

a rate to provide 3 pounds to each 1,000 square feet of green, and very beneficial effects result from this treatment. However, more definite experiments are needed before the practice can be recommended. Frequently sand alone is recommended as a late fall top-dressing on clay soil greens. Benefit may be obtained from such an application, but the evidence of carefully conducted tests indicates that sand with well-rotted organic matter and loam gives much better results than when applied alone as a top-dressing. Pure sand really does not mix well with the soil beneath but has a decided tendency to remain in a layer on the surface. Furthermore, most sand top-dressings do not leave as desirable a surface as do compost dressings, and unless sand is applied rather sparingly it has a tendency to retard the growth of the grass.

To those who wish suggestions relative to the treatment of greens here are some for consideration:

Remove noxious weeds at once.

If the greens are located south of the latitude of Philadelphia and these suggestions are received before October 15, top-dress with 1 cubic yard of compost to which is added 10 pounds of ammonium sulfate, the mixture to be applied to 5,000 square feet of green. Apply evenly and water in thoroughly. For all greens in the northeastern quarter of the United States, whether or not they have been top-dressed by the middle of October, an application of 1 cubic yard of compost to 3,000 to 5,000 square feet of surface is recommended as late as approximately December 1. The greens should be given no other treatment for the year, as far as top-dressing or covering is concerned, and if the drainage is what it should be they may be confidently expected to survive the winter in good condition.

QUESTIONS AND ANSWERS

All questions sent to the Green Committee will be answered in a letter to the writer as promptly as possible. The more interesting of these questions with concise answers, will appear in this column each month. If your experience leads you to disagree with any answer given in this column, it is your privilege and duty to write to the Green Committee.

While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

1. ANNUAL BLUEGRASS IN SOUTHERN PUTTING GREENS.—I am enclosing a small quantity of a foreign grass which is appearing in our greens in large volume. In some cases it covers the surface in patches, but in most cases grows in tufts at an interval of one or two inches, making the greens very bumpy and almost impossible to cut low enough to make a smooth putting surface. This grass appears in the early fall and is continuous throughout the winter, and is what is generally referred to here as winter grass. Last year there was very little of it in our greens, but this year, possibly by reason of our using some top-dressing which contained the weed seeds, it is present in all of the greens and creates a very serious situation. Of course, it is not difficult to pull it out by hand, but this would be a tedious job. It can also be removed by thorough scratching with a plank containing sharp nails. What treatment would you recommend for getting rid of it? (Texas.)

ANSWER.—The grass you send is *Poa annua*, or annual bluegrass,

which has been described on pages 39, 188, and 213 of the 1921 volume of *THE BULLETIN*. It is a winter grass and grows in abundance in most putting greens throughout the United States. In many sections it completely covers greens during the winter and early spring and makes a very good putting surface. Here at Washington it disappears only toward midsummer, being replaced by the bents. It is not regarded as objectionable in the latitude of Washington. Northward it seems to be more undesirable. It is reported to appear in patches on Bermuda greens at Atlanta, Georgia, and is objectionable because it does not make a continuous turf and makes the greens bumpy. It is a difficult grass to eradicate, and the only method that has been tried is hand-weeding, which is very expensive. This will have to be done very thoroughly, as the grass seeds almost next to the ground. It would also have to be weeded out or destroyed in the approaches to the greens, as of course it would readily spread from there to the greens again. We have tried the use of chemicals in various ways to kill the grass without injuring the other grasses, but have not had any real success.

2. "ATLANTA" AND OTHER STRAINS OF BERMUDA GRASS, AND THEIR SOURCE.—In the December, 1923, number of *THE BULLETIN*, on page 313, you make reference to "the discovery of the Atlanta strain of Bermuda grass." Through my interest in Bermuda grass for putting greens, I have endeavored to locate turf of the "Atlanta" strain at that place, but I learned there that all of the clubs at Atlanta purchase western-grown Bermuda grass seed, the same as all clubs through the South. I am wondering on what grounds your statement is made that an "Atlanta" strain of Bermuda grass has been discovered. Is it not a fact that on different soils and under different conditions, Bermuda grass necessarily assumes different forms? It is my experience that on poor soil Bermuda grass is of fine texture, and on rich soil it is of coarse texture. (Virginia.)

