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BARLEY IN MINNESOTA

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MINNESOTA AS A BARLEY STATE

MINNESOTA produces more barley than any other state in the Union. Its annual production is about one-sixth of the entire output of the United States. In 1929 its yield was 53,760,000 bushels from 2,200,000 acres. From 1930 to 1933, and particularly in 1933, a drouth year, yields were reduced, but the acreage was not far short of 2,000,000, showing a sustained interest in the crop.

Interest in barley in Minnesota has resulted from a growing appreciation of barley as a feed crop, of barley as a crop suited to a good rotation, and of the renewed demand for the grain by maltsters.

Because of the sustained interest in the crop, the Division of Agronomy and Plant Genetics, cooperating with the Division of Plant Pathology and Botany, of the Minnesota Agricultural Experiment Station, has sought to develop varieties that excel in agronomic characters, in yielding ability, in resistance to diseases, and in uses for feeding and for manufacturing purposes.

The results of the efforts of the two divisions named are summarized in this bulletin, as a guide to farmers in choosing varieties suited to their needs and the conditions under which the crop must be grown, and in controlling the more serious diseases.

BARLEY IN MINNESOTA

BARLEY production in Minnesota has increased greatly within the last few years. In 1926, the year that Velvet barley was introduced, 1,307,000 acres of barley were harvested, with a total production of 32,675,000 bushels. In 1929, 2,200,000 acres were harvested, with a total production of 53,760,000 bushels. From 1930 to 1933, the number of acres harvested remained fairly constant at about 1,900,000, and, owing to drouth, the production in 1933 was decreased to 28,675,000 bushels. In 1934, an extremely bad drouth year, the number of acres harvested was 1,536,000, and the production was 24,115,000 bushels. However, Minnesota still produces more barley than any other state, or about one-sixth of the barley grown in the United States.

A growing appreciation of the value of barley as a feed crop and the introduction of smooth-awned varieties adapted to Minnesota conditions have been the chief causes for the increase in the barley acreage. Barley, corn, and oats are important feed crops in Minnesota. The average farm value of barley compared with corn and oats will be found in Table 1. The figures are obtained from extensive yield trials conducted at the six experiment stations in Minnesota and summarized in Minnesota Agricultural Experiment Station Bulletin 312.

Table 1

Average Farm Value Per Acre of Barley, Corn, and Oats in Comparable Tests Conducted by the Minnesota Experiment Station, 1921-1932

Place grown	Barley	Oats	Corn
University Farm	$18.63	$18.04	$21.89
Waseca	23.97	21.05	31.02
Morris	15.78	17.14	24.31
Crookston	15.59	17.86	17.93
Grand Rapids	13.25	15.57	....
Duluth	15.78	16.97	....

The average farm value of barley is slightly greater than that of oats at University Farm, 14 per cent greater at Waseca, and less at the other stations. Southern Minnesota is the region of greatest barley production in the state. Barley is a somewhat more satisfactory feed than oats for some classes of livestock. Barley which grades "malting" will often sell at a substantial premium over feed barley.

Corn has a higher value per acre than barley, but in many sections of the state barley can be grown to greater advantage than corn, and, even in southern Minnesota, it is of advantage to grow a small grain crop in the farm rotation.

BARLEY FITS INTO THE ROTATION

A good rotation should consist of a cultivated crop, a small-grain crop, and a hay or pasture crop. Barley may be seeded so as to distribute or balance the acreage of other small grains. To include barley among the small grains aids in the distribution of labor at seeding and harvest time. The barley harvest usually precedes oats. The practice of seeding sweet clover or alfalfa with barley is becoming common. Barley is a much better companion crop than oats, as it does not shade the ground so completely.

In years when the supply of corn is limited, barley comes at an opportune time and may enable farmers to avoid the purchase of high-priced feed for pigs before the new corn is ready for use.

USES AND PRODUCTS

Maltsters estimate that 65 million bushels of barley are used annually for malting and for breakfast foods, and that about 1,500,000 bushels are pearled. This represents approximately 25 per cent of the average total barley production of the United States, and for the last few years this barley on the market has brought a premium over feed barleys. Therefore, those who grow barley in Minnesota should pay more attention to the quality of the barley they produce.

