BARLEY

L. B. McWETHY

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Wyoming Agricultural Experiment Station

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BARLEY.

In the corn belt states, corn stands pre-eminent as the food for live stock. This crop is adapted to the hot growing season characteristic of those sections, but because of the higher altitudes and cooler temperatures of Wyoming, corn is not well suited to the greater part of our agricultural areas. The live stock feeders in their endeavor to grow a suitable substitute grain for winter feeding have largely given their attention to oats.

According to the reports of the Department of Agriculture for 1909, the acreage of grain grown for feed in Wyoming was apportioned as follows: Oats, 78,000 acres; barley, 4,000 acres; corn, 3,000 acres; rye, 1,000 acres. This reveals the fact that the oat crop aggregates nearly ten times the acreage of other grains grown for feeding purposes.

The relative composition of corn, oats and barley, according to Henry, is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Crude fiber in</th>
<th>Protein</th>
<th>Carbohydrates</th>
<th>Ether Extracts</th>
<th>Carbohydrates</th>
<th>Ether Extracts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100 pounds</td>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
</tr>
<tr>
<td>Corn</td>
<td></td>
<td>7.9</td>
<td>66.7</td>
<td>4.3</td>
<td>100</td>
<td>7.9</td>
</tr>
<tr>
<td>Barley</td>
<td></td>
<td>8.7</td>
<td>65.6</td>
<td>1.6</td>
<td>100</td>
<td>8.7</td>
</tr>
<tr>
<td>Oats</td>
<td></td>
<td>9.2</td>
<td>47.3</td>
<td>4.2</td>
<td>100</td>
<td>9.2</td>
</tr>
</tbody>
</table>

From the above and reference to numerous feeding tests, barley ranks as about equal in value to corn as a feed for farm animals. Oats by comparison are low in carbohydrates and high in fiber. This latter fact is due to the presence
of the hull on the oat grain, which constitutes about one-third of the weight of the grain. The hull is mainly crude fiber and practically worthless except that it gives the grain a greater bulk of less concentrated feed, making the oat popular, especially as a feed for horses. From the viewpoint of a feed for maintenance or for fattening purposes, barley, containing as it does a greater proportion of nutriment, possesses a merit not found in the oat grain. As a crop for the stockmen in Wyoming, barley deserves increased attention and more general culture.

Barley is adapted to a wider range of climate than any other cereal, records showing its successful culture from the extreme north, even Alaska, to semi-tropical localities. The cool temperatures of Wyoming allow a long ripening season in which barley reaches full development and a perfection of quality. While barley is a very successful crop under irrigation, it is also adapted to growth under conditions of minimum quantities of moisture; hence, it is one of the most desirable crops for dry farming areas.

TYPES.

There are several types of barley that could be classified in various ways according to the characteristics chosen as the basis. The more common classification is into two-rowed and six-rowed types. Another may be according to whether the grain is covered with a closely adhering hull, that constitutes from ten to twenty per cent. of its weight, or whether the kernels thresh free of the hull, as is the case with wheat. Some of the leading types are outlined as follows:

HULL PERSISTENT.

1. A Six-rowed, Hullled, and Bearded Type.—The heavy beards persist on the grain and often are only partially removed in the threshing process. This type is extensively grown and is represented by such varieties as Oderbucker
b. Six-rowed, Beardless, Hullless Barley.
a. **Six-rowed, Bearded, Black, Hulled Barley.**

b. **Six-rowed, Bearded, Hulled Barley.**
and Manshury. Both black and white varieties are found in this type. A modification of this is that of a strain in which the majority of the beards drop at ripening.

2. *A Two-rowed, Hulled, and Bearded Type.*—The beards are less harsh and entirely removed in threshing. Such varieties as Chevalier and Hanna are representative. Other varieties have black grain instead of white. A few varieties drop the main portion of their beards at ripening time.

3. *A Six-rowed, Hulled, Beardless Type.*—The entire absence of beards is the characteristic feature. The head is inclined to be brittle and to shatter easily.

4. *A Six-rowed, Hulless, Beardless Type.*—Straw strong, well covered with leaves; beards entirely absent.

5. *A Six-rowed, Hulless, Bearded Type.*—Heavily bearded; color of grain purple-black, or, in some varieties, an olive green. In the barleys of this type the straw is weak just below the head. This often proves a source of waste, especially in overripe grain.

6. *A Two-rowed, Hulless, Bearded Type.*—Heavily bearded, straw not strong. One variety presents the variation of dropping all its beards at ripening time.

