

efforts used to dispose of this seed to golf clubs. Because of this wider interest in bent seed we are devoting an entire number of the Bulletin to the subject of bent seed production. The seed of other grasses used on golf courses will be considered in the following number.

There are five principal bent-seed producing regions in the world and the methods used in harvesting seed in four of these regions are described in this number of the Bulletin. The fifth region, which is not reported on here, is New Zealand, from which large quantities of colonial bent seed, with a high percentage of purity and germination, are imported into the United States. The descriptions of the methods used in the four bent-seed producing regions, however, bring out the variety of methods which range from hand-harvesting to the highly developed machine-harvesting and threshing by means of the combine. It is well to compare the methods used in harvesting bent seed with those used in the production of the closely related but much cheaper seed of redbtop.

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## Oregon Bent Grass Seed Certification

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The identification of the seeds of the bent grasses has always been a problem. It has become acute with the strong demand for seed and the consequent temptation to adulterate that has developed with the higher prices. The seeds are so small that examinations with the naked eye are of little use in the identification of the various types and varieties. Such examinations serve only in the detection of the presence of inert matter and foreign seeds.

The first bent grass seed harvested in Oregon as such was threshed in 1924, and our problem of identification came shortly thereafter. When the seed of the Oregon grown seaside creeping bent grass was first placed on the market it was found that seed analysts, including our own analyst at the Oregon Experiment Station laboratory, were identifying it as redbtop. Up until that time, we did not know of the very great similarity between the seed of the two grasses, and it had not been a problem with us. At the request of Lyman Carrier, one of our staff members examined a number of seaside creeping bent fields and drew samples from every sack of seed harvested that year. A composite sample made from all these samples was examined by our analyst and by F. H. Hillman, of the seed laboratory of the United States Department of Agriculture. The composite sample proved satisfactory, and small lots of it were subsequently sent to every seed analyst and to the more important of the seed companies throughout the United States as an official type sample of Oregon grown seaside creeping bent grass seed. With the issuance of these official type samples, seed analysts soon learned to distinguish lots of seaside creeping bent grass seed that were being offered, from lots of redbtop seed, and the immediate problem for the one producer was solved.

Immediately the apparent profit in the bent grass seed crop attracted a number of dealers to Oregon, and it was feared that some of them might be tempted to mix redbtop into the much more expensive bent grass seed and the reputation of the Coos County seaside creeping bent producing district would be jeopardized. Seed certification was discussed in 1925 in order that protection of the industry

might be assured. The plan for certification consisted of a field examination to be followed by a careful examination of the threshed and cleaned seed and the sealing of the bags of seed. This plan was considered feasible, and the first field inspections were made for a small acreage in 1925.

The crop was exceedingly short that year and only a few thousand pounds were harvested. It was all sold without the sealing and so none of the seed was actually carried through the certification. In 1926 a loss of two staff members during the certifying season made it impossible to make any inspections of the seaside creeping bent grass fields. However, the first inspections of the Astoria colonial bent grass fields were made. These field inspections were made in the summer, and during the fall and winter the clean seed was inspected and sealed. This was the first bent grass seed to be certified in the United States. Certification of the seaside creeping bent grass was carried through to completion in 1927, and most of the Oregon acreage of each grass has been inspected for certification each year since that time. In each of the producing districts the beginning was made by one person or one organization, and as time has gone on others have engaged in the production and cleaning business and this has complicated the certification problem.

The development of the seed certification has been something of an evolution, and we are improving the work each year. In the first years, we simply made a field examination by walking through the fields and arriving at an empirical decision as to the quality of the field without actually having any very definitely established standards. Now we go through the fields with a tally checker in each hand. We check each step that is made during the period of examination with one instrument and use the other to check each step that contains any other bent or redtop. After having walked through representative parts of the field so that we can see any qualities or any differences, and having taken the count on what may be considered to be a fair sample of the field, we use the counts recorded on the tally checkers in arriving at a figure which will determine whether or not the field shall pass.

The standards for this certification are very rigid, in that we are very jealous of the products of the state and want them to go into the hands of customers who will be well satisfied and who will send in repeat orders. With this in mind, we do not pass any field as pure bent grass if it contains more than a very slight trace of redtop. Few fields that pass contain any at all. We do not pass any field as pure bent grass if it contains more than one-half of one per cent of other kinds of bent grass that may be recognized upon field examination. As a matter of fact, most fields offered for examination are so pure that but few are found which contain so much mixture as to require rejection. In the event that fields contain more than the permitted amount of mixtures and are harvested for seed, we record them as mixed fields, and, if the producer desires, will put on a "red statement" tag, which is not a "certification" tag but which indicates just what was found. The red tag is also used for seed that may be slightly musty or that may contain excess inseparables. In some instances this has helped to sell the seed, as the mixture is usually below 5 per cent.

The field inspector makes a record of the acreage as well as his

findings in the matter of purity and also usually makes an estimate of the possible yield of the field for checking purposes. After the fields are passed for certification, the grower is required to keep each lot separate until it has been examined after threshing and cleaning.

