strong soil acidity checks the decay of clippings, dead stems, leaves, and roots. They accumulate at the surface as a peatlike layer, sometimes several inches thick. When this occurs it is impossible to keep good turf during hot weather. Cross-discing, renovation with a rotary hoe, or better yet, with an Aerifier, followed by an application of finely ground limestone eventually corrects the condition. The use of nitrogen to encourage development of the soil organisms responsible for decay of plant residues is sometimes necessary.

Phosphorous is fixed in difficultly soluble forms when the soil is strongly acid. A reaction of pH 6.2 to 6.5 is most favorable for the mobility of phosphorus.

Fertilization of established fairways: Fertilization is the clue to increased turf density, provided other unfavorable factors have been corrected.

Phosphate and potash are needed by every plant, but play a secondary role on established fairways because clippings are not removed. Nevertheless, the first step in formulating a fertilizer program is to decide whether the soil supply of these elements is adequate. If not, they should be applied so nitrogen can do its work and produce a dense uniform coverage of turf.

Potash rarely needed: Fairways seldom need potash fertilizer because most soils contain an abundance of it. The soil supply is replenished when the clippings decay. The use of potash without adequate amounts of nitrogen encourages clover. Poor sandy soil and the peats are the only ones that may need potash occasionally. An application of 60 per cent grade muriate of potash at 100 to 200 pounds per acre is ample.

Phosphate overemphasized: The need for phosphate on established fairways has been overemphasized by some. It should be used liberally only on soils known to be deficient, or where reseeding is necessary. The initial application should furnish 80 to 100 pounds per acre of actual phosphoric acid. This amount is contained in 400 to 500 pounds superphosphate, 20 per cent

grade. After that, a fertilizer containing one-third to one-half as much phosphoric acid as nitrogen will supply all the phosphorus fairway grass requires. Phosphate alone, or without enough nitrogen, encourages clover also.

Nitrogen is the key to good fairway turf: On established fairways, nitrogen fertilization is the thing that causes grass to spread and form a dense turf. When used in adequate amount, it helps discourage clover and weeds. There were good fairways before the days of sodium arsenite and 2,4-D, both in the North and

Weeds are mostly plantain and grass is Kentucky bluegrass with a little bent. Good turf can be secured by using 2, 4-D and fertilizer.

in the South. The problem of crowding out clover and weeds was simpler with Bermuda, but it was not too difficult on Northern bent fairways.

Nitrogen imparts deep green color, and is responsible for active growth more than any other element. It is the sales promoter among plant food elements. When phosphate and potash are applied alone or in combination, the effect is seldom noticeable to the eye. But put nitrogen with them, or apply a little ammonium sulphate, nitrate of soda, etc., and the effect is startling and like magic. The grass becomes a beautiful dark green, and starts to grow at an accelerated rate. Because of this marked effect on top growth, many conclude that nitrogen is the cause of shallow roots. This is not true. Nitrogen is an essential constituent of protein, which is in turn a vital part of every plant cell. Roots are made up of cells and need nitrogen just as well as leaves and stems. The root system will be restricted when nitrogen is deficient. Only when the use of nitrogen is grossly overdone does it tend to produce shallow roots.

On starved grass heavy rates of nitrogen are justified spring and fall until turf of desired density is obtained. After that, the rate can be reduced to bare maintenance requirements and possibly to only one application a year. In crab grass regions, major nitrogen fertilization should be in the fall with smaller doses in the spring in order not to encourage crab grass. Farther north heavy spring feeding is feasible and desirable.

Summer use of nitrogen on watered fairways: Lack of moisture need never be a growth-limiting factor on watered fairways, so fertilizer can be used at any time from the moisture standpoint. Some of the courses in northern regions apply little or no nitrogen at the start of the growing season in spring. They wait for the first flush of growth to subside and fertilize in May or June. More nitrogen is applied each month during the summer, but in limited amount, and is followed by a generous application in September. This plan has been eminently successful where bent grass predominates. Withholding nitrogen in early spring is believed by some to help discourage poa annua.