In the variety test of barleys at the Wyoming station for 1909, the seed was sown on a fresh breaking of alfalfa sod at the rate of 75 pounds per acre. The plots were 1-20 of an acre in size, but not sufficiently uniform for the most accurate results. The records of the test for the season of 1909 are as follows:
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description</th>
<th>Days to mature</th>
<th>Strength of straw</th>
<th>Length of straw inches</th>
<th>Weight per bushel in lbs.</th>
<th>Yield per acre in lbs.</th>
<th>Average for the Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>203</td>
<td>Hanna</td>
<td>Two-rowed Hullled Bearded</td>
<td>108</td>
<td>Medium</td>
<td>32</td>
<td>52</td>
<td>1874</td>
<td></td>
</tr>
<tr>
<td>195</td>
<td>Smyrna</td>
<td>&quot;&quot;</td>
<td>103</td>
<td>Strong</td>
<td>28</td>
<td>51</td>
<td>2193</td>
<td></td>
</tr>
<tr>
<td>343</td>
<td>Moravian</td>
<td>&quot;&quot;</td>
<td>108</td>
<td>&quot;&quot;</td>
<td>36</td>
<td>53</td>
<td>1971</td>
<td>2071</td>
</tr>
<tr>
<td>270</td>
<td>Bohemian</td>
<td>&quot;&quot;</td>
<td>108</td>
<td>&quot;&quot;</td>
<td>35</td>
<td>52</td>
<td>1892</td>
<td></td>
</tr>
<tr>
<td>22905</td>
<td>Svanhals</td>
<td>&quot;&quot;</td>
<td>107</td>
<td>&quot;&quot;</td>
<td>36</td>
<td>54</td>
<td>2201</td>
<td></td>
</tr>
<tr>
<td>22903</td>
<td>Primus</td>
<td>&quot;&quot;</td>
<td>107</td>
<td>&quot;&quot;</td>
<td>36</td>
<td>54</td>
<td>2495</td>
<td></td>
</tr>
<tr>
<td>20000</td>
<td></td>
<td>Six-rowed Hullled Bearded</td>
<td>108</td>
<td>Medium</td>
<td>32</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>Six-rowed Hullled Bearded</td>
<td>104</td>
<td>Strong</td>
<td>31</td>
<td>51</td>
<td>2229</td>
<td>2133</td>
</tr>
<tr>
<td>283</td>
<td>Frankish</td>
<td>&quot;&quot;</td>
<td>104</td>
<td>&quot;&quot;</td>
<td>27</td>
<td>47</td>
<td>1833</td>
<td></td>
</tr>
<tr>
<td>575</td>
<td>Gaitami</td>
<td>&quot;&quot; &quot;&quot; Black</td>
<td>97</td>
<td>Medium</td>
<td>32</td>
<td>50</td>
<td>2375</td>
<td></td>
</tr>
<tr>
<td>481</td>
<td></td>
<td>Six-rowed Hulless Bearded</td>
<td>104</td>
<td>Medium</td>
<td>32</td>
<td>64½</td>
<td>1907</td>
<td>1908</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>&quot;&quot;</td>
<td>104</td>
<td>&quot;&quot;</td>
<td>32</td>
<td>64½</td>
<td>2208</td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>Ideal Hulless</td>
<td>Six-rowed Hulless Beardless</td>
<td>108</td>
<td>Strong</td>
<td>34</td>
<td>61</td>
<td>2196</td>
<td>2106</td>
</tr>
<tr>
<td>424</td>
<td></td>
<td>Two-rowed Hulless Bearded</td>
<td>108</td>
<td>Weak</td>
<td>31</td>
<td>63½</td>
<td>1803</td>
<td></td>
</tr>
<tr>
<td>345</td>
<td></td>
<td>&quot;&quot;</td>
<td>108</td>
<td>&quot;&quot;</td>
<td>31</td>
<td>63</td>
<td>1384</td>
<td>1594</td>
</tr>
</tbody>
</table>

*Some varieties were received from the Department of Agriculture, Washington, D.C., by number with no name attached.
Barley.

The following is the average yield of the varieties by types:

Two-rowed, hulled, bearded barleys, 2,104 lbs. per acre.
Six-rowed, hulled, bearded barleys, 2,153 lbs. per acre.
Six-rowed, hulless, bearded barleys, 1,998 lbs. per acre.
Six-rowed, hulless, beardless barleys, 2,196 lbs. per acre.
Two-rowed, hulless, bearded barleys, 1,593 lbs. per acre.

It should be noted that the six-rowed, hulless, beardless type is represented by but one variety, hence is hardly an accurate comparison with the other types.