When the seed is threshed and cleaned, it is put in unpatched seamless bags and the inspector examines each bag for mixture or adulteration and for purity and condition. Procedure is as follows: A regular compartment grain tryer, such as is used in sampling wagon boxes or carloads of grain, is put to the bottom of each 50- or 100-pound sack of the bent grass seed; or if it is in bulk numerous samples are taken by thrusting the tryer to the bottom of the



In a bent-seed warehouse at Astoria, Oreg. On the table are samples of seed ready for examination. In the rear and to the left are sealed bags of seed; at the right are unsealed bags. A seed sampler, or tryer, is standing against the post in the center.

bin and withdrawing the sample. This tryer has a number of compartments, and upon being withdrawn from a 100-pound sack of bent grass is emptied upon a large sheet of paper on the inspection table. The table is usually filled with samples, and a general or naked-eye examination is made. If the seed looks uniform and sufficiently free from foreign material that it warrants a microscopic examination, the latter is made with a high-powered binocular. If any bag or any part of a bag shows substantial differences in quality or the presence of too much foreign material or inert matter, the entire bag is rejected for certification until it is reconditioned.

An examination of a single field of vision of the powerful binocular microscope shows about 22 to 26 seeds in the field of vision at one time. From four to six or eight fields of vision are examined in each of at least three of the piles deposited on the table by the tryer. In some cases all of the piles are examined. In this way all piles are given the general examination, and there are from three to six microscopic examinations of at least four microscopic fields on

each sack of each lot, and any sack that does not come up to specification is rejected.

Sacks that are passed are immediately secured by twisting a soft iron wire tightly around the top of the sack, using a special tying tool. Then the numbered and signed tag is sealed on the bag by passing a lead rivet through it and the loops on the ends of the tightly twisted tying wire and then crushing the rivet seal with a clamping tool or seal press. This latter method of sealing is a new one developed by the writer for this year's crop and is substantially superior to any of the seals we have seen in use so far. Formerly a combination wire tie and a lead and wire seal were used, but immediately upon breaking the seal the tag could be placed on another bag and no one would be the wiser unless he examined the actual seal very closely. The seals used carry the name Oregon Agricultural College, Corvallis, on one side, and on the other side the number of the seal press.

In the event that bulk seed is examined or in the event of the sealing of small lots as 5- and 10-pound bags, the examination is made in 100-pound bags or in bulk and, after passing, the seed in sacked and sealed immediately under the supervision of the inspector.

We believe our new sealing system precludes the second use of the tags and offers very much greater assurance that the neck of the bag may not be opened, the bent grass seed drained out, and redtop substituted.

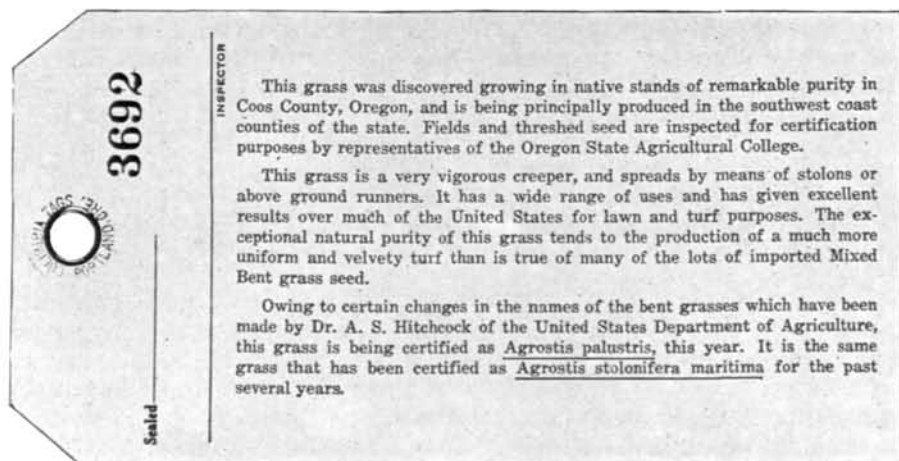
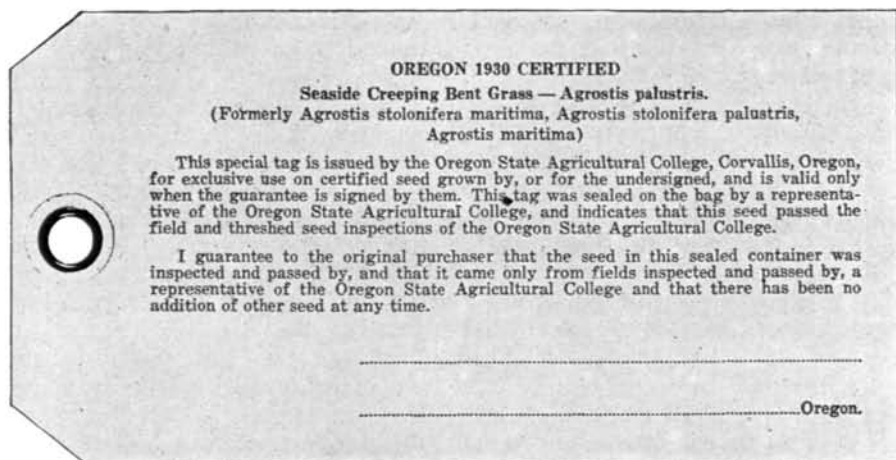
We are seriously contemplating the use of paper bags for next year, as the paper bags seem less subject to tampering than the cotton ones.