Kind of Nitrogen Fertilizer to Use: There are two types of nitrogenous fertilizer. One kind is water soluble and exemplified by ammonium sulphate, urea, ammonium nitrate, cyanamid, etc. They

A watered fairway of poa annua. The Kentucky bluegrass is gone because of close cutting and heavy watering. The footprints are bad because grass is wilting and about to die. Then clover will become worse. Renovation and reseeding with colonial bent is needed on this course.

are inorganic chemicals which act quickly and burn if used at heavy rates. Effects are of short duration, when compared with the other group of natural organic fertilizers exemplified by cottonseed and soybean meal, tankage, and Milorganite. The nitrogen in them is mostly water insoluble and is converted into usable form by soil

organisms at a variable rate. Organics act slower than chemical fertilizer, but effects last longer.

Both kinds of nitrogen have their place in turf fertilizer programs, but the trend is toward organics for fairways. Some use organics only, others a combination of both, and a few prefer chemical sources only. Split applications are necessary with soluble fertilizer on starved turf to provide enough nitrogen. Serious burning of the grass is bound to occur when the total quantity is applied at one time. True organics are safe to use in a single appli-

White grub damage on a fairway caused by the Phyllophaga grub. Weeds and clover get a start in the injured spots. It costs less to prevent, rather than repair, damage.

cation, even at the heavy rate needed in impoverished soil without danger of scorching the turf. Organics are safe for summertime use and are definitely superior for fall, because any nitrogen not taken up and utilized that season will not leach away during winter. Cool weather in spring retards decomposition of organics, so the use of soluble fertilizer at that time will start earlier growth when that is desirable.

Water requirements are lessened by an adequate supply of nitrogen: No amount of water will produce green grass on nitrogen depleted soil. When nitrogen is adequate, much less water is needed to keep the grass green and turf dense. On watered fairways, the cost of fertilizer is offset in large part by the reduced expense for water.

Turf on unwatered fertilized fairways stays green longer after drought starts, and comes back quicker after rains. Less water is needed to revive the brown turf. Grass recovers on fertilized fairways after a light rain but there is little or no visible effect on unfertilized fairways.

The startling effect produced by 2,4-D has made everybody more conscious of weeds, and has focused attention on chemical weed killers. Some results on broad leaf weeds have been so striking that the other factors in weed control have been overlooked. Unless dense turf is developed after killing the weeds, there will be another and a bigger crop of the same kind, or new weeds will appear. Some clubs used 2,4-D in the spring to kill broadleaf weeds and made crab grass worse. Farther north, where crab grass is less active, but clover a more serious pest, it replaced the weeds on the unfertilized turf.

The simplest weed problem is on courses where turf is thin but the grasses are the right kind and weeds are dandelion, plantain, and buckhorn. On these fairways, 2,4-D along with generous fertilization—and lime if needed—will do a miraculous job, usually in one season. Before the discovery of 2,4-D, it took several years to crowd and eliminate the weeds by fertilization alone.

The next simplest case is on courses where existing grass is pure bluegrass, but watering is contemplated. The broadleaf weeds can be killed with 2,4-D, then nitrogen and phosphate fertilizer applied generously, and good quality colonial bent seed introduced. Within a few years after starting to water and cut bluegrass turf short, poa annua and clover usually take over. Then it is a tough job to get a satisfactory stand of bent grass with a single seeding.

The toughest job is on watered fairways which have been cut so close that there is little or no permanent grass left. Poa annua is the principal grass and grows well in spring and fall along with chickweed. During the summer clover and knotweed are bad. The use of 2,4-D has been disappointing because it doesn't kill clover or chickweed effectively and because it is not a safe material to use before sowing grass seed. The most satisfactory renovation program has been to use sodium arsenite several times during the summer to kill the clover, chickweed, and knotweed and to check the poa annua. Then to seed with colonial bent. Such a program has been used successfully on a number of courses.

