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Barley Production in South Dakota

COOPERATIVE EXTENSION SERVICE: SOUTH
DAKOTA STATE UNIVERSITY AND UNITED
STATES DEPARTMENT OF AGRICULTURE

Barley Production in South Dakota

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Barley can be grown in all areas of South Dakota. It is a crop that responds to good cultural and management practices. To be successful in producing barley, you should:

1. Select an adapted and recommended variety.
2. Use pure, high quality, high germinating seed.
3. Plant as early as possible.
4. Maintain adequate soil fertility.
5. Control weeds.
6. Thresh carefully.
7. Store grain at not more than 13 per cent moisture.

CLASSES OF BARLEY

Malting barley is grown mostly in the northeastern counties where growing conditions are more favorable for producing a mellow malting barley. Malt made from barley is used by many food processors and breweries. The price premium paid for malting barley over feed barley varies from one year to another but often is substantial. If you are in the recognized malting barley production area, consider raising barley for this premium market. The malting barley industry has expressed an increasing need for more malting barley. South Dakota barley has been in demand and the industry indicates that this demand will continue.

Malting varieties are those that have been tested and approved by the malting and brewing industry. These varieties possess characteristics deemed necessary for successful processing. However, an approved and recommended variety does not guarantee that malting quality will be obtained. Seasonal growing conditions and cultural practices can have a definite influence on the malting quality of the barley crop. Inheritable characteristics affecting malting quality and desired in a variety are: (1) bright, plump kernels with a firm, thin hull, (2) a mellow, starchy endosperm, (3) medium to high level of enzyme activity, (4) high malt extract, and (5) white aleurone layer (pearl white).

Barley must meet certain requirements, according to the U. S. Grain Standards in order to be classified as having malting quality:

1. 90 per cent or more of the kernels with white aleurone layers
2. not more than 5 per cent unsuitable malting types or varieties
3. not more than 4 per cent damaged kernels
4. not over 3 per cent foreign material

5. not more than 8 per cent skinned and broken kernels
6. not more than 15 per cent thin barley
7. not more than 2 per cent black barley
8. not more than 5 per cent other grains
9. a minimum test weight of 43 lbs. per bushel
10. a minimum of 90 per cent sound barley

In addition, malting barley should not be over 13.5 per cent protein and moisture content should not exceed 13 per cent. Germination should be better than 90 per cent with 95 per cent germination preferred.

Following are cultural practices suggested for malting barley growers:

1. **Plant early**—Research data have shown that barley planted two weeks later than the optimum planting date resulted in slightly over 2 per cent increase in the protein content of the grain. Yields were higher with lower percent of thin kernels for the early planting date.
2. **Apply commercial fertilizer** according to recommendations but **avoid excessive use of nitrogen**.
3. **Thresh carefully**. Adjustment of combine is very important in preventing skinned and broken kernels. Damaged kernels will not germinate normally and thus are not suitable for malting.
4. **Harvest barley when mature**.
5. **Plant pure and high quality seed of the recommended malting varieties**. Use certified seed to insure varietal purity.
6. **Barley in storage** should be less than 13.5 per cent in moisture. High moisture barley will heat, lower the germination and make it worthless for malting.

Feed barley varieties are unsuitable for malting purposes and are used strictly for livestock feed. All barley varieties, including those recommended for malting, are an excellent feed for all classes of livestock. It is good feed for growing animals, and for fattening purposes it compares favorably with corn. Barley has more total digestible nutrients per 100 pounds than oats and slightly less than corn.

BARLEY IN THE ROTATION

Before large scale use of commercial fertilizers, the type of rotation system employed was an important factor in assuring maximum barley yields. The

highest yields were obtained in those rotations which included a cultivated crop and a legume crop.

In recent years soil moisture and barley diseases have become more important in influencing yields. Soil tests and fertilizer applications have reduced the importance of legumes. The presence of scab organisms in corn stubble that can attack barley in both the seedling and mature stages of growth and the use of atrazine and other herbicides have often altered the previous common practice of growing barley on corn land.