A large part of the barley crop is fed to hogs, and for that reason growers are interested particularly in its feeding value. Plump, full-weight barley, when ground, on the average is about 5 per cent less valuable than shelled corn for pork production. Barley is higher in both protein and ash content than corn, but about 6 per cent lower in energy value. There is considerably more fiber in barley than in corn and more fiber in light-weight shrunken barley than in heavy, plump grain. When possible, plump barley should be used for hog feed, as fibrous feeds are not desirable.

Hog-feeding tests conducted by E. F. Ferrin and Mark McCarty, of the Division of Animal Husbandry, University of Minnesota, showed that shelled corn gave a greater daily gain than ground barley. They found also that oats, unless very low in price, are not desirable for raising pigs for pork. Barley has less hull than oats and because of this is considered more valuable for growing pigs.

Barley has proved a valuable feed, also, for fattening sheep and lambs. P. S. Jordan and W. H. Peters, of the Division of Animal Husbandry, University of Minnesota, carried on feeding trials at the West Central Experiment Station, Morris. In the fall of 1928, they found whole barley approximately equal to ear corn, bushel for bushel. The lambs

fed whole barley made practically the same daily gains as those fed ear corn and were appraised at the same figure. The cost of the barley was higher than that of corn, so that the net profit was slightly in favor of the corn. In the fall of 1929, a comparison was made between the efficiency of barley and that of oats as feed for fattening lambs. In a ration of alfalfa hay and a protein supplement of linseed meal, oats failed to make as good a showing as barley. The lambs fed whole oats failed to gain as rapidly as those fed whole barley, required more feed per hundred pounds of gain, had a higher cost of grain, and were appraised at 50 cents less per hundredweight. In several experiments reported in "Feeds and Feeding," by Henry and Morrison, lambs fed whole barley made slightly less gain than those fed corn, and consumed 5 per cent more grain and 10 per cent more hay for each 100 pounds gained.

Barley does not do as well as corn in fattening baby beeves, as was proved by tests reported by Vaughan in University of Minnesota Experiment Station Bulletin 237. For calves fed barley the margin per calf over feed cost was $6.91; for those fed corn, the margin was $16.15. The animals fed barley returned 63 cents per bushel of grain, while those fed corn returned 96 cents per bushel.

BARLEY VARIETIES

What variety of barley a producer should grow depends on the purpose for which he intends to use the crop, on the type of land on which the crop is to be grown, and on his location in the state. If the crop is grown for marketing, seed from high-quality malting varieties should be planted, but if grown for feed malting quality is not important.

The Manchuria variety (Minn. No. 184) came from a plant selection, made by the Minnesota Agricultural Experiment Station in 1901, from an old variety by that name. Glabron and Velvet are the results of selections from crosses of Smooth-Awn with Manchuria and Smooth-Awn with Luth, respectively, made at the Minnesota Experiment Station in 1920. Wisconsin No. 38 came from a cross of Oderbrucker with a smooth-awned variety and was developed by the Wisconsin Agricultural Experiment Station. Peatland is the result of an individual plant selection, made from a variety called Switzerland, in 1918, and developed by the Minnesota Experiment Station. Trebi comes from a single plant selection, made from an original importation obtained from Asiatic Turkey. Trebi was developed by the U. S. Department of Agriculture.

Extensive yield trials have been made at the central and branch experiment stations. The results for the southern and central part of Minnesota are summarized in Table 2.

Table 2

Average Yields of Varieties of Barley in One-Fortieth Acre Plots Grown at University Farm, Waseca, and Morris, 1923-1934

Variety	Minn. No.	Yields in bushels per acre			Yield in per cent of Manchuria		
		Univ. Farm	Waseca	Morris*	Univ. Farm	Waseca	Morris*
Manchuria	184	34.0	47.7	33.3	100	100	100
Velvet	447	35.5	45.1	34.6	104	95	104
Glabron	445	40.9	46.9	36.1	120	98	108
Wisconsin No. 38†	529	36.3	51.5	36.8	107	108	111
Peatland†	452	33.4	42.8	34.4	98	90	103
Trebi	448	40.7	53.2	38.9	120	112	117

* Ten-year average, 1923-1932.