Sodium arsenite continues to be the best treatment for crab grass on a large scale, such as fairways. Light dosages will kill it at the time seedheads start to form, although two or three treatments may be needed. The soil must be moist to a depth of 4 to 6 inches in order to avoid serious injury to the grass. Clubs in Philadelphia have used sodium arsenite on crab grass infested fairways and then seeded with colonial bent.

(Continued on page 88)

Club Managers Appoint Regional Directors

John J. Pomeroy, Red Run GC, Detroit, re-elected president of the CMAA, announces the appointment of Regional Directors for 1949 by the Board of Directors at a meeting following the annual convention. Country Club managers named to regional positions were: Harry C. Andrews, Oakley CC, Watertown, Mass.; Mac Arrowsmith, Colonial CC, Memphis, Tenn.; Ralph P. Collins, Transit Valley CC, East Amherst, N.Y.; C. W. Gelwick, Gainesville G&CC, Gainesville, Fla.; Carl J. Jehlen, Glen Ridge CC, Glen Ridge, N.J.; L. Shell Jones, Danville GC, Danville, Va.; William Overton, Lubbock CC, Lubbock, Texas; E. A. Vetter, Portage CC, Akron, Ohio.

DEVELOPING FINE TURF

(Continued from page 58)

Common chickweed is becoming a serious pest on watered fairways in the North. One spraying with 2,4-D checks but does not kill it. Repeated treatment with 2,4-D is dangerous where there is any amount of bent grass in the fairways. The bent will be seriously damaged. Some clubs have had excellent results by using sodium arsenite in October and November. The chickweed is one of the last plants to stop growth in the fall. Two or three treatments of sodium arsenite, spaced a week or two apart can be made and will not be noticed because the grass has started to turn brown by that time.

Soil Compaction and Matted Turf

The turf on approaches should be better, or at least as good as on any other part of the fairway. Many approaches have the poorest coverage and are mainly clover and knotweed after early summer. Wear from concentrated traffic by players and tractor drawn equipment, along with associated

compact soil are the common causes. Damage may be accentuated further by poor placement of traps from a maintenance standpoint. Some of them make traffic congestion even worse. The same thing occurs to turf around some traps placed along the edge, or jutting out into the fairway. Repeated passage over the same spot by tractor and mowers wears the turf and compacts the soil. A greater concentration of knotweed down the center of some fairways is due to wear and compaction from double passage over the same strip by tractor and mowers to complete the cut. This is another reason for mowing in different directions. Some cross-mow to avoid corrugations, but distribution of wear may be just as important.

The use of the F. G. Aerifier, a rotary hoe, or a disc once or twice a season should go far toward producing better turf on approaches, around traps, and down the center of the fairway, by eliminating soil compaction. The aerifier does the best job in theory at least, because of the cultivating effect of the spoons.

Fairway turf in the North and Bermuda grass in the South may develop a dense surface mat. Water from rains or sprinklers does not penetrate the mat and wet the soil below. Root systems underneath the mat are shallow. The grass wilts and dies during dry periods. The use of these tools (Aerifier, rotary hoe, or disc) destroys enough of the mat so water will penetrate and turf will develop a better root system. These mechanical tools are very beneficial on fairways. Spring and fall are the best times to do the renovating. Some favor fall, especially in the bad crab grass areas.

Insects and Fungus Diseases

Fairway turf must be protected from injury by insects such as white grubs and chinch bugs. Earthworms are objectionable to players and ants are troublesome in some places. Cut worms may cause severe damage occasionally, particularly in the South. Leaf spot is the most serious fun-

gus disease, although dollar spot and brown patch occasionally attack bent fairways.

White grubs: The grubs of the Japanese, the Asiatic, and the May or June beetle frequently cause serious and extensive damage to turf. The life cycle of the Japanese and the Asiatic beetle is completed within a year, so turf damage is apt to be an annual occurrence. The May and June beetles have life cycles covering a span of three years. Severe injury may occur every third year, but in some places, such as western Michigan, two broods are extensive, so turf devastation may be bad two years out of every three.