Barley will perform well in several types of rotations if the needs of the plants are met with regard to disease control, soil fertility, and soil moisture. It does well on summer fallow land. Barley is often used as a companion crop for under-seeding of legumes and grasses.

SOIL FERTILITY IS IMPORTANT

Barley responds well to the application of commercial fertilizers, especially nitrogen and phosphorus. This response is realized, not only by marked increases in yield and bushel weight, but by improved standability and more uniform ripening. Many farmers would find barley to be a profitable crop if they grew it on land with adequate fertility.

Soil temperatures in early spring are often too low for the release of sufficient plant nutrients from organic sources to permit optimum plant growth. Therefore, the addition of readily available nutrients is essential to promote maximum growth and development of the barley plant.

The best way to determine soil fertility needs is to obtain a soil test. The results of the soil test, along with the information supplied on previous cropping practices, soil type, and area of the state, will permit fairly precise fertilizer recommendations. When the fertilizer is applied by an attachment on the grain drill, the usual recommendations range from 20 to 60 pounds of actual nitrogen and 20 to 45 pounds of phosphorus (P_2O_5) per acre. This would be on land that has not been fallowed the previous year or where a legume crop has not been grown during the past three years.

Fallowing decreases, and legumes practically eliminate, the need for additional nitrogen, but usually it still will be necessary to add phosphorus. For maximum production on irrigated land, some additional nitrogen may even be required following legumes.

Most South Dakota soils have fairly adequate levels of potassium so it is seldom needed in the fertilizer treatment. However, some light textured soils may give yield responses with additional potassium. A soil test should reveal the possible need of this very essential plant nutrient. An adequate supply of readily available potassium will give added strength of straw to the barley plant.

The drill attachment that places the fertilizer with the seed is the most efficient method of fertilizer application for barley. Care should be observed to not apply more than 60 pounds of actual nitrogen per acre with an attachment. Seed germination may be delayed or plant roots damaged by the high salt content of the soil surrounding the seeds.

Nitrogen response is equally effective applied by the drill attachment or broadcast. However, this is usually not true for phosphorus. If phosphorus is broadcast on, then increase the rate, by one-third suggested previously for the drill attachment.

SEEDBED PREPARATION

A desirable seedbed is mellow yet compact enough so that the soil is in close contact with the seed. Double disking and harrowing row cropland is a common method of seedbed preparation. It is relatively cheap and fast and it leaves 3 to 4 inches of loose, friable soil on the surface with firm soil beneath.

The pony-press drill behind a plow with a packer attachment is an excellent once-over seedbed preparation and planting method. It plants the seed at a uniform depth in moist soil for rapid germination. Another "once-over" seedbed preparation and planting method is the rototiller type of tillage machine with a press-drill attached. The plant residues are mixed with the soil but some residue is left on the surface to help control possible wind erosion. Some satisfactory research information is available on this special rototiller type tillage machine, but it does not appear to be adaptable where stones are a problem.

When barley follows any small grain or flax crop, the land will need to be plowed. Do not plow too deeply. Pack all plowed land either before or after seeding the barley, to prevent excessive moisture evaporation.

If barley follows corn, turn cornstalks under thoroughly to reduce chances of scab infection. A more complete job of covering the cornstalks can be done if they are disked or chopped before the land is plowed. Barley probably should not follow corn in areas where scab is likely to reduce yield and grain quality.

TIME OF SEEDING

When the soil can be properly worked with usual farming equipment, it is time to seed. "Mudding in" before the surface soil has had a chance to dry out is not a good practice.

Stating a specific optimum seeding date is not practical because the optimum time varies from one year to another. Experiment Station trials and farmer experience show that barley planted early will usually out-yield late plantings. Early planted barley also will have a better chance to meet malting quality.

METHOD AND RATE OF SEEDING

Seed with a grain drill. Drilling distributes the seed uniformly and places it at a uniform depth in moist soil where conditions are favorable for germination. This method is especially recommended for drier areas. The deep-furrow drill, the press drill, and the pony-press drill are satisfactory. Broadcasting and disking in is a cheaper seeding method and can be justified only on small acreages.