† Comparable weighted average for Peatland from 1927-1934, and for Wisconsin No. 38 from 1931-1934.

For southern and central Minnesota, Trebi produced the highest average yields. Trebi is, however, strictly a feed barley. Of the smooth-awned varieties, Glabron gave the highest yields at University Farm and Wisconsin No. 38 gave the highest at Waseca. The difference between Wisconsin No. 38 and Glabron at Morris was only 3 per cent. Glabron and Velvet, particularly the former, have stiffer straw than Wisconsin No. 38. This fact may be important on very fertile land. Peatland does not appear to be well adapted at Waseca. It is the lowest-yielding variety at University Farm, and only 3 per cent higher in yield than Manchuria at Morris.

In Table 3 are summarized the yield data from the three branch stations in northern Minnesota.

Table 3

Average Yields of Varieties of Barley in One-Fortieth Acre Plots Grown at Crookston, Grand Rapids, and Duluth, 1923-1934

Variety	Minn. No.	Yields in bushels per acre			Yield in per cent of Manchuria		
		Crookston	Grand Rapids*	Duluth	Crookston	Grand Rapids*	Duluth
Manchuria	184	35.4	25.8	35.6	100	100	100
Velvet	447	36.6	27.4	35.9	103	106	101
Glabron	445	35.9	26.4	36.3	101	102	102
Wisconsin No. 38†	529	47.4	30.7	51.5	134	119	145
Peatland†	452	38.9	29.9	38.0	110	116	107
Trebi	448	41.5	29.5	38.6	117	114	108

* Ten-year average, 1925-1934.

† Comparable weighted average for Peatland from 1927-1934, and for Wisconsin No. 38 from 1931-1934.

Wisconsin No. 38 is outstanding in yielding ability at each of these three stations, particularly at Crookston and Duluth. The other two smooth-awned varieties, Velvet and Glabron, are slightly better than

Manchuria. Glabron was superior to Velvet in yield at University Farm, Waseca, and Morris, but yielded slightly less than Velvet at Crookston and Grand Rapids.

Peatland seems to be particularly adapted to conditions at Grand Rapids, yielding more, comparatively, than at any other station. Trebi is second in yield at Crookston and Duluth and third at Grand Rapids. Manchuria gave the lowest yields, of the six varieties compared, at all three of the northern stations.

In addition to varietal trials on experiment station fields, extensive tests of Glabron and Velvet have been made on farmers' fields. This has been accomplished by furnishing sufficient seed to sow a strip of the variety to be tested in the center of the farmer's field. Yields were determined by harvesting representative samples. Results of these trials are given in Table 4.

Table 4

Comparison of Barley Varieties in Farm Trials, 1929-1933

Variety	No. of years tested	No. of tests	Yield in bushels per acre
Glabron	4	35	37.1
Trebi	4	35	39.0
Glabron	4	107	36.8
Farm Variety	4	107	33.9
Glabron	4	126	42.0
Farm Velvet	4	126	38.6
Glabron	2	13	33.0
Manchuria	2	13	28.3
Velvet	2	13	36.2
Farmer's Glabron	2	13	36.7
Velvet	2	15	33.5
Farmer's Manchuria	2	15	31.6
Velvet	1	2	32.0
Farmer's Oderbrucker	1	2	32.6
Velvet	2	2	47.8
Trebi	2	2	54.9
Velvet	2	12	39.7
Farm Variety	2	12	38.3
Velvet	1	3	30.0
Farmer's Wisconsin No. 38	1	3	37.7

Trebi, which was the second-highest yielding variety, as an average of the experiment station tests, is six-rowed and rough-awned (see Fig. 1). In a total of 35 tests conducted in co-operation with farmers, and extending over a period of four years, Trebi outyielded Glabron by an average of 1.9 bushels per acre. It is, however, not satisfactory for

malting and if sold commands the price of feed barleys, which for the last few years has been considerably below that of desirable malting types. Trebi is susceptible to covered smut, Helminthosporium, and head blight. It also has weak straw.