ANSWER.—Perhaps the choice of the name "Atlanta" for the strain of Bermuda grass to which we have reference, is unfortunate. It is undoubtedly true, as you state, that any one strain of Bermuda grass (and this is also true of other grasses) varies considerably in texture dependent upon the character of the soil in which it is growing. There are nevertheless many different strains of Bermuda grass, which display their differences on any kind of soil. We have grown as many as twelve different strains at different times on our experimental plots, and find that the strain to which we have given the name "Atlanta Bermuda Grass" is the best of all for putting greens. On any of the putting greens about Atlanta, or indeed in other places of the South, on clayey ground, it is very easy to detect two different strains of Bermuda. With respect to western-grown Bermuda grass seed, so far as we are able to learn (and we are fairly sure of it), both the Atlanta strain and the other strain are in the seed gathered in Arizona. In other words, this seed is not the seed of a single strain, but of at least two strains, one of which is vastly superior to the other and which we have been calling the "Atlanta" strain. Bermuda grass, like creeping bent grass, embraces a considerable number of strains, the characteristics of which persist perceptibly irrespective of the character of the soil and the conditions under which a strain is grown. The different strains of creeping bent grass that have been isolated, however, are greater in number than those of Bermuda grass.

3. TOP-DRESSING BERMUDA TURF.—We have been advised by different authorities to top-dress our Bermuda greens with nothing but sand, notwithstanding the contrary advice which has appeared in *THE BULLETIN*. When our greens were constructed, three of them had a 3-inch layer of plain muck and the rest plain glades marl or potash marl. We have been top-dressing with 25 per cent muck and the

rest marl, with a small portion of black hammock sand or leaf mold, which is very satisfactory, except for the muck, which forms small pills and is slow to disintegrate. The last top-dressing we applied was a marl hauled from quite a distance, which is of a more clay-like consistency and which we believe will be better. We should like to have your advice in the matter. (Florida.)

ANSWER.—We would not use sand for top-dressing Bermuda turf. We would advise you to use your marl soil, with good humus (and you will have to use your own judgment as to what is good humus), not to exceed 20 per cent mixed with it. If part of the humus can be barnyard manure it will be still better, as this puts life in the soil. Your finished mixture should be of such a consistency that it will rattle down into the turf like sand or sandy loam and fill in the hollows. Good Bermuda turf wants a firm soil. We have never seen first-class Bermuda turf on sandy soil.

4. TURF GRASSES FOR FLORIDA.—Our soil is a rich dark hammock soil, and we should be glad to know what grasses you would recommend for use on a golf course we are building here. (Florida.)

ANSWER.—If you are on the ordinary flatwoods type of land the best grass to seed on your fairways is carpet grass. It is possible also that the land is such that it will grow Bermuda grass, and it might be well to seed your fairways to a mixture of four parts carpet grass and one part Bermuda grass. You should endeavor to plant your putting greens with runners of Atlanta Bermuda grass. To obtain sufficient runners for the purpose, you will first have to start the grass in a nursery.

5. CHEMICAL FERTILIZERS AS COMPARED IN VALUE WITH ORGANIC FERTILIZERS; COTTONSEED MEAL AS A FERTILIZER.—Our course is in play from January 1 to April 15 only. During the rest of the year we keep our fairways mowed so as to prevent the growth of weeds, but aim not to produce a vigorous growth of grass, since it would necessitate extra expense for mowing during the period April 15 to January 1. It has therefore been our custom during this period to fertilize the fairways with sheep manure, as we understand this has a long-sustained but mild fertilizing action. Last year we were able to purchase sheep manure for \$25 a ton, but this year can not get it for less than \$35, which we think is out of proportion to its value. We can buy bone meal for \$36 a ton. Most of our soil is light and sandy, and we have accordingly been working on the theory that it is better to use organic fertilizers, in order to give the soil more body. We are aware that more nitrogen can be obtained from chemical fertilizers, such as ammonium sulfate and sodium nitrate, for the money expended in purchasing them, but believe that these fertilizers would simply serve to promote a vigorous growth of grass if used on the fairways during the summer period, and at the same time leach out of the soil before the playing season starts. How would it do to fertilize the fairways in May and September with 500 pounds of bone meal per acre, and with ammonium sulfate in December, just before the playing season starts, in order to stimulate a quick growth of the grass at that particular time? (Florida.)

ANSWER.—Under your conditions you are quite right in following the practice of using mainly organic fertilizers, chiefly bone meal. In our experience sheep manure is very expensive, measured by the results it gives. Bone meal is about the best of all organic fertilizers, and probably the cheapest in the long run. It is possible that under your conditions cottonseed meal is even cheaper; and it is an excellent fertilizer for grass. It seems to us that your policy should be to fertilize your fairways with bone meal or some other organic fertilizer early in the fall, and just before the playing season starts use ammonium sulfate or sodium nitrate for quick results. This is virtually your program, except that we do not see any value in your fer-

tilizing the fairways in May unless it should appear that the growth of the grass becomes so weak as to indicate its probable dying. The fall application is however the most important. Other valuable organic fertilizers are fish scrap, tankage, and blood meal. If you have not used cottonseed meal we would advise you to apply it rather carefully, as during hot weather it is apt to scorch the grass if used in quantities in excess of 15 pounds to 1,000 square feet.

