

GROWING BARLEY *in* MICHIGAN

By E. E. Down

Field test plots for comparing varieties of barley for malting purposes at East Lansing.



MICHIGAN STATE COLLEGE : EXTENSION SERVICE
EAST LANSING

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Barley and oats are Michigan's two important spring grain crops. The 10-year production, 1935-1944 average, of each in this state is as follows:

CROP	HARVESTED ACREAGE	TOTAL PRODUCTION (bushels)	ACRE YIELD (bushels)	FARM PRICE	ACRE VALUE
Barley	190,000	5,207,000	27	\$0.72	\$18.58
Oats	1,316,000	44,458,000	33.4	.46	14.68

The much larger acreage of oats is due to the wider adaptation of oats to different soils, the greater sensitivity of barley to adverse weather, the greater ease with which oats may be handled in harvest, the superior value of oat straw, and, to some extent, a lack of appreciation of the true value of barley.

A bushel of barley weighs 48 pounds and contains approximately 80 per cent total digestible nutrients. A bushel of oats weighs 32 pounds with total digestible nutrients of approximately 70 per cent. Hence, a 40-bushel yield of barley is equivalent in feeding value to about 68 bushels of oats.

USES OF BARLEY

Feeding—The most important use of barley is as a feed for livestock. Any good barley is acceptable for this purpose, and off-grade barley may still be used for feed.

Experiments have shown that for dairy cattle ground barley may replace corn pound for pound in the concentrate ration with equally satisfactory results. Similar results have been obtained in the feeding of steers. Sheep likewise can use barley rather than corn, and in this case the whole grain may be used satisfactorily. Hogs generally do slightly better on corn than on barley, but often hogs can be fed out on barley and marketed early, bringing higher returns to the feeder than would be the case if he waited for the new corn crop. Barley is generally considered a "heavy" feed for horses, but when properly mixed with bran or oats it may form at least one-third of the grain ration. Chickens do not readily eat whole barley but it may be used to supplement or largely replace corn in the mash feed.

Scabby barley may cause illness if fed to hogs or horses, but it may safely be fed to cattle and sheep.

Malting Barley—Malting is a specialized process in which barley of a suitable malting variety is treated in the following manner:

1. Carefully cleaned and sized.
2. Washed and steeped in water until the kernels are saturated.
3. The steeped barley is placed in large vats to germinate until the sprout reaches the tip of the kernel. In the germinating process the development of the enzyme, diastase, is stimulated and this in turn helps convert starch to malt sugar.

4. The germinated grain is dried at high temperature to a low moisture content. The "malt", dried, sprouted barley, is then sold to commercial users.

In order to be satisfactory for the malting process barley must be:

1. A variety suitable for malting.
2. Fully matured when harvested.
3. Low in moisture content — 12-14 percent.
4. Free from cracked, skinned and broken kernels.
5. Soft and mellow — not steely.
6. Strong and uniform in germination.
7. Plump and uniform in size.
8. High in test weight
9. Satisfactory as to color.

The effectiveness of the "malt" is dependent on:

1. Uniform, strong and complete germination with the sprout held close against the kernel by a sound undamaged seed coat or hull.
2. Maximum growth of the sprout without it extending beyond the hull.
3. Freedom from ungerminated or slow germinating kernels, so no starch is converted to sugar or only partially converted in such kernels.
4. Freedom from frayed or skinned kernels, whose sprouts were broken off in the germination vats (changing of starch to sugar is stopped in such kernels).

The preceding information on malting explains why great care should be taken at harvest time to prevent damage to the grain in order to obtain maximum malting prices. If barley is grown as a cash crop the best market is to the malting trade. About 100,000,000 bushels of malt is produced in this country. About 70 percent of this is used by the brewers, about 20 percent by the distillers, about 7 percent by food and related industries, and about 3 percent is used for experimental purposes.

Pearling — Pearled barley is made by the dehulling of the grain. It is used for making soup. High-quality grain is required, but the amount used is relatively small compared with that used for malting and food.

