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FS 301

# Barley Production in South Dakota

COOPERATIVE EXTENSION SERVICE  
SOUTH DAKOTA STATE UNIVERSITY  
U. S. DEPARTMENT OF AGRICULTURE

# Barley Production in South Dakota

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**B**ARLEY IS PARTICULARLY adapted to good cultural and management practices. To be successful in producing barley, you should:

1. Select an adapted and recommended variety.
2. Use clean, pure, high-germinating seed.
3. Treat all seed.
4. Plant early (April 15).
5. Maintain soil fertility.
6. Control weeds.
7. Thresh carefully to prevent skinned and broken kernels.
8. Store grain at not more 13.5% moisture.

## CLASSES OF BARLEY

**Feed barley** varieties can be grown in all areas of the state. Most of the barley crop in South Dakota is used for livestock feed, much of it being fed on the farm where it is raised.

Barley is a valuable feed for all classes of livestock. It is a good feed for growing animals and for fattening purposes it compares favorably with corn. It has more total digestible nutrients per 100 pounds than oats and slightly less than corn.

In 1965 barley compared very favorably in gross dollars per acre returned as compared to other cereal crops. Gross dollars per acre returns for barley in 1965 were \$34.20. This compares to \$25.74 for oats, \$25.74 for wheat and \$25.11 for rye. These dollar returns are derived by multiplying the average seasonal price received by growers with the state average yield per acre. It is recognized that 1965 was a good barley year, but it also was an excellent year for other small grains.

**Malting barley** is generally grown only in the 12 northeastern counties where growing conditions are more favorable for producing a mellow malting barley. Malt made from barley is used by food processors and breweries. The price premium paid for malting barley over feed barley varies, but is often substantial. If you are in the malting barley production area, you should consider raising barley for this premium market.

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.

The Malting Barley Industry has expressed an increasing need for more malting barley. South Dakota malting barley has been in demand and Industry indicates that this demand will continue.

Barley must meet certain requirements in order to be classified as having malting quality. It should be a recommended malting variety. Protein content should not be more than 13.5 percent, and moisture content should not be more than 13.5 per cent. It should be bright colored. Germination should be better than 90 per cent. It should have at least 60 per cent plump and not over 5 per cent skinned and broken kernels.

Following are suggestions for malting barley growers:

1. **Plant early**—According to a research project in North Dakota, barley planted two weeks later than the optimum planting date resulted in an increase of slightly over 2 percent of 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 recommendation 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% in moisture. High moisture barley will heat, lower the germination and make it worthless for malting.

## BARLEY IN THE ROTATION

Experiment station tests indicate barley does better following an intertilled or row crop than following another small grain. The highest yields were obtained in those rotations which included a cultivated crop and a legume crop. Barley also does well on summer fallow. Barley is often used as a companion crop for under-seeding of legumes and grasses.

## SOIL FERTILITY IS IMPORTANT

Barley is a poor crop to plant on low fertility soil. Many farmers have become discouraged with barley; however, if adequate soil fertility is maintained through use of legumes and wise use of commercial fertilizer, many crop failures could be prevented.

Barley should make fast growth in early spring for maximum yield. However, soil temperature at this time of the year may be too low for adequate release of sufficient plant nutrients for good plant growth. Therefore, the addition of readily available nitrogen and phosphorus is usually necessary for maximum economical production.

Test your soils to determine fertility needs. When soil tests have not been used, apply about 30 pounds of nitrogen and 20 pounds of  $P_2O_5$  on land that has not been fallowed or where a legume has not been grown during the last 3 years. Fallowing and the use of legumes generally eliminate the need for additional nitrogen, but it may still be necessary to add phosphorus. The use of a drill attachment that places the fertilizer with the seed is the most efficient method of fertilizer application for barley.

## SEEDBED PREPARATION

Double disking and harrowing row crop land is the common method of preparing a seedbed for barley. This method 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 and packer, attached to a plow, is an excellent once-over seedbed preparation and planting method. When barley is to follow small grain crop, you should plow stubble-mulch. Stubble-mulch tillage is highly recommended as it controls soil erosion, conserves moisture, and controls weeds.

Scab, a fungus disease of barley, is often a serious problem. The same disease attacks corn and the organisms can be carried over to the next season by the corn stalk refuse. If scab is a problem and barley is to follow corn, plow the land and thoroughly cover the corn stalks. Pack all plowed land either before or after planting to prevent excessive moisture evaporation.

## 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.

The usual practice on most farms is to plant the wheat and oats first, as barley is more susceptible to frost injury. Also the yields of wheat and oats are reduced more than those of barley by delayed seeding. However, barley planted early will usually out-yield late plantings and have a much better chance to meet

malting barley requirements. April 15 is about the optimum seeding date.

## 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 the drier areas. The deep-furrow, the press drill, and pony-press drills are satisfactory types of grain drills. Broadcasting and disking in is a cheaper seeding method and can be justified on small acreages.

Seed at the rate of  $1\frac{1}{2}$  to  $1\frac{3}{4}$  bushels per acre. Western areas may seed less than  $1\frac{1}{2}$  bushels. Increase the rates slightly for broadcasting.

## USE GOOD SEED

The use of pure seed, free of weed seeds, and of high germination, is the first prerequisite to insure a successful crop. *Certified seed is an assurance of good seed.*

**Seed Treatment.** Proper seed treatment with a recommended seed fungicide is always a good practice. Treating aids in the control of covered smut, scab, and other seed borne diseases. The chemical offers protection to the seed and to the small seedling when germination is slow due to adverse growing conditions.

There are several approved seed treatments or fungicides on the market. Thorough mixing of the seed and fungicide is necessary for complete coverage of the seed. The actual cost per acre is very small. Except for small lots of seed, custom treating has proved very practical.

## WEED CONTROL

Weeds compete with crops for moisture and plant nutrients. A good weed control program includes both cultural and chemical control methods which are practiced throughout the rotation. Cultural control involves (1) use of weed-free seed, (2) clean cultivation of row crops, (3) summer tillage of grain stubble, and (4) preventing weed seed production.

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 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.

Herbicides like dicamba and bromoxynil have been tested for the control of wild buckwheat in bar-

ley. However, limited research information and possible damage to the crop prevent any recommendation of these herbicides for use in barley.

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

Barban, an early post emergence herbicide, sold under the tradename 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 ½ to ¾ pounds per acre, at 50-60 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

Most of the barley acreage is harvested with a combine, either direct or from a windrow. Because of weeds, uneven ripening, shattering, and possible high moisture of the grain, the windrowing and combining method is the most common. Highest quality barley is attained by allowing the grain to get fully mature and thresh as soon as the grain is dry enough for safe storage. The moisture content of the grain should be 13.5% or less for safe storage. A safe moisture level is especially important for malting barley.

Malting barley cannot contain more than 5% skinned and broken kernels. At one shipping point