

number of dead spots. These should be scarified and sprigged with fresh Bermuda stolons, as well as the sowing of fresh Bermuda seed each year. The amount of seed needed each year will depend entirely on the green. As soon as the green gets a good start, applications of sulfate of ammonia at the rate of 6 pounds per 1,000 square feet should be made; these applications made preferably in a water solution. However, this fertilizing may be done by broadcasting and the water applied afterwards.

The Bermuda should never be allowed to get high and rank. Early cutting is advisable. The mower should be set low and the green clipped regularly. Early and constant cutting seems to cause the Bermuda to spread. An additional application of ammonium sulfate should be made at frequent intervals, depending on the growth of the particular green under consideration. A light application of fertilizer—about every two weeks—during the growing season is advisable.

It is not necessary to do any topdressing until a few days before the green is to be put in play. To get the best results with Bermuda greens it has been found, in a majority of instances, that a topdressing should be made by using 50 percent of woods earth and 50 percent finely screened sharp sand, using this filling about every three weeks to a month.

To get a good Bermuda green the stolons should be kept buried, only the leaves of the grass showing through. Sometimes a Bermuda green can go as long as six weeks without topdressing, but this is unusual. Where giant Bermuda is used for putting greens more frequent dressings are necessary. In the so-called Atlanta strain, where the stolon is much smaller and the leaf much finer and the growth much more compact, such frequent topdressing is not necessary.

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## Poa Bulbosa

By H. L. Westover and O. B. Fitts

The Green Section, in cooperation with the U. S. Department of Agriculture, has been experimenting with *Poa bulbosa* at the Arlington Turf Garden for several years. Little has been written about this grass as the results of the experiments thus far have not been such as to warrant very definite conclusions regarding its possibilities for putting green purposes. However recent press publicity has resulted in so many inquiries concerning the value of the grass for winter putting greens that a short article giving such information as we have regarding the grass should be timely.

*Poa bulbosa* is a bluegrass, the underground stems of which are true bulbs about the size of a grain of wheat. The leaves are fine and of a bright green color. At Arlington Farm it begins to grow about October 1 and remains green until May 1, when it dies down. For this reason it is often spoken of as a winter annual, though it is in reality a perennial since the bulbs remain dormant during the summer, sending up new shoots in the fall. The grass seldom grows to a height of more than three inches until in April when it sends up scattering seed stalks about twelve inches in height. Most of the

panicles are normal in the Eastern States except that they produce no viable seed. In some cases, especially on the Pacific Coast, the spikelets are proliferous, small bulblets developing in the seed heads. The underground bulbs multiply about ten to fifteen fold per annum at Arlington farm and are known to retain their vitality for a year or more when stored in a warm, dry room. The grass is easily propagated by planting the bulbs produced underground or the bulblets produced above ground. The bulblets, while much smaller than the underground bulbs, apparently produce just as vigorous plants.

*Poa bulbosa* is a native of Europe. The grass has been established in different sections of this country for fifteen years or more, though it was not identified until 1916. Just when and how it was intro-