SOIL REQUIREMENT

1. For best results barley should be grown on a level, well-drained, fertile loam, silt loam, or clay loam soil.

In Michigan such soils are found most commonly in the Saginaw valley, the "Thumb" district, and the southeastern corner of the state. Although the barley acreage is greatest in those areas, the crop does equally well wherever similar soil and climatic conditions prevail.

2. Sandy soils or soils low in fertility are unsuited for barley growing. On such soils barley straw will generally be short, the grain light in weight, and the crop unprofitable.

BARLEY IN THE ROTATION

1. It is best that barley be grown in the rotation following such cleanly cultivated row crops as corn, beans, soybeans, sugar beets, or potatoes.
2. Barley is conveniently used as a companion crop for seedings of alfalfa, the clovers, and forage grasses thereby providing returns from the land while the forage seedings are being established.

FERTILIZERS

1. On loam, silt loam, and clay loam soils where no clover, alfalfa, or manure has been used recently a desirable fertilizer application for barley is 150 to 250 pounds an acre of a complete fertilizer such as 4-16-4, 2-16-8, or 2-12-6.
2. In case alfalfa, clover, or manure has been used recently the fertilizer application may well be changed to 150 to 250 pounds an acre of 0-20-0.
3. If barley is being used as a companion crop for clover, alfalfa, or grass seedings, the fertilizer should cover requirements of the forage crop to be grown in subsequent years as well as the immediate barley crop. Thus, a good fertilizer for barley and a seeding of alfalfa which is expected to be used for 3 or 4 years is 400 pounds an acre of 0-20-20.

For more detailed information on fertilizers for barley growing in Michigan, consult the most recent fertilizer recommendations of the Soils Science Department of Michigan State College (Extension Bulletin 159), obtainable from your local county agricultural agent or directly from Michigan State College.

VARIETIES

1. *Wisconsin 38*, also called Wisconsin Barless is the most commonly grown barley in Michigan. This is a smooth-awned, six-rowed, white barley, rather late in maturity. Its straw is only moderately strong, but it yields exceptionally well, and makes excellent feed. When pure and of good quality, it is acceptable for malting purposes.
2. *Bay* variety of barley is slightly earlier, has a stiffer straw and holds the heads better than Wisconsin No. 38. Tests indicate that it is equal or better than Wisconsin No. 38 in yield and slightly higher in test weight. It is a six-row smooth awn barley. Extensive malting trials indicate that it is equal to Wisconsin No. 38 for malting purposes.
3. *Spartan* is a high-yielding, two-rowed, white barley with smooth awns, sparse foliage, and a stiff straw. Its stiff straw, sparse foliage and early maturity make this variety of exceptional value as a companion crop for seedings. Because it is a two-rowed barley it is not acceptable to the malting trade.
4. *Pure seed* of these varieties is produced under certification by members of the Michigan Crop Improvement Association.
5. *Winter barley* is grown to some extent in Michigan. Winter barley matures early and, when it survives the winter, it often outyields spring barley, especially on the lighter soils and in the most southern counties. However, none of the present varieties of winter barley is nearly so hardy as the better varieties

of winter wheat. Winter killing of fall-sown barley is too common. Growers wishing to grow winter barley should plant it around September 1 and should be prepared to substitute a spring-sown crop should the winter be severe.

SEED TREATMENT

1. New Improved Ceresan dust, when used according to directions furnished by the manufacturer, will control covered smut, one form of loose smut, and some other common seed-borne barley diseases.

2. Manufacturer's recommendations must be followed carefully, because an over-dosage of Ceresan may injure germination of the seed. Ceresan is a *poison*. It must be kept away from children. Treated grain must not be fed. Breathing the dust will cause illness, hence it should be applied in an open place or the worker should wear an aspirator while applying it.



Fig. 1. Determining the best rate for seeding barley, East Lansing.

TIME OF PLANTING

1. To obtain maximum yields, barley should be planted as soon as the land can be worked in the spring.

2. In the barley-producing areas of the state, barley planting should be completed by the first of May. Barley planted later than the first week of May stands a poor chance of producing profitable returns.

SEEDBED PREPARATION

1. Land which is to be planted to barley does not need to be plowed unless there is excessive plant refuse or sod to be turned under.