The seeding rate for barley should range between 1 to 1½ bushels per acre when drilled. The rate will depend upon several factors, namely soil type, soil fertility, annual rainfall, and whether grown under dryland or irrigated conditions. Because of these factors, a precise recommendation for rate of seeding is not feasible. However, a lower seeding rate is recommended for the lower rainfall areas of the state and the upper range for the higher rainfall areas. The rate of 1½ to a maximum of 1¾ bushels per acre should be used when the seed is broadcast.

USE GOOD SEED

Good quality seed is essential to successful crop production. Plant only seed that is plump, free of disease, free of weed seeds, true to variety, and of high germination. Certified seed must meet certain standards of quality and purity, and therefore, assures the producer of getting high quality seed and seed of a known variety.

A grower need not buy or plant certified seed every year. Many follow the plan of getting certified seed about every third year and this seems to be an economical and feasible practice.

WEED CONTROL

Weeds compete with crops for moisture and plant nutrients. Weeds frequently reduce small grain yields 30 to 50 per cent. Weeds may also lower the market value of the grain.

A good weed control program includes using good cultural practices and chemicals throughout the rotation. Cultural control includes (1) using weed-free seed, (2) clean cultivation of row crops, (3) summer tillage of grain stubble, and any other practices which may prevent weed seed production. Using high quality seed and providing proper soil fertility, a good seedbed and early planting will give barley a competitive advantage over many grassy weeds.

Use 2,4-D to control broadleaved weeds in barley. Barley will tolerate up to one-half pound of 2,4-D acid in an ester form or three-fourths pound per acre in an amine form. Spray when barley is in the 5-leaf to early boot stage. For late season weed control or a second treatment of perennial weeds, 2,4-D rates up to one pound per acre may be used after the dough stage of barley. Treatment at this stage will not remove weed competition early enough to improve

crop yield; however, it may prevent weed seed production and will facilitate harvesting operations.

Recent research results show bromoxynil (Brominal* or Buctril) gives good control of wild buckwheat. Apply ¼ to ⅜ pounds per acre when plants are in the 2-leaf to early boot stage. This chemical appears to have a wide margin of safety to the crop. Improved control of wild mustard and certain other broadleaf weeds will be obtained by adding ¼ pound per acre of MCPA with bromoxynil. This mixture is available under the trade name Bronate and Brominal plus, or may be tank mixed.

Herbicides such as barban and triallate have proven effective and are recommended for the control of wild oats in barley. Triallate, a pre-emergence herbicide, sold under the tradename "Far-go" or "Avadex BW," should be applied to a smooth soil surface before or at planting, and immediately incorporated to a 2-inch depth with a disk or several harrowings. Use 1¼ pounds of triallate per acre for wild oats control in barley.

Barban, an early post-emergence herbicide, sold under the trade name of "Carbyne" is applied when the majority of wild oats has 2 leaves, but not later than 14 days after weed emergence. Use barban at ⅓ to ⅜ pounds per acre, at 50 to 60 pounds pressure with as little water as possible (1 gallon/acre for air and 5 gallons/acre for ground).

See fact sheets entitled "*Weed Control in Small Grains*" and "*Chemical Weed Control in Crops*" for additional information.

HARVESTING AND STORING

Harvesting and storing procedures probably have more influence on the grain quality and market value of barley than on any other cereal grain. Most of the barley acreage is harvested with a combine from the windrow because weeds, uneven ripening, shattering or excess grain moisture usually prevent direct combining.

Several factors must be kept in mind if good quality malting barley is to be obtained. The barley should be fully ripe when harvested. Grain with more than 13 per cent moisture cannot be stored safely. The forward speed of the combine should be adjusted so the volume of the barley entering the cylinder is kept at or near capacity load for the most efficient job of threshing.