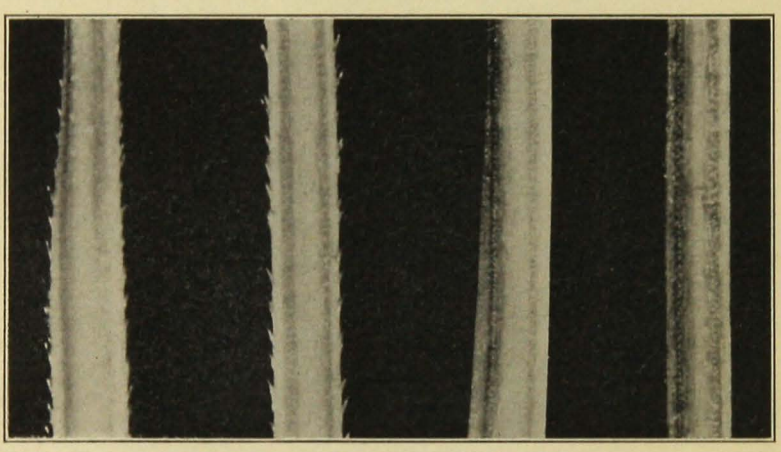

Fig. 1. Photograph of Portions of Rough and Smooth Awns
Rough-awned, left; smooth-awned, right

Velvet is a smooth-awned variety of the Manchuria type, and has yielded slightly more than Improved Manchuria. The introduction of Velvet to farmers in 1926 has without doubt been an important factor in the rapid increase in barley production in Minnesota. In 12 tests on farmers' lands for a period of two years, Velvet has produced a somewhat higher yield than ordinary farm varieties with which it has been compared. This variety is well liked by maltsters. In addition to high yield, Velvet has a somewhat stiffer straw than Manchuria. Velvet is susceptible to loose smut, scab, and stripe.

Glabron is six-rowed, very stiff-strawed (Fig. 2) and smooth-awned. In 107 comparative tests in farmers' fields, for a period of four years, Glabron outyielded the farm varieties by an average of 2.9 bushels per acre. In similar tests, involving 126 trials for four years, it averaged somewhat higher in yield than Velvet. It is susceptible to scab and loose smut.

Improved Manchuria is well adapted to all parts of Minnesota, but like other rough-awned varieties it is difficult to handle. It has been somewhat inferior in yield to Glabron and Velvet in all experiment station trials except at Waseca. Manchuria has weaker straw than either Glabron or Velvet, and is susceptible to stripe and moderately susceptible to covered smut. It has been replaced to a great extent by the smooth-awned varieties.

Peatland is a rough-awned variety, which, as its name indicates, is well adapted to peat soils. It has not yielded well, as compared with other varieties, at University Farm or Waseca. Of the six varieties compared in Tables 2 and 3, Peatland ranked third in yield at Crookston and Duluth and second at Grand Rapids. Where the common barley diseases are prevalent, such as scab, spot blotch, head blight, and black stem rust, Peatland is particularly desirable, as it is resistant to these diseases. It is susceptible to stripe, however.

Fig. 2. Glabron Barley in a Farm Demonstration Trial in Faribault County Note the difference in the degree of lodging. Glabron, left; farm variety, right.

ADAPTATION OF VARIETIES

The smooth-awned varieties, Glabron and Velvet, and the rough-awned varieties, Improved Manchuria and Peatland, seem to be adapted to all sections of Minnesota, altho some varieties produce better yields than others in certain areas (see Tables 2 and 3). Trebi and Wisconsin No. 38 are weak-strawed varieties and are not adapted to rich soils where lodging is likely to be a problem.

Some of the choicest malting barley is produced in southeastern Minnesota. The area of greatest production of malting barley is in south central and southwestern Minnesota, centering in Nobles, Jackson, Martin, Faribault, Murray, Cottonwood, Watonwan, Blue Earth, Redwood, Brown, and Nicollet counties. Barley of malting grade is often

obtained in western Minnesota also, altho there is a pronounced tendency for barley in this region to become steely in adverse years.

PERCENTAGE OF HULL

Velvet and Glabron have about the same percentage of hull, while Manchuria and Trebi are slightly lower. Peatland has the lowest percentage of hull amoung the six-rowed varieties (see Table 5).

