

being sure in particular that your drainage and your top-dressing materials are what they should be. As a prominent golf architect said to me not long ago, "Greens are always going bad, more or less." In golf turf, arsenate of lead gradually loses its toxicity and becomes chemically inert, as so much sand or cinders. The cumulative action of this chemical is improbable, if not impossible.

A Classification of the Bent Grasses

We have recently received a pamphlet entitled "Commercial Bent Grasses (*Agrostis*) in Canada," written by Dr. M. O. Malte, botanist in charge of the herbarium of the National Museum of Canada, Ottawa. This treatise appears in the annual report of the museum for 1926 (Bulletin No. 50). It is a technical discussion, but since it contains much of interest and value to those interested in the production of bent turf, we offer this brief review for the benefit of our readers to whom this information might not otherwise be available.

The increased interest in recent years in fine turf, especially for putting greens, has stimulated the demand for bent and has led to the opening of new seed sources in the maritime provinces of Canada, especially in Nova Scotia and Prince Edward Island. Dr. Malte expresses the opinion that the production of commercial bent grasses will be of increasing importance in that section of Canada. "In the writer's opinion, however," he says, "the success with which seed growing on a commercial scale may be met will, to a very great extent, depend upon the confidence which seedsmen as well as the purchasing public will have in the genuineness and trueness to name of the seed produced. Such confidence can be obtained only if the characteristics of the 'varieties' can be precisely defined and if, based thereon, a supply of pure seed, true to name, can be offered to the trade. At present, tens of thousands of dollars are wasted annually on account of a loose and, in many cases, quite misleading application of so-called scientific names to commercial varieties of bent grasses. For this the seedsmen must not be criticised too seriously as there exist, as will be seen in the following, very great differences of opinion among taxonomic botanists as to the systematic relationship between the various species and forms, differences which are quite natural on account of the perplexing variability of the different species." It is the purpose of Dr. Malte's treatise to give his "conception of the relationship of the various species and varieties of the genus *Agrostis* which are of commercial interest to Canada."

"In most Canadian seed catalogues," he writes, "only three so-called varieties of bent grasses are listed, viz. redtop, creeping bent, and Rhode Island bent. Occasionally the names 'herd's grass' and 'florin' occur, and quite recently the name 'Prince Edward Island bent' has been introduced by a few seedsmen."

Concerning redtop, the tallest and most important agriculturally of the bent grasses in Canada, he writes, "It grows anywhere from 1 to 3 feet high or more and generally possesses runners or stolons which are either wholly underground or from a subterranean start develop into upright, aerial, leafy shoots. On account of its upright growth and plentiful foliage, it is of importance as a hay grass, especially on wet land. Its relative coarseness, however, and in many

cases rather pronounced lack of durability, when cut close to the ground, make it not nearly as well adapted to lawns and greens as some of the other bent grasses."

"Creeping bent grass," he states, "as the name implies, is a grass of a spreading habit. . . . By means of runners or stolons which trail on the surface of the soil and freely root at the nodes it quickly forms a dense and continuous sod. It thrives best on moist land and is particularly well suited for lawns and greens which can be adequately supplied with water. Creeping bent is not a uniform variety, in a botanical sense, but under that name are included many more or less sharply defined races of a similar creeping habit. The majority of the creeping bent races produce comparatively few and short, scantily leaved stems."

"Rhode Island bent grass," he continues, "grows upright like redtop, but is of a lower stature and of a much finer texture. It is generally rather loosely tufted, with a dense bottom growth of short, leafy shoots. In some of its many races creeping surface stolons are developed, but these are as a rule only a few inches long and never as luxuriant as in creeping bent. It, therefore, spreads comparatively slowly and does not form as matted and compact a sod as that produced by the latter. Nevertheless, it makes a fine turf and is much superior to redtop for lawns and greens. It is much less exacting in its demand for moisture than creeping bent and, as it will thrive even on dry, sandy soil, it has a much wider range of usefulness than the latter."

Herd's grass, as applied to a species of bent grass, is the same as redtop.

