

season, watering before sunrise with a strong stream helps greatly to prevent brown-patch injury.

4. The grass should be kept cut short. It is well to mow every day.

The above are the methods adopted on the experimental plots at Arlington after a great deal of experimenting. Do not do anything else than advised above.

Washington bent is still the best strain.

Acid Soils for Putting Green Grasses*

By R. A. Oakley

Since the subject of acid soils has been brought very prominently to the attention of greenkeepers recently it would appear helpful to discuss it at this time in a very popular way. Farmers and other plant-culturists very generally have the notion that acid soils ("sour soils," as they call them) constitute one of the greatest drawbacks to crop plant production. The following is typical of a very large number of inquiries which reach the Green Section: "The turf on our greens is poor. We think the soil must be sour." It seems to be true that many of our important crop plants thrive better on soils that are neutral or slightly alkaline than they do on acid soils; but it is not correct to generalize from this that all plants prefer soils that are non-acid. As for our cultivated turf grasses, notwithstanding the many years they have been grown and studied it is regrettable but true that their soil relations so far as acidity is concerned have in no case been critically determined. It appears to be true, however, that at least the bents and fescues—that is, the ones that we use in making putting greens—are so constituted as to thrive vigorously on acid soils. When it is said that the soil relations of our turf grasses, so far as acidity is concerned, have not been scientifically determined, it is with full appreciation of the fact that there is almost an overwhelming notion that Kentucky bluegrass is a species that requires a so-called sweet soil for its best growth. Furthermore, it is very generally thought that it requires a soil well supplied with lime. It is not the intention here to attempt to break down this view. It is merely wished to call attention to some points which should be borne in mind. They are these: Largely because Kentucky bluegrass grows so abundantly and well on the limestone soils in the northeastern one-fourth of the United States and under similar conditions elsewhere, it has more or less naturally been assumed that it requires sweet soils with much lime in them for its best development. The fact that these soils are what we call rich soils, for reasons not directly related to their lime content, has not been taken fully into account. There is abundant evidence to indicate that what Kentucky bluegrass requires for its best growth is a rich soil, and some evidence to indicate that such soil need not be sweet in the commonly accepted sense of the term. For example, in certain parts of the Pacific Northwest on soils that are acid and low in lime content, Kentucky bluegrass flourishes abundantly. There is also some experimental evidence to support the view that Kentucky bluegrass can be grown with much success on acid soils if they are rich in what is called available plant food. We hope to get some very definite data on this subject from experiments already under way. This may mean much to us in developing a practice of fertilizing bluegrass fairly with the view to controlling weeds.

* A part of a paper read at the Annual Meeting of the Green Section, New York City, January 10, 1925.

The writer does not profess to know much of the theory of soil acidity. He is very much of a layman when it comes to the technical features of this phase of soils. But interesting as it may be, we need know little about it for the practical work of greenkeeping. Let us accept the empirical facts and utilize them to the fullest extent possible. We know that when ammonium sulfate or ammonium phosphate is applied to bent turf as it should be applied, and other cultural factors are as they should be, these fertilizers will assist greatly in producing good clean turf. We also know that they will tend to make the soils to which they are applied acid, and their continuous and systematic application will tend to keep these soils so. But our good friend the greenkeeper says, "I have used ammonium sulfate for some time and still I have white clover and other weeds in my greens." Very well, but when we examine his soils we find them to be neutral or even slightly alkaline, regardless of the fact that he has used ammonium sulfate liberally. Probably at some time he has used lime on his greens, or nitrate of soda, or both. Our friend the greenkeeper then wishes to know how he can test his soil so that he may see for himself just how he is progressing in the matter of getting it acid.* Technically the test is one which measures the p^H or hydrogen ion concentration of the soil. But all those making it need to know or do about this technical feature, is to regard p^H , or hydrogen ion concentration, merely as marks on a scale. When a putting green soil shows 6.9 p^H by this test it is not sufficiently acid to keep white clover or crab grass or goose grass or chickweed out of bent greens. It must get to about 4.5 p^H before results in this direction are reasonably to be expected.

For our purpose we may assume that it is the sulfate part of the ammonium sulfate and the phosphate part of the ammonium phosphate that makes soils acid; and we must bear in mind that we must use these fertilizers more or less continuously if we are to keep soils acid once they get into this condition. Soils seem to have a tendency to go back to their original condition when fertilizer treatment is discontinued. Our problem in this regard is how to get soils acid quickly without injuring the turf growing upon them or impairing their value for turf production. In the natural course of events, our fertilizer treatment, if we use ammonium sulfate or ammonium phosphate in conjunction with compost, will keep soils at about the proper acidity.

If you are still troubled with white clover and crab grass on your greens after liberal use of ammonium sulfate or ammonium phosphate, do not think them ineffective in controlling these weeds. Your trouble is probably due to the fact that your soil was high in its lime content when you started. Possibly also you have used alkaline-reacting fertilizers in conjunction with ammonium sulfate or ammonium phosphate. The thing to do is to continue with these fertilizers in the way it has been found best to use them. Desired results are sure to follow.

Don't build your tees too small.—The only way of being assured of constantly having turf from which to tee is to build your tees amply large. Under ordinary conditions 250 square feet should be the minimum space devoted to teeing grounds; if more space is available, so much the better.

* "The Use of Bromocresol Purple in Testing Soil for Acidity." BULLETIN OF THE GREEN SECTION, January, 1925, page 8.