Grub-proofing of turfed areas is justified wherever there is any possibility of severe damage. May, June, Japanese, or Asiatic beetles in great numbers are the forewarning of a plentiful crop of grubs that fall and the next year. The grub-proof treatments are expensive, but the task of fairway renovation is even more costly. Any club in the path of the advancing Japanese beetle should meet the problem of grub control before the beetles arrive. It is a case where an ounce of prevention is better than a pound of cure.

Lead arsenate was the first effective insecticide used to control white grubs. It lasted five years or more when applied at 200 to 400 pounds per acre, and controlled every known species. Slowness of action was its chief drawback. An application made at the first sign of turf damage did not stop further injury that year. By the next season the treated area was protected. Lead arsenate has become so costly since the war that it is not being used.

DDT and Chlordane are the materials now being applied for grubs of the Asiatic, Japanese and the annual June beetle grubs. Control is excellent, and the action is fast, particularly with Chlordane. The recommended dosages are 25 pounds actual DDT and 10 pounds actual Chlordane per acre. The effect from DDT lasts four to five years or more, and Chlordane plots treated three years ago are still grub-free, but the untreated ones are not.

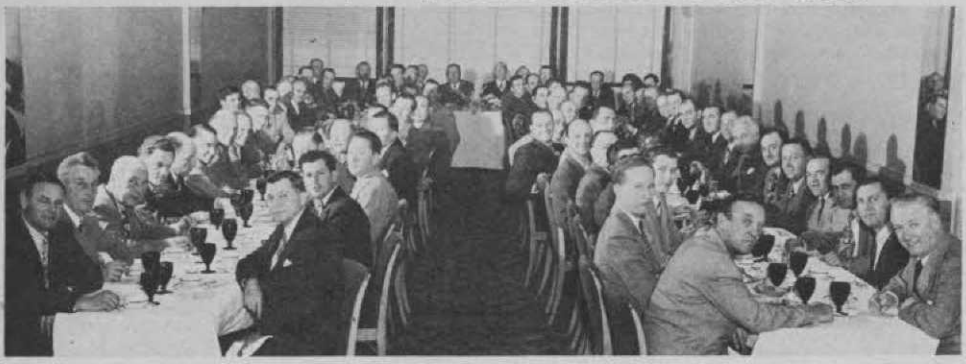
A disease called "Milky White Disease" kills the grub of the Japanese beetle. Entomologists say the action is a specific one, and that the disease does not affect other specifies of white grubs. Spores of the disease are mixed with talc and used to inoculate the soil. A commercial preparation is marketed under the trade name "Japademic". The mixture is too costly to be applied broadcast. Spots are treated instead, according to a definite pattern. The disease spreads gradually in the soil and does not become fully effective for three to five years. Hence treatment to stop an infestation, followed by inoculation with the disease is advisable.

The white or phyllophaga grub of the 3-year life cycle June beetle is harder to kill, especially during the second year of its residence in the soil, than the annual types. DDT has not been effective on these grubs. Chlordane at more than the 10-pound rate is said to be effective against the grub during the first year of its growth. The use of lead arsenate is still advocated by some for this grub.

Sodium arsenite and arsenic acid used for weeds helps control white grubs of all kinds. Concentrations of 1½ to 2 pounds per 1,000 square feet (60 to 80 pounds per acre) equal 5 to 10 pounds (200 to 400 pounds per acre) of lead arsenate.

Chinch bugs: The chinch bug has been a turf pest in Florida for a long time, but caused little damage in the North until

ILLINOIS SECTION, PGA, HOLDS ANNUAL SPRING MEET



Illinois Section, PGA, made plans for its biggest year of activity at the annual spring meeting held in the Morrison Hotel, April 4. In the background seated at the head table are: (L to R) Fred Slyder, CDGA sec'y.; Frank Whiston, CDGA pres.; Geo. S. May, Tam O'Shanter CC; Joe Graffis, GOLFDOM magazine; Bill Gordon, Ill. Section pres.; John Kennan, ex. sec'y., WGA; John D. Ames, Chmn., USGA Implements and Ball Committee, and Lou Strong, Ill. Section sec'y.

the past decade. Injury has been confined to the region along the Atlantic Coast, and to parts of northern Ohio. The insect causing damage in the North is called the hairy chinch bug, and is not the one responsible for injury to farm crops throughout the temperate zone.