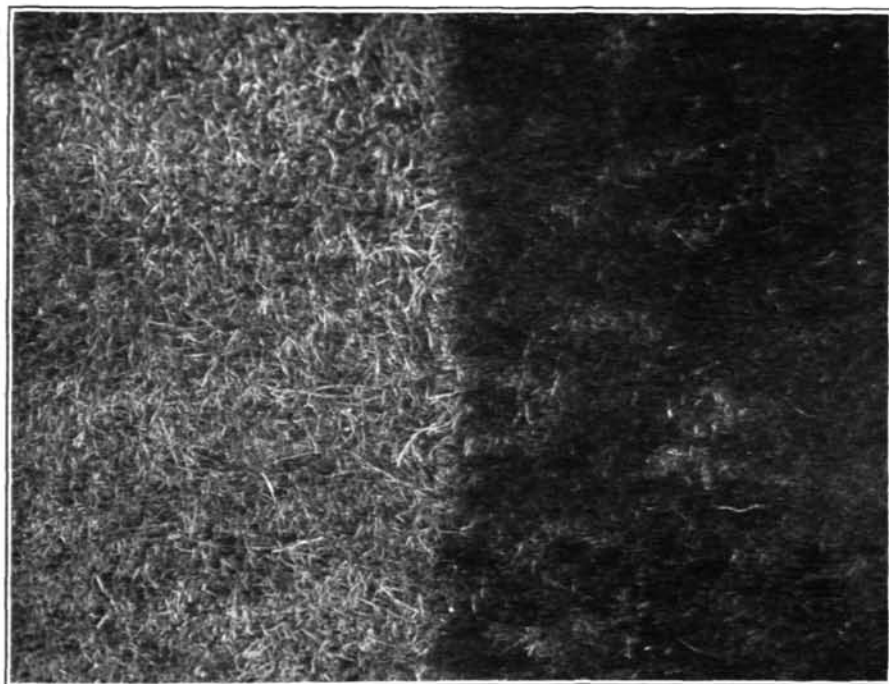


Fig. 1. *Poa bulbosa* growing in dormant Bermuda turf on the right contrasted with dormant Bermuda turf on the left.

duced is not known. It has been established in the lawn of the Capital Square at Richmond, Va., for many years where it was brought to the attention of the U. S. Department of Agriculture in June, 1915, and was positively identified in February, 1916. Since that time *Poa bulbosa* has been found growing in relatively large areas in Washington, Oregon and southern California, and in smaller areas in the vicinity of Middletown, Conn., and Virginia Beach and Ashland, Va. In 1915 a small quantity of the bulbs from the lawn at Richmond, Va., were held in the Forage Crop office of the U. S. Department of Agriculture at Washington, D. C., for a year or more. In the fall of 1916 these dry bulbs were planted in a plot at the Arlington Turf Garden and produced a fairly good stand of grass the first year.

The stand was much thicker the second year, however, and the third year a very dense turf developed. Regardless of the fact that a considerable quantity of bulbs have been harvested each spring since 1922, this thick, uniform stand has been maintained to date. In 1926 some of the bulblets were harvested on the Pacific Coast and for the first time offered for sale.

Wherever *Poa bulbosa* has been observed under turf conditions it has shown conclusive evidence of its value as a winter grass for fairways and lawns. In combination with Bermuda it furnishes a turf that is green throughout the greater part of the year. In the vicinity of Washington, D. C., *Poa bulbosa* begins growing about October 1, which is about the time the Bermuda begins to turn brown, and re-

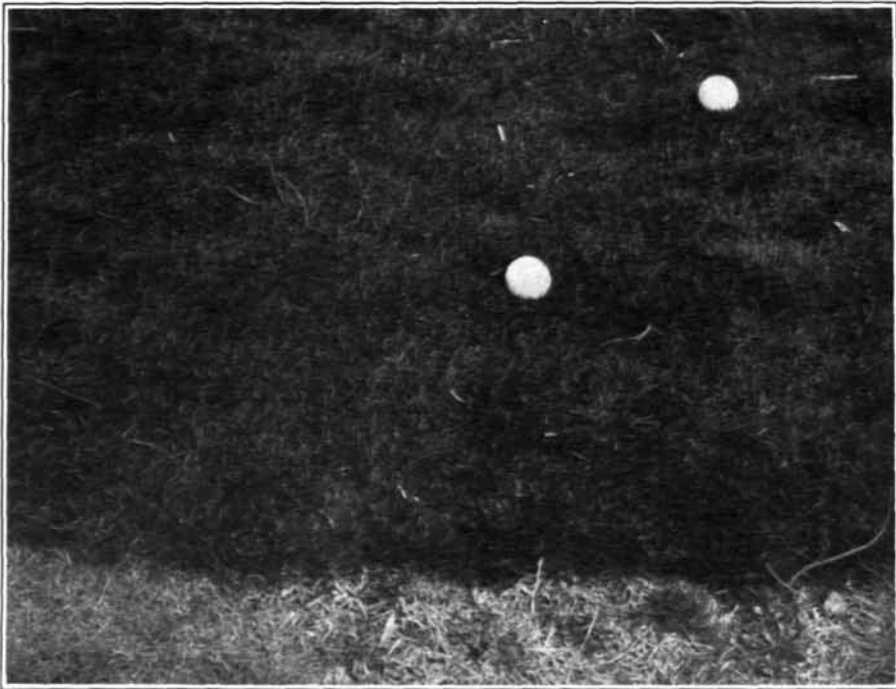


Fig. 2. A good lie on *Poa bulbosa*.

mains green until May 1, which is usually about two weeks before the Bermuda starts to grow. This lapse of two weeks is the only time during the year that the turf is really unsightly in appearance, whereas Bermuda, growing alone, is brown or straw colored from October 1 to May 15, and where *Poa bulbosa* is grown alone the ground is bare from May 1 to October 1. The accompanying photograph (Fig. 1) shows the difference during the winter months between the combination of these two grasses and Bermuda alone.