There is considerable variation in the maturing period of the several varieties. An early-maturing barley has an advantage in the higher altitudes where the seasons are short. This qualification does not appear associated necessarily with lower productivity. In the table the earliest maturing variety was one of the heaviest yielders.

Some varieties of barley have a weak straw just below the head, which permits many heads to break off. This fact seems particularly true of the six-rowed, hulless, bearded type.

Shattering of the grain is another source of loss among certain varieties. It appears especially troublesome with the six-rowed, hulled, beardless type, if it is allowed to become overripe.

Proper strength of straw is often wanting. Some of the two-rowed varieties are particularly lacking in this respect, but the defect is not common to all of them.

The presence of beards has always been an objection to barley, especially from a feeding standpoint. The introduction of the beardless types has removed this trouble and made them popular, but variety tests and the general experience of growers have not proven the beardless barleys to be as heavily productive as those that are bearded. Among the bearded barleys the beards are heavier and more troublesome in some varieties than in others; with the six-rowed barleys, the beards persist strongly on the grain.
Recently considerable interest has centered around the hulless barleys. While these may have their usefulness, the presence of the hull adhering to the grain is an advantage from a feeding standpoint. Replies from many stockmen to whom inquiries were directed indicate that they prefer the hulled barleys, since the hulless varieties are harder and inclined to pass through the digestive tract entire and undigested.

Judging from results secured this season, a few of the varieties that give promise of usefulness are the following:

The six-rowed, hulled, bearded barley, No. 282, was found very productive. No. 575, Gaitami, is a very early sort and an excellent yielder in our test this season. The seed was furnished the station through Mr. H. B. Derr, of the Department of Agriculture, Washington, D. C.

No. 22203, Primus, and 22305, Svanhals, are two barleys furnished the station by the Division of Foreign Seeds and Plant Introduction of the U. S. Department of Agriculture. They are of the two-rowed, hulled, bearded type, with the valuable characteristic of light beards, nearly all of which fall at ripening. They have proven as productive as any barley grown during the year.

The white, hulless, beardless barleys are productive in their class. A leafy foliage with a strong straw suggests their profitable use as a hay crop.

In recent years there has been considerable discussion regarding the relative merit of the two-rowed and six-rowed hulled barleys. The results of variety tests at the experiment stations allow of no definite conclusions. For the western plains there seems to be some points in favor of the two-rowed barleys. In the results at this station for 1909, the average yield of the six-rowed compared with the two-rowed types gives the former an advantage of 49 pounds per acre. From the results of 1907 at this station, the best seven six-rowed barleys averaged 1,560 pounds per acre; the best seven two-rowed barleys yielded 1,709 pounds per acre, an advantage
a. No. 343 Moravian, Two-rowed, Hulled Barley. Beards Partially Fall at Ripening.

b. No. 22303 Primus, Two-rowed, Hulled Barley. A Larger Proportion of Beards Fall at Ripening.
a. SIX-ROWED, BEARDED, BLACK, HULLESS BARLEY.
b. TWO-ROWED, BEARDED, HULLESS BARLEY.
for the latter of 149 pounds per acre. Whichever type is chosen for culture, the main problem is to secure the most improved strain, the producing power in pounds being the main consideration.

Having secured a satisfactory foundation strain, it is better to grow but a single variety, in order to maintain a pure stock of seed; it will also be necessary to sow an area for seed on clean ground to avoid mixing with the growth of volunteer grain. Fresh breaking, summer fallow, or land devoted the previous year to root crops or potatoes will meet these requirements. A mixture of types is detrimental to the best success of the crop; this is a certain result in ordinary practice where several types are grown on the same ranch. There is also a definite need for the production of new and improved strains adapted to local conditions, both for dry farming and for irrigated areas.

SOME CONDITIONS OF CULTURE APPLICABLE TO BARLEY.

Barley is well adapted to a large variety of soils. A deep furrow combined with a thorough working of the surface is especially essential to the best success with this crop. In common with other grain crops, thorough work in providing the plant a good medium in which to grow, will pay well in subsequent returns. Local conditions must largely govern in this matter.

It is usually better to delay the time of sowing until danger from severe freezing is past; it can well follow oats, wheat, and peas, in order of sowing.

The use of a fanning mill to remove weed seeds and foreign matter and to give uniformity of size to the seed sown is as excellent a practice with barley as with other grains.

In the culture of barley, smut may be a very serious source of loss, unless proper precautions are taken to prevent this disease. A thorough treatment of the seed with formalin,
one pound to forty gallons of water, the same as with oats, will be effective as a preventative.