When we began the certification of bent grass seed, identification was not on a very satisfactory basis. It was and is relatively easy for seed analysts to distinguish the seed of Astoria colonial bent grass from many of the other bents because of its peculiar characteristics. On the other hand, the seaside creeping bent identification was not as easy. As experience has been gained we now feel that we are able to detect very small quantities of redtop or other bent grasses in the seaside creeping bent seed and expect that in the course of time we may be able to eliminate the need for the expensive field inspections. The seaside creeping bent seed has a very distinctive callus and crease near its base, and there is also a very distinct keel in a good many cases. There is such a substantial difference in the callus and keel characteristics between the seaside creeping bent grass and the redtop that identification is getting to be pretty positive, and now even relatively small percentages of impurities can be detected.

The standards that have been adopted in connection with our certification were considered to be very rigid a few years ago, and some of the growers criticized them because of the strict requirements, particularly in connection with some of the weed seeds difficult to separate. However, we have consistently adhered to this rigid certification system and aim to pass no lots of seed which carry more than an estimate of one per cent of weed seeds.

As certification is carried on in warehouses, on docks, in barns, and in vacant store rooms, it is not possible to carry around delicate balances and use them, and the practical use of time precludes the making of complete and detailed analyses. Experience has shown us

about how much foreign seed may be present and still not exceed one per cent. When, in the judgment of the inspector, there is more than one per cent of weed seeds in any part of a bag, the bag is required to be further re-cleaned. This was a rigid standard in the early years, but now most of the growers are so successful in their cleaning operations that there are a great many who are producing a substantially better quality of seed. The Oregon grown seed containing even one per cent of weed seeds is so much better than much



Front and back of certification tag used by the Oregon State Agricultural College on bags of certified seaside creeping bent seed

of the bent grass seed that is commonly offered on the market that we consider it very good and are planning to continue tagging such seed as blue-tag seed. However, in view of the fact that a large number of producers are putting seed on the market with not more than two-tenths of one per cent of weed seeds, we have decided that a purple-tag grade with probably not more than an estimated 25-hundredths of one per cent of weed seeds will be inaugurated. Seed

of this purple-tag quality is so good that it will do away with a great deal of hand weeding in the greens, and of course it will command a better price.

For some of the other turf purposes, such as fairways, lawns, courts, parks, polo fields, and landing fields, the seed with not more than one per cent is good; and indeed it is seed of excellent quality for a large percentage of the putting greens as well.

In the evolution of the standards, we have set up the one standard on purity or freedom from weed seeds. The field standard of not more than a very slight trace of redtop and not more than one-half of one per cent of other bents is adhered to in connection with the cleaned seed inspection.

In view of the fact that these bent grasses contain from 5,000,000 to 6,000,000 seeds to the pound, and in view of the fact that so much seed is used in normal sowings, we do not consider a small quantity of inert matter to be serious unless it is of such a character as to injure the appearance of the seed. Therefore we have not set a definite standard on inert matter, but depend a good deal on the judgment of the inspector, limiting his approval to lots that do not carry excess quantities of inert matter or that do not present a bad appearance because of the inert matter.

We will probably include bushel weight or test weight in the specifications for another year. Test weights are being made on the seed this season and most of it is running from 34 to more than 38 pounds to the bushel. Practically no seed weighing less than 32 pounds to the bushel has been passed for certification. Definite specifications of this kind will probably be included by next year.

We pass no seed as "certified" that is wet, heating, hot, or musty, or that is otherwise out of condition. We may place a red explanatory tag on some such lots, but do not place blue tags on any lot not in good condition.

The whole idea in connection with certification has been to enable the various growers to put a standard product on the market and to assure the customer that he is getting a satisfactory product. By means of careful certification and high standards we hope to maintain a continued profitable market for the Oregon bent grass seeds.

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**How birds help the greenkeeper.**—The intense activity and the rapid digestive powers of birds are responsible for the large amounts of food consumed by them. Around the golf course we ordinarily do not think of birds as an asset to the maintenance of the course, yet most birds are actually a factor of no little consequence in controlling enemies of the golfer. With respect to food habits, birds may be divided into three classes—the seed eaters, the insect eaters, and the rodent destroyers. Among the common seed eaters are the mourning dove, the cowbird, the meadow lark, and the field and song sparrows. Investigators examining the stomach of a dove found 6,400 foxtail seed, and in another 9,200 seeds of various plants were found. Foxtail is considered a weed on golf courses. Among the insect eaters are the bluebird, the robin, the blackbird, the yellow warbler, and the nuthatch. The rodent destroyers include the horned owl, the screech owl, and the various hawks.