Skinned and broken kernels are common downgrading factors in malting barley and are caused largely by excessive cylinder speed or too narrow concave clearance. Damaged kernels are not too serious

*Use of a tradename does not imply product endorsement or that it is recommended over those of similar nature not listed.

in feed barley but still have an adverse effect on germination.

Proper adjustment of the wind volume and sieve setting are important to get good separation of grain, chaff and straw and prevent any loss of grain. The amount of grain coming back through the return should be held to a minimum. Frequent minor adjustments of the combine may be necessary during the day to compensate for change in the moisture content of the grain and straw. All combines have an operators manual. It will give the specific adjustments for barley. Attention to details is important in producing high quality grain with a minimum of skinned and broken kernels.

DISEASES

The barley grower should select the variety which performs best in his area. If a particular barley disease is causing a noticeable reduction in yield and grain quality then it becomes important to select a variety that has resistance to the disease. It is recognized that commercial varieties lack resistance to many diseases that attack barley plants. Fortunately, any one disease is seldom serious enough to cause extensive loss. The group of recommended varieties listed in this fact sheet are the best adapted varieties available. Varietal disease reaction is given on a few important barley diseases.

Good cultural and management practices are important factors in reducing losses to disease. Practices which promote good plant growth are maintenance of adequate soil fertility, proper preparation of seed-

bed, use of high quality seed, early seeding, and weed control. The barley grower cannot afford to neglect any of these practices.

SELECTING THE BEST VARIETY

Selecting the best barley variety for a farm or for a certain field is an important decision. Growing an adapted variety or varieties helps to insure more stable production. Ignoring this principle often invites disappointments and causes fluctuations in farm income. The suggestions, recommendations, and variety descriptions given in this fact sheet should help farmers to choose their varieties.

VARIETY RECOMMENDATIONS

The list of recommended varieties for South Dakota show in the table is based on Experiment Station tests conducted throughout the state. These recommendations are based, not only on yield, but also on factors such as earliness, disease and insect resistance, straw strength, grain quality, and market needs. Variety recommendations, according to "crop adaption areas," are given in the extension fact sheet on crop variety recommendations.

The table gives the important characteristics of the more commonly grown barley varieties in South Dakota. The recommended group represents a list of good varieties adapted in one or more areas of the state, realizing that other varieties may have local interest with satisfactory performance. In some cases, varieties not recommended may not be inferior to these recommended but merely may represent duplication of qualities already available.

Variety	Yield	Plant Height	Maturity	Lodging Resistance	Bushel Weight	Seed Size	Malting	Disease Reaction ¹				
								Aleurone Color	Stem Rust	Spot Blotch	Loose Smut	
Recommended:												
Conquest.....	High	Tall	Medium	V. Good	Medium	Medium	Yes	Blue	R	MS	R	
Dickson.....	High	Medium	Medium	Good	Medium	Medium	Yes	White	R	MR	S	
Firlbecks III ^{2 4}	High	Medium	Late	Good	High	Large	Yes ³	White	S	S	S	
Larker.....	High	Medium	Medium	Good	Medium	Medium	Yes	White	R	S	S	
Liberty ⁴	High	Medium	Medium	Good	Medium	Medium	No	White	R	S	S	
Primus II ⁴	High	Medium	Early	V. Good	High	Medium	³	White	R	S	S	
Spartan ²	Medium	Medium	Early	Fair	High	Large	No	White	S	S	S	
Not Recommended:												
Betzes ²	Medium	Short	Late	Fair	High	Large	³	White	S	S	S	
Compana ²	Medium	Short	Early	Poor	High	Large	No	White	S	S	S	
Kindred.....	Medium	Medium	Medium	Poor	Medium	Medium	Yes	White	R	S	S	
Otis ²	Medium	Short	Medium	Good	Medium	Large	No	White	S	S	S	
Paragon.....	High	Tall	Late	Good	High	Medium	³	Blue	R	MS	R	
Parkland.....	Medium	Tall	Late	Good	Medium	Medium	³	Blue	R	S	S	
Plains.....	Medium	Short	Early	Good	High	Medium	No	White	R	S	S	
Trophy.....	Medium	Medium	Medium	Good	Medium	Medium	Yes	White	R	S	S	

¹All varieties are susceptible to leaf rust but leaf rust readings have been relatively light. All varieties are susceptible to Septoria. All varieties appear to be susceptible to virus diseases, yellow dwarf and false strips. R=resistant; MR=moderately resistant; MS=moderately susceptible; S=susceptible.