2. Following a clean-cultivated crop, the seedbed should be prepared by thorough disking and dragging.

3. When plowing is necessary, it should be done in the fall so as to insure a firm seedbed and earlier planting in the spring.

4. Cultipacking, following planting is a good practice. It is beneficial to the barley crop and especially so to any seedings made with it.

RATE OF SEEDING

1. *Wisconsin 38* usually does best when planted at the rate of $1\frac{1}{2}$ to 2 bushels per acre.

2. *Spartan* barley has a larger grain than Wisconsin 38, and it should be planted in the amount of 2 to $2\frac{1}{2}$ bushels per acre.

3. Where it has been difficult to obtain good seedings of forage crops with barley, a lighter rate (Bay and Wisconsin 38, 1 bushel, Spartan, $1\frac{1}{2}$ bushel) of seeding is a good practice.

4. The general belief among growers that barley should be planted at a heavier rate on heavy soils and a lighter rate on light soils is not verified by experimental results.

DEPTH OF PLANTING

1. Barley should be planted as shallow as possible — but in moist soil.

2. On heavy soils the seed should be placed from 1 to $1\frac{1}{2}$ inches deep.

3. On light soils the seed should be planted from $1\frac{1}{2}$ to 2 inches deep.



Fig. 2. Barley should be completely ripe when it is cut with the binder.



Fig. 3. Cutting and windrowing barley with a windrowing machine.

4. Deep planting does not cause the plant to root deep in the soil or to be more drouth-resistant. Barley seedlings form their crown and permanent root system close to the surface of the soil regardless of the depth of planting.

HARVESTING FOR QUALITY

1. **Binder Harvest**—The grain should be cut with the binder as soon as it has completely ripened. When ready to cut, the kernels will be in the medium hard dough stage and the straw will have just nicely turned yellow.

2. **Windrowing**—When the windrow method of harvesting is used, the grain should be cut at the same maturity as for the binder method of harvest.

3. **Combining**—Grain must be dry (down to 14 per cent moisture) before it is cut with a combine if the threshed grain is going to keep in the bin without heating and spoiling.

CARE OF GRAIN AFTER CUTTING

1. **Binder-cut Grain**—The bundles from the binder should be shocked in open shocks. Barley usually dries better, and there is less danger of shock damage when the open, rather than the round-capped, shock is used. When the grain is thoroughly dry, it may be threshed from the field, stacked, or stored in the mow.

2. *Windrowed Grain*—The grain should be left in the windrow until thoroughly dry. Under good drying conditions, this requires from 2 to 3 days. After the grain is thoroughly dry it is picked up by the combine and threshed.

3. Grain cut with a combine is threshed in the one operation.

THRESHING

Quality of the grain is greatly affected by the threshing operations. Investigations have shown that high-quality barley is obtained more often when threshing is done by grain-separator than when a combine is used. These studies also showed that the poor quality of combined barley is due mainly to improper combine operations. The principles of operation of the two types of machines is similar. The following suggestions apply to both types of machines.

1. The operator must know his machine in order to make needed adjustments, quickly and satisfactorily.

2. Grain should be threshed immediately when dry (14 percent moisture). Grain allowed to remain in the field after reaching 14 percent moisture (in the shock, windrow, or standing for combine) becomes discolored and decreases in test weight. This change is caused by dews and rains.

3. The speed of cylinder and set of concaves should be adjusted to prevent cracking and skinning of kernels. Eliminate all end-play in the cylinder.

4. The wind should be adjusted to remove light seeds, chaff and foreign material.

5. While threshing, *check frequently* the condition of the grain coming from the machine and make adjustments of speed or set of concaves whenever necessary.

STORAGE

1. Grain with 14 percent moisture may be stored without danger of spoiling.

2. Grain with moisture in excess of 14 percent should be stored in shallow, well-ventilated bins and moved repeatedly until it is dry enough to be safe from heating injury.

REFERENCES ON BARLEY

Extension Bulletin 191—Dust Treatment for Barley Diseases
Farm Crops Department Reprints:

1. Bay, a new Barley variety.
2. Improving the Quality and Yield of Michigan Malting Barleys
3. Rate of Seeding for Barley