In the nymph stage, the chinch bug is small and reddish in color. When fully grown, it is one-eighth inch long, and oval in shape. The body is black and the wings are white with black markings, and are folded on its back. Chinch bugs injure grass by sucking the juice from the stems. Afflicted turf wilts and turns brown. Chinch bugs do not like water or direct sunlight. Hence they are more common in dry than wet years, and are seldom in closely cut putting green turf. There are two broods, one in late May or June, and the other in August or September. The bent grasses are more susceptible to injury than fescue or Kentucky bluegrass. Clover and weeds are not attacked.

Finely ground tobacco dust, containing at least 1 per cent nicotine, derris, or cube dust containing one-half of one per cent rotonone have been used at 25 to 30 pounds per 1,000 square feet with indifferent success.

Sabadella and DDT dust are superior to anything used heretofore, but excellent kill has been claimed for Chlordane. Filmer and Smith at New Jersey got an excellent kill with 10 per cent DDT dust at 100 pounds per acre. With these new weapons there is no need to fear chinch bugs in bent turf.

Earthworms: Worm casts are very objectionable when the grass is sparse. They are bad for play and are apt to retard turf improvement by fertilization. Tractor and mower wheels squash the casts and smother the grass underneath. Worm casts are less noticeable when turf becomes dense, but are annoying underfoot to players. The control of worms is necessary on many fairways, especially if they are watered.

Lead arsenate at 200 to 400 pounds per acre has been the most effective way to control earthworms. Sodium arsenite and arsenic acid curb worms, beside their weed control function. Worm casts disappeared on experimental plots after the third or fourth treatment. So when they are used for weed and clover control, lead arsenate is not required for earthworm control.

Cutworms: The army worm is very bad some years and defoliates the grass as it moves across the fairways. Damage can be prevented by using DDT or lead arsenate as a barrier on a strip ahead of the army of advancing worms.

Leaf spot: The disease is caused by the fungus Helminthosporium vagans. The

lesions start as tiny brown specks on the leaves and enlarge until they may extend across the leaf. Then they cause the leaf to wither and turn brown. The tissue in the center of the spot becomes straw-colored, and has a narrow outer border, which is dark brown to black in color. In aggravated cases the entire leaf sheath is infected and turns brown. The stem and crown of the plant may become infected, and result in death to the entire plant. This type of leaf spot is called footrot. Permanent damage to the turf occurs during the footrot stage.

Leaf spot is most prevalent during moist cool weather, especially in spring. There is some evidence indicating that the sole and continuous use of chemical nitrogen aggravates the disease.

There are no treatments for leaf spot. Raising the height of cut to permit the development of more leaf surface is about all that can be done.

Brown patch and dollar spot: Both of these diseases have attacked bent grass fairways. Severe damage is rare. Recovery from brown patch occurs after weather becomes cooler. Total loss of grass has never been reported. Dollar spot is uncommon on well fertilized fairways, and is most prevalent on turf which does not get enough nitrogen. Injury has never been sufficient to necessitate fungicide treatment. Turf comes back and is usually better the next year because the disease thinned the grass and eliminated part of the heavy mat.

MODERN GREENKEEPING

(Continued from page 72)

golf course maintenance and in making use of chemistry has been a life-saver for golf. Without this development golfers simply couldn't afford courses of today's standard. But there is reason to believe that, given a hand by informed club officials, the greenkeepers will carry this work much farther in the next ten years. If they don't continue to supply the impetus for this progress golf's expected growth will be sharply checked. That means the clubs, the golf goods manufacturers, the professionals and the club managers all will be disappointed financially.

Salary Lag Greenkeepers' Fault

Financially the golf clubs' picture now is in sounder condition that it's ever been before. But that's not been reflected in a