The Bermuda does not seem to interfere in the least with the growth and durability of *Poa bulbosa*, and it is doubtful if the latter will interfere with the Bermuda where conditions are favorable for Bermuda. At Arlington Farm, where the two have been growing in combination for several years, the Bermuda has thinned out con-

siderably. This, however, is not regarded as a fair test since Arlington Farm is in the extreme northern range of Bermuda grass, where it is often injured by low temperatures during the winter. Under such conditions the apparent lack of endurance of the Bermuda turf can not be attributed entirely to the *Poa bulbosa*. A valuable characteristic of this grass so far as fairways and lawns are concerned is its dwarf habit of growth, eliminating the necessity of mowing during the winter months as it seldom attains a height of more than three inches. The turf is usually dense enough to provide a good lie for the ball on fairways as shown in Fig. 2.



Fig. 3. Natural size photograph showing characteristics of individual *Poa bulbosa* plants.

We have no knowledge of this grass having been tried out under turf conditions any farther south than Richmond, Va., but there is no apparent reason why it should not grow successfully on fairways in most parts of the southeast. Recently experiments have been started in different sections of the South and it is hoped that more conclusive information will be available in the near future.

At Arlington Farm close cutting of *Poa bulbosa* which would be necessary under actual putting green conditions, has thus far been rather discouraging. We have as yet been unable to produce a satisfactory putting turf with this grass as it produces a rather long stem between the surface of the ground and the leaves (Fig. 3) and when cut closely enough to provide a putting surface the foliage is practically all removed, leaving a stubble rather than a turf. This stubble is unsightly and not at all satisfactory to putt on. Furthermore, the grass is very slow to renew its growth after being cut closely; in fact it never has recovered from more than one mowing during the entire winter. This experience, of course, is limited to the Arlington Turf Garden and there is a possibility that under different conditions it may produce a satisfactory putting green surface. How-

ever, based on our experience, we can not recommend this grass for putting greens:

*Poa bulbosa* should be sown in the fall and if the bulblets are used the rate of sowing should be about 4 to 5 pounds per 1,000 square feet; if the underground bulbs are used a somewhat heavier rate is advised. The preparation of the soil for sowing *Poa bulbosa* should be similar to that for other grasses. Where it is to be sown on established Bermuda grass turf, all that is necessary is to cut the Bermuda as closely as possible and rake or harrow lightly in order to loosen the surface, after which the bulbs or bulblets may be sown broadcast. The ground should then be rolled and in case of a dry season an occasional sprinkling will be found beneficial until the grass becomes well established. Watering is not absolutely essential, however, as the bulblets will not start until moisture conditions are favorable. For this reason there is little danger of the plant starting and then being killed by drought.

### QUESTIONS AND ANSWERS

All questions sent to the Green Section 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 Section.

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. Improving sandy fairway soil; growing rye for soil improvement.**—We are preparing to build the last four holes of our 18-hole course. The area is about 15 acres, which were covered with a sparse growth of scrub-pine and scrub-oak. The land is extremely sandy. There is a top layer of about 1½ inches of black sand produced, no doubt, by the decomposition of vegetation over a period of years, but when plowed to a depth of about 4 inches, which was necessary in order to dispose of the pine needles and smooth and level the land, this black sand was turned under and pure sand brought to the surface. Loam is scarce and expensive here, costing about \$3 per cubic yard delivered. Stable dressing can be obtained only in small quantities and is also very expensive. Can you suggest some inexpensive method of fertilizing this area? It has been suggested that we grow a crop of rye on it in the spring, to be turned under as soon as sufficiently grown, thereby getting some organic matter into the soil, and then in early September to seed the land with equal proportions of red fescue and redbot. (Massachusetts.)

**ANSWER.**—If you can get a fair turf once started on your sandy soil you should be able to bring it later to good condition by fertilizing. If you have reason to believe that it would be unwise to sow your land until the soil is improved, and if you desire to seed the land this fall, we know of no other way by which you can bring your soil to a satisfactory condition than to add loam, and mushroom soil, or manure this spring. It is not likely that a crop of rye planted in the spring would make sufficient growth by early summer to permit you by turning it under to add any appreciable amount of humus to