Table 5

Percentage of Hull for the Recommended Varieties of Barley Grown at University Farm, Crookston, and Grand Rapids

Variety	Univ. Farm	Crookston	Grand Rapids	Average
	per cent	per cent	per cent	per cent
Velvet	11.5	12.2	13.2	12.3
Glabron	11.1	12.5	12.4	12.0
Improved Manchuria	10.3	12.0	11.6	11.3
Trebi	11.2	11.5	12.2	11.6
Peatland	8.4	9.1	9.3	8.9

BARLEY FOR MALTING

The interest in barley for malting is due largely to the premiums paid for such barley. The main factors in determining whether barley is of good malting quality are: variety, cultural practices, disease, and the locality in which the barley is grown. Some of the physical characteristics of barley varieties are given in Table 6.

Table 6

Some Physical Characteristics of the Barley Grain, Taken from Barley Grown at Waseca, 1931-32

Variety	Weight of 1,000 kernels in grams	Plumpness*	Mellowness*	Adherence of hull to the kernel*	Discoloration*
Velvet	33.3	2	2.5	2.5	4
Glabron	34.1	2.5	3	2	5
Manchuria	30.1	3	2.5	1.5	1.5
Trebi	39.6	3	4	1	3.5
Peatland	28.7	2.5	2.5	1	1.5
Wisconsin No. 38	35.6	2.5	3	2	4

* Scored on an index basis where 1 is the best and 5 the poorest.

Whether a variety is of good malting quality can be determined to some extent by an examination of the physical characteristics of the threshed grain. The characters of primary importance are: weight per 1,000 kernels, plumpness, mellowness, adherence of hull to the kernel, and color. In the last four columns of Table 6 the more desirable types

are represented by the lowest figures, 1 being the most desirable and 5 the least desirable. It is highly desirable that malting barleys be plump and of good size. A short plump kernel is more desirable than a long slender one. Weight of 1,000 kernels and plumpness are taken to determine the type of kernel.

In comparisons made in Minnesota, Trebi had the greatest weight per 1,000 kernels. Of the smooth-awned varieties, Wisconsin No. 38 showed the greatest weight per 1,000 kernels, but Velvet was slightly superior to Wisconsin No. 38 in plumpness. In mellowness, Trebi is inferior, and Velvet and Manchuria are the most desirable. Table 6 shows that in the adherence of the hull to the kernel the smooth-awned varieties are distinctly inferior to those having rough awns. Peatland and Manchuria were more free from objectionable discoloration. No general conclusions can be drawn from Table 6 as no variety was consistently better in all characters. It is interesting to note that in mellowness, the results agree fairly well with the recommendations of maltsters. Maltsters have listed the following varieties as satisfactory: Oderbrucker, Manchuria, Velvet, Wisconsin No. 38, and Odessa. Glabron is inferior to Velvet and Wisconsin No. 38 for malting purposes.

Cultural practices may determine whether the barley crop will receive premium prices. Barley which is harvested so early that it has a green tinge is not desired by the maltsters. After cutting, it should be shocked, left to dry thoroly, and then, if possible, stacked. Close threshing, resulting in the skinning or the breaking of kernels, should be carefully avoided. Skinned and broken kernels are objectionable, as they do not germinate properly in the malting process, making it difficult or impossible to convert the starches adequately into sugars. The tendency of kernels to skin depends upon the types of barley being grown, as shown in Table 6. The hulls of the smooth-awned varieties have a greater tendency to peel back, and it is, therefore, necessary that growers of such varieties as Velvet and Wisconsin No. 38 exercise greater care in threshing. It is better to leave some of the awn on the kernel than to have badly skinned and broken barley.

The federal grain standards provide that barley to grade "Malting" must weigh 43 pounds per bushel; must be at least 90 per cent sound; may not contain more than 5 per cent of two-rowed Trebi or black barley, and not more than 15 per cent barley and other matter that can pass through a sieve with perforations 0.076 inch by 0.75 inch; may not contain more than 5 per cent skinned or broken kernels; may not contain more than 4 per cent damaged barley, of which not over one-half of 1 per cent can be heat-damaged kernels, and at least 75 per cent of the kernels must be mellow.