6. SOIL PREPARATION FOR PUTTING GREENS AND FAIRWAYS; USE OF RYE, COWPEAS, AND SOYBEANS IN PREPARING LAND FOR TURF GROWING.—We have acquired additional land for the construction of nine more holes. Much of this land is abandoned farm land and some of it is pretty well grown up. The soil is for the most part a sandy loam, and is well drained. We should like to have your comments on our plans for preparing this land, which are as follows: The parts intended for the fairways we propose to plow and thoroughly clean this spring and summer of stumps, roots, stones, and other debris, putting the land in good condition for seeding this fall to rye. The following spring we shall turn the rye under and seed to cowpeas and soybeans, these in turn to be plowed under in the late summer for seeding to the permanent grasses. As for the greens, we are contemplating building up the subsurface of the soil with 6 or 8 inches of our top soil mixed with a liberal amount of well-rotted manure. Upon this we shall spread a thin layer of compost, then spread the creeping bent stolons, then spread a thin layer of compost upon the stolons, and finally roll and keep well watered. (New Jersey.)

ANSWER.—With regard to your fairways, we believe you will obtain good results by clearing the land this summer and sowing in the fall to rye, but after you turn the rye under next spring we would advise you to let the land lie idle until you are ready to sow the grass seed in the fall. An important thing in getting good turf is first to have a good seed bed. Plowing the ground twice next summer, the second time after a crop of cowpeas or soybeans, would leave the ground so loose that you might have difficulty in getting it to settle for a good seed bed. After the rye is turned under, however, the ground should be worked occasionally in order to keep down weeds and get the soil in good tilth. It should then be in good condition by the latter part of August or the first of September, which is the time when you should sow it to your permanent grass. If you could get some good manure to plow under this summer before sowing the rye, it would help materially. Care should be used also to plow the rye under sufficiently early next spring so that it will decompose thoroughly before you are ready to seed to grass.

As for your putting greens, we would suggest that instead of going to the expense of building up the surface with 6 or 8 inches of top soil mixed with well-rotted manure, you save most of the manure for the construction of compost heaps for future use on the greens after the turf is established. We have evidence which indicates that stolons will make excellent greens if planted on ordinary loam or clay loam, provided good top soil or compost is available for top-dressing afterward. At Arlington Experiment Farm, our best plats of bent are those which have as a base a well-drained stiff clay, and upon which top-dressings of compost have been applied rather frequently. On 4-year old turf the depth of the top-dressings has reached approximately 1½ inches. Top-dressings may be applied with good results every thirty or forty days during the growing season. One cubic yard of compost is a fairly good quantity to apply to 5,000 square feet of green at one time. This works in well and does not interfere with play for any considerable length of time.

In brief, your plan should be to obtain a good, well-fertilized seed bed for your fairways before sowing the seed, on account of the expense that would be involved in attempting to improve the turf on such large areas afterward; whereas with the putting greens, the growth of the grass may readily be controlled at any time, provided a good compost is available for use as top-dressing.

7. SEEDING, AS A POSSIBLE ADJUNCT TO STOLON PLANTING, IN THE VEGETATIVE PLANTING OF BENT GREENS.—During the past thirty days (August) three of our greens have been plowed up and creeping bent stolons have been planted in the manner recommended at various times by you through the columns of THE BULLETIN. In addition to an attempt at straight vegetative propagation, a liberal quantity of seed was planted at the same time. We naturally presumed that since creeping bent stolons were being planted, our people had supplemented this propagation with seed of Rhode Island or Colonial bent, or possibly South German mixed bent. However, upon inquiry we found that the seed for supplemental planting is Chewings' fescue. This policy appearing to us to be inconsistent, we ventured to inquire of one of the green committeemen why they used fescue and not bent seed. His reply was that the commercial bent seed (he mentioned German mixed bent) was very expensive, would cost about \$2.00 per pound, and possessed but a small percentage of viability. We are, however, not satisfied that it is a wise policy to supplement the vegetative propagation with a seed of an entirely different grass, unless there appeared an emergency requiring quick and sure results, in which case we would supplement with redtop and let the other take its place eventually, which it naturally should do. If, however, we deemed it necessary or advisable to plant seed in addition to stolons, in this case we think we would favor using bent seed only, as there is no emergency, and we can not hope to use these greens before next June or thereabouts. If it were a question of the cost of seed we would limit the quantity per green to fit our finances. Colonial bent would be our choice. These particular greens have been plowed up and replanted once yearly during the past three years, and we are anxious to know if we are on the right track now. (Ohio.)