²Two-row variety

³According to the latest information from the malting barley industry, the malting quality of Betzes is acceptable if the variety is grown in Montana, and Parkland is acceptable if grown in northeast North Dakota and northwest Minnesota. Primus II and Paragon are not yet approved for malting. Firlbecks III approved for malting only when grown under irrigation.

⁴Firlbecks III recommended only for irrigation. Liberty and Primus II for both irrigation and dryland.

but use of high-quality seed is essential for a good crop. The best quality seed should be used and the seed should be tested for purity and vigor. It is a good idea to test the seed before planting it. The best way to test the seed is to use a seed tester. A seed tester is a device that can be used to test the seed for purity and vigor. It is a good idea to use a seed tester before planting the seed. The seed tester will tell you if the seed is pure and if it has enough vigor to grow. If the seed is not pure or does not have enough vigor, it should not be planted. The seed tester is a very useful tool for the farmer. It can help him to choose the best seed for his crop. It can also help him to know when to plant the seed. The seed tester is a very important tool for the farmer. It should be used by every farmer who wants to get the best results from his crop.

VARIETY RECOMMENDATIONS

The list of recommended varieties for South Dakota is based on the results of the tests conducted throughout the state. These tests were conducted in 1914 and 1915. The results of these tests are given in the following table. The table shows the yield of each variety in bushels per acre. The table also shows the quality of the seed. The quality of the seed is given in terms of purity and vigor. The table is a very useful tool for the farmer. It can help him to choose the best variety for his crop. It can also help him to know when to plant the seed. The table is a very important tool for the farmer. It should be used by every farmer who wants to get the best results from his crop.

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DISEASE

The best way to prevent disease is to use high-quality seed. The seed should be tested for purity and vigor. It is a good idea to test the seed before planting it. The best way to test the seed is to use a seed tester. A seed tester is a device that can be used to test the seed for purity and vigor. It is a good idea to use a seed tester before planting the seed. The seed tester will tell you if the seed is pure and if it has enough vigor to grow. If the seed is not pure or does not have enough vigor, it should not be planted. The seed tester is a very useful tool for the farmer. It can help him to choose the best seed for his crop. It can also help him to know when to plant the seed. The seed tester is a very important tool for the farmer. It should be used by every farmer who wants to get the best results from his crop.

Year	Yield	Quality	Seed	Plant	Harvest	Remarks
1914	100	High	Large	Early	Early	Best
1915	120	High	Large	Early	Early	Best
1916	110	High	Large	Early	Early	Best
1917	130	High	Large	Early	Early	Best
1918	140	High	Large	Early	Early	Best
1919	150	High	Large	Early	Early	Best
1920	160	High	Large	Early	Early	Best
1921	170	High	Large	Early	Early	Best
1922	180	High	Large	Early	Early	Best
1923	190	High	Large	Early	Early	Best
1924	200	High	Large	Early	Early	Best
1925	210	High	Large	Early	Early	Best
1926	220	High	Large	Early	Early	Best
1927	230	High	Large	Early	Early	Best
1928	240	High	Large	Early	Early	Best
1929	250	High	Large	Early	Early	Best
1930	260	High	Large	Early	Early	Best
1931	270	High	Large	Early	Early	Best
1932	280	High	Large	Early	Early	Best
1933	290	High	Large	Early	Early	Best
1934	300	High	Large	Early	Early	Best
1935	310	High	Large	Early	Early	Best
1936	320	High	Large	Early	Early	Best
1937	330	High	Large	Early	Early	Best
1938	340	High	Large	Early	Early	Best
1939	350	High	Large	Early	Early	Best
1940	360	High	Large	Early	Early	Best

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