DATE OF SEEDING

Date-of-seeding tests at University Farm in 1920, 1921, and 1922 showed that the best yields were obtained when barley was sown as early in the spring as it was possible to make a good seedbed. The results with later dates varied with the season. In 1920, when planting was delayed 20 days, there was a reduction in yield of about 16 bushels per acre. In 1921, 10 days' delay in time of planting led to lower yields. In 1922, however, Manchuria yielded about the same for the earliest planting, 10 days later, and 20 days later, but when planting was delayed 30 days, the yield was 11.5 bushels less than that obtained by the earliest planting.

RATE OF SEEDING

With a seedbed in average condition, the recommended rate of seeding would be two bushels per acre. A rate as low as one and one-half bushels an acre would be satisfactory if the seedbed was very carefully prepared. For average conditions, the two-bushel rate is to be preferred. The rate of seeding should be increased slightly if the seed is broadcast. Satisfactory soil conditions and good cultural practices should be maintained.

ADEQUATE SEED SUPPLY

Seed of the recommended varieties may be registered or certified by the Minnesota Crop Improvement Association, co-operating closely with the Minnesota Agricultural Experiment Station and Agricultural Extension Service. Liberal quantities of registered or certified seed are produced annually by seed growers widely distributed in Minnesota. The fields of growers producing registered seed are inspected before harvest for purity, freedom from weeds and diseases, and general fitness for seed purposes. Purity of seed stocks is rapidly lost where no effort is made to keep them up. Seed registration is a very satisfactory means of maintaining a supply of good seed.

DISEASES AND CONTROL METHODS

The most important diseases of barley are loose and covered smuts, stripe, spot blotch or Helminthosporium, scab, and blight.

Loose Smut

Loose smut infects barley at blossoming time and overwinters in the newly formed seed. The spores develop in the heads of infected plants the next year. These spore clusters are enclosed in a thin membrane which ruptures as the head emerges and sets free the loose spore-mass. The spores are soon scattered by the wind, leaving the naked rachis and infecting neighboring plants.

If barley shows a high degree of infection with loose smut, the seed should be discarded and new seed obtained. If this is impossible, enough seed for a seed plot may be treated by the hot-water method. Fill burlap bags half-full of seed and soak in water at room temperature for about six hours. Then immerse in hot water at a temperature of 126 to 129 degrees Fahrenheit for about 13 minutes. This treatment is rather difficult on the farm and if possible farmers should work co-operatively, treating their seed at a creamery where temperatures can be properly controlled.

Velvet, Glabron, and Wisconsin No. 38 are susceptible, while Peatland, Improved Manchuria, and Trebi are resistant to loose smut.

Covered Smut

The spores of the covered smut are carried on the barley seed. If the grain is not treated, these spores germinate and infect the seedling plants. The fungus keeps pace with the growth of the plant and a mass of spores is formed at ripening time in place of a barley seed.

Treatment with a formaldehyde solution made with one pint of 40 per cent formaldehyde to 40 gallons of water is effective in the control of covered smut. Dip or sprinkle the seed with this solution, or use a commercial seed-treating machine. Sow without allowing the seed to dry and do not allow the treated seed to freeze.

New Improved Ceresan, an organic mercury dust, is a better treatment for barley than formaldehyde, as it is easier to apply and controls both covered smut and the stripe disease. Use one-half ounce of New Improved Ceresan to a bushel of seed. An excessive amount should not be used as it may cause injury. Be sure the chemical is well mixed with the seed. The mixing may be done in an old barrel churn fitted with baffle boards, or a home-made mixer built on the same principle. The treatment also may be made by simply scattering one-half ounce of the dust per bushel over the grain and then shoveling the grain into a new pile 3 or 4 times and allowing it to stand for 24 hours before seeding. The dust is poisonous. It should not be breathed by the operator, and the treated seed must not be fed to livestock.

Trebi is very susceptible, Improved Manchuria and Velvet are moderately susceptible, and Glabron and Peatland are moderately resistant to covered smut.

There is another smut on barley, sometimes called intermediate smut, because it looks like loose smut and behaves like covered smut. This smut can not usually be distinguished from the ordinary loose smut in the field, but the difference can readily be determined by laboratory test. Trebi is susceptible. The control measures for intermediate smut are the same as those recommended for covered smut.