A good grain drill possesses all the advantages for seeding barley that it does for other grains. The quantity of seed is determined by the stooling habit of the variety, the soil condition, and quality of seed; from 50 pounds to 100 pounds of seed per acre is standard. Particularly on heavy soils, barley is better not sown too deep.

A thorough harrowing to break up the soil crust and conserve moisture is an excellent practice during early growth; some precaution need be taken not to harrow while the barley is still too small to withstand the operation without injury.

If at harvest the barley crop is cut in the stiff dough, it will reduce the loss from shattering and improve the quality of the straw. If cut too green, shrinkage in the grain will result.

USES OF BARLEY.

Barley in its previous history has been extensively used for brewing purposes. Its chief use in the West will be as a feeding grain for live stock. Though there may be certain areas where corn will thrive, we believe barley can be raised more cheaply than corn in this state as a grain for feeding purposes. As settlers come to the state to make new homes, it will be better if they leave their corn in its native environment and devote their interest to barley as a substitute. Barley is proving to be a grain especially suitable for hogs and sheep in finishing them for market.

From the results of the feeding tests at this station during the season of 1908-09, it may be noted that corn and alfalfa compared with barley and alfalfa, gave a slight preference to barley as a feed for lambs. This work is reported in bulletin No. 81.

Prof. M. A. Carleton, of the Department of Agriculture, states: "Barley has recently acquired a steadier and stronger demand and is being more generally used every year. It is
Barley. II

growing in favor for feeding to stock, especially for hog feed-
ing. Barley-fed bacon is considered to be of much better
quality than that produced from corn.

Mr. C. C. Georgeson, in charge of the Alaska Experiment Station, writes: "I am quite certain that barley can take
the place of corn as feed for live stock, and you can grow as
heavy a weight per acre of barley grain as you can of corn.
* * * We need particularly a beardless barley, the beards be-
ing a drawback for feeding purposes. Grain hay is grown and
fed quite largely in Alaska, and it would, therefore, be a de-
cided advantage if we could get a beardless variety which will
grow as large and yield as heavily as, for instance, Manshury."

Mr. O. W. Bryant, reporting on his work at the Gov-
ernment station at Cheyenne in circular No. 92 of the Office
of Experiment Stations, writes regarding his experience with
barley: "Beardless and hulless barley has been grown ex-
tensively on five different plats each season, and has proven
to be a good dry-farmed grain, having yielded as high as
21.8 bushels per acre on summer-fallowed land. It makes
nourishing feed when ground and mixed with other feedstuffs
to form chop. It is not as sure a crop as rye, but makes a
better and stronger hay when cut green. When irrigated at
the critical period, it has developed remarkably full, heavy
berries, weighing 62 pounds per struck bushel."

The South Dakota Experiment Station Bulletin No. 113
gives results of trials of 37 varieties of barley grown for from
four to six years. In these tests the Kitsing, a two-rowed
variety, in a four-year test yielded an average of 45.3 bushels;
Odessa, a six-rowed variety, in a five-year test averaged 43.91
bushels per acre; Swan Neck, a two-rowed variety, in a five-
year test averaged 43.5 bushels; Chevalier, a two-rowed va-
riety, in a five-year test averaged 41.21 bushels; Chevalier, a
two-rowed variety, in a six-year test averaged 40.94 bushels;
Hanna, a two-rowed variety, in a six-year test averaged 40.66.
The results recorded in this bulletin show also length of straw,
period of growth, tendency to lodge, resistance to smut and
With regard to the uses of barley this bulletin states: "There seems to be a specific place for barley as a feed in the Northern Great Plains, for barley can and may fully occupy the position which corn occupies in the corn belt."

From the table of yields, we find that the average for all varieties was 2,019 pounds, or 42 bushels, per acre. This yield is equal in weight to 72 bushels of ears, or 36 bushels of shelled corn, per acre.

The average yield per acre of Indian Corn for the North Central states west of the Mississippi river for the past ten years was 1,571.92 pounds, or 28.07 bushels per acre. It therefore follows that if a Wyoming farmer can raise a ton of barley per acre, he can grow 25% more grain with a higher protein content than his immediate neighbors in the corn belt. It has further been demonstrated that barley is equal as a maintenance and fattening ration to Indian corn. The average yield of shelled corn from all the North Central states, the great corn field of the world, is but 1,749 pounds of shelled corn per acre. Our average yield of barleys last year was 15% more grain per acre than the yield of Indian corn in the great corn growing district. With these facts regarding barley, there is much hope of growing on our Wyoming farms a complete substitute for the Indian corn.