ANSWER.—When a green is planted properly by the vegetative method we do not advise that any seed be sown. If, however, it is desired to sow seed, bent seed had best be used. Perhaps it is fortunate that your committee used red fescue. Fescue has no chance in persisting with the bents. This is true even when the seeds of the two are mixed. We do not see therefore that you need to be concerned about the results. The only unfortunate thing is that the money your club invested in fescue seed is wasted.

8. YARROW IN SOUTH GERMAN MIXED BENT SEED.—Do mixed bent seeds all carry a certain amount of yarrow? We find in our new greens sown with mixed bent quite a quantity of yarrow. We have read the articles on yarrow in THE BULLETIN and are not greatly alarmed by its presence but would like to know if all bent seeds carry a certain amount of yarrow. (Pennsylvania.)

ANSWER.—Yarrow very commonly comes in impurities in the South German mixed bent seed. Some samples received during the past year contain much higher amounts than formerly, and some clubs have complained of the large amount of yarrow which appeared. Yarrow makes really quite a satisfactory turf—that is, mixed with grasses—but we have failed utterly to get satisfactory turf from yarrow alone. In our opinion you should not feel at all concerned about it. While perhaps not the most desirable thing in the world in putting turf, yarrow is really not undesirable.

9. GRASSES FOR FAIRWAYS ON SAND HILLS.—We are desirous of turning a number of sand hills on our course into fairways. What grass can we sow on this

sand? Anything that will take hold will be satisfactory for the time being. (Michigan.)

ANSWER.—Red fescue and sheep's fescue will grow on poor sandy soils, but they make a cuppy turf and are much better for the rough than for fairways, and we doubt that you would care to use the latter, especially in your fairways. If the land is very sandy it would be well to include a light seeding of rye also. Your best grasses, if you can get them to take hold, are, in order named, Rhode Island bent and Kentucky bluegrass, and it would certainly pay you to include some white clover. Another thing that would be advantageous, if at all practicable, would be to top-dress with sufficient good soil so that the better fairway turf grasses will grow.

10. FERTILIZERS FOR NEWLY-PLANTED CREEPING BENT STOLONS.—What fertilizer would you advise mixing with top soil that is fairly rich at the time of planting creeping bent stolons? (New York.)

ANSWER.—We would advise the use of bone meal or stable manure. We think it best to dispense with the use of quick-acting fertilizers, such as ammonium sulfate, until plants from the stolons have made good growth.

11. UTILIZING STRAW IN THE IMPROVEMENT OF SOIL.—What treatment of straw do you recommend for making it of value in fertilizing and improving the mechanical condition of soil? (Indiana.)

ANSWER.—We would recommend that it be composted for a year with manure and soil. The decomposition of the straw can be hastened by adding approximately 100 pounds of sodium nitrate or ammonium sulfate to a ton, dry weight, of vegetable matter, and then composting this with the manure and soil, and keeping the pile moist.

12. BENT GRASS IN MIXTURE WITH BERMUDA GRASS.—Is it possible to grow bent grass in a heavily-matted Bermuda-grass green? Will the Bermuda grass choke out the bent? (California.)

ANSWER.—We do not believe that bent grass will survive in Bermuda-grass turf under your conditions.

13. RIDDING A POND OF VEGETATION.—Have you any information on the eradication of cattails? We have an area of swamp land on our course which we would like to convert into a lake if we can rid it of the cattails. On page 130 of the 1921 volume of THE BULLETIN you publish a formula for "chemical methods for destroying all vegetation." Would the use of these chemicals be practicable? (Virginia.)

ANSWER.—The only practicable method we know of for eradicating plants in swamps is the building of a dam to raise the height of the water a foot or so. This will generally kill out the vegetation. As new plants become established they can be eradicated by lowering the depth of the water to the original level. It would be very expensive to resort to the use of chemicals for killing vegetation in a pond of considerable area.

14. KELP AND OTHER SEA WEEDS AS A SOURCE OF HUMUS.—Our course is near the seashore, whence a large supply of kelp and other sea weeds is available for our use. Do you know of any objection that could be raised to our using such material in our compost piles? (Massachusetts.)

ANSWER.—Such material may be advantageously used in compost piles. The decomposition of the material can be hastened by mixing manure and soil into the compost pile, with the addition of ammonium sulfate. We advise that the humus content of the compost pile (that is, the sea weed and manure) should not exceed one-fourth of the whole, the balance being soil.