Barley Stripe

Stripe may be very destructive. It causes long white or yellowish stripes on the leaves. These stripes later enlarge and turn brown. Many of the stripes may run together, discoloring the entire barley plant. The heads also may be affected, and the entire plant killed prematurely. The spores from these brown stripes are carried by the wind and settle in the blooms of the barley spike. The disease can be controlled by the use of New Improved Ceresan.

Minsturdi, Velvet, Peatland, and Improved Manchuria are susceptible; Glabron and Wisconsin No. 38 are moderately resistant; while Trebi is resistant to barley stripe.

Spot Blotch or Helminthosporium

The organism causing the Helminthosporium or spot blotch may affect any part of the plant. Somewhat elongated, dark blotchy spots are formed on the leaves and stems. Foot and root rots often follow, and the seed may not develop properly. Primary infection results from wind-borne spores and from spores on the seed and in the soil. Numerous secondary infections may take place up to the time of ripening.

Treating the seed with New Improved Ceresan will help to control the root rot, while proper rotation, together with good cultural methods, will reduce the prevalence of the disease. The best defense against this disease is to grow the resistant varieties, Peatland, Glabron, Velvet, Improved Manchuria, and Wisconsin No. 38. Trebi is susceptible, altho it yields well in spite of the disease.

Scab

The scab organism infects the heads of barley, chiefly during the blossoming period. The attacked kernels ripen prematurely and turn pinkish to dark brown. The diseased kernels may even resemble those produced by Helminthosporium. The scab organism overwinters principally on cornstalks and stubble, where it multiplies abundantly. Therefore, the best control measure is to sow barley on land which has not grown corn for at least a year. If, however, it is necessary to sow barley on corn land, the land should be plowed deep enough to turn under the corn debris. Since scab is usually much more prevalent on low land and on lodged grain, it is important to select land with good air drainage and not too rich in organic matter.

Selecting clean and sound seed and treating it with New Improved Ceresan will help to prevent seedling blight and root rot, also produced by scab.

Most barley varieties are susceptible, but Peatland is moderately resistant and Improved Manchuria and Trebi are somewhat less susceptible than Glabron, Velvet, or Wisconsin 38.

Blight

Blight is a general term applied to grains of barley discolored by fungi and bacteria. The color of the diseased kernels may vary from pinkish brown to creosote black, depending somewhat on variety, weather condition at time of blighting, and on the causal organism. Diseased kernels generally are shrivelled as well as discolored. Many organisms are capable of blighting the kernels. In the southern part of the state, especially in the corn belt, much of the blight is caused primarily by the scab fungi, while in the northern part much of it is caused by Helminthosporium, Alternaria, and many other fungi and bacteria. This latter type of blight also is common in the cornbelt area.

The control measures for blight are the same as those recommended for scab and Helminthosporium.

SUMMARY

Minnesota leads all other states in barley production, producing approximately one-sixth of the barley grown in the United States.

Plump, full-weight barley has been found to be valuable feed for hogs, sheep, and lambs. Scabby barley should not be fed to hogs. Barley does not compare favorably with corn for fattening baby beeves.

About 25 per cent of the barley crop in the United States is used for malting. Maltsters favor Oderbrucker, Manchuria, Velvet, and Wisconsin No. 38, but refuse to buy Trebi for malting purposes. Glabron is generally classed as inferior to Velvet and Wisconsin No. 38 for malting purposes.

Velvet and Wisconsin No. 38 are recommended for production if the barley is to be sold for malting. Glabron is recommended for production for feed and for growing on rich soils where Wisconsin No. 38 is likely to lodge because of its weak straw. Peatland is recommended for production on peat soils and in sections where disease is likely to be a serious problem.

The most important barley diseases are covered smut, loose smut, stripe, scab, spot blotch, and blight. New Improved Ceresan treatment, one-half ounce per bushel of seed, will control covered smut and stripe and aid in the control of root rot caused by scab and Helminthosporium organisms. For the control of loose smut, enough seed for a seed plot should be treated by the hot-water method. Many of the diseases can be controlled or materially reduced by growing resistant varieties.