Fiorin, apparently a corruption of the Irish "fiorthan," is applied to a grass belonging to the creeping bent group. This name is now in many cases applied indiscriminately both to redtop and to stoloniferous bent grasses allied to the latter.

Browntop is botanically the same as Rhode Island bent. Prince Edward Island bent is another name for the same grass.

Colonial bent is a bent grass grown in New Zealand. Historical evidence is given to indicate that the stock of Colonial bent came originally from the Canadian maritime provinces and that it is identical with Rhode Island bent.

Velvet bent, or brown bent, occurs in mixtures, but is now being harvested practically pure on Prince Edward Island. "Velvet bent," he writes, "is a more or less loosely tufted grass with short, very narrow-leaved basal shoots and commonly also with creeping surface runners. It grows to about the same height as Rhode Island bent which, to some extent, it also resembles habitually. It produces, however, a much smoother turf and is no doubt the finest of all the bent grasses for lawns and greens."

Carpet bent occurs in so-called South German mixed bent and is one of the many forms of creeping bent.

He refers to the great variety of scientific names under which these grasses are listed in the seed catalogues and even in textbooks and different editions of the Seeds Act. From this it is obvious, as he states, "that there exists a very confusing instability in the application of technical names to at least some of the most important trade varieties of bent grasses, an instability paralleled by the divergency of opinion, concerning the systematic status of the various

forms, which is found in North American floras and other scientific publications dealing with the subject." He lists a number of authoritative publications which show as great variation in the scientific naming of the bent grasses as is found among the seed catalogues. He attempts to bring some kind of order out of the existing chaos by determining the systematic relationship between the various forms and what technical names should be applied.

Dr. Malte points out that "the term 'species' is in many cases applied more or less at random and, as a consequence, in very many cases to systematic units of manifestly widely different rank. In this connection, however, it is of less importance to argue what the term 'species' should or should not imply than to set forth how it is applied, i. e., to make clear what systematic units the writer has in mind when speaking of 'species.'" He recognizes the need for minute character differences in plant breeding, but chooses for this type of taxonomic work to use the term "species" in a wide sense. Accordingly, he suggests, "It will be employed to designate groups of forms which, although in several respects differing from each other rather considerably, yet have morphological characters in common which clearly indicate that they are of a very close systematic relationship." Individuals of different species do not usually intercross, and when they do, "their progeny is, as a rule, characterized by a high degree of sterility in both the male and female organs." Progeny of such crosses, "generally termed hybrids in descriptive, systematic botany, are not uncommonly met with in grasses, although, so far, slight attention appears to have been paid to them by North American botanists." He refers to several foreign works, and states, "In the genus *Agrostis* several hybrids are well known, and in all cases their hybrid nature manifests itself by a very high degree of sterility."

The writer then gives a technical discussion of the characteristics of the different species that have been described and points out his reasons for making his classification. He traces several errors in nomenclature back through the old literature and establishes his names under the international rules of biological nomenclature. As an example of misleading characteristics, he points out that the stoloniferous habit, which by some writers is regarded as characteristic of a species, may occur in forms of all the species of *Agrostis*.

Dr. Malte recognizes only three distinct species: *Agrostis stolonifera*, *A. tenuis*, and *A. canina*.

Agrostis stolonifera is an extremely variable species and includes two distinct varieties which are well recognized in agricultural writings. Redtop he considers as belonging to this species, and is designated as variety *major*. Creeping bent, also a variety of this species, is variety *compacta*.

Agrostis tenuis is given as the most acceptable scientific name for the grass known commonly as Rhode Island bent, browntop, Prince Edward Island bent, or Colonial bent. He recognizes two distinct varieties within this species, but since they do not occur pure they are as yet of no practical importance.

The third species is velvet bent, *Agrostis canina*. There are also two distinct varieties of this species which are not sufficiently abundant to have any practical value. He also mentions two hybrids, which are rare in Canada: *A. stolonifera* x *tenuis* and *A. canina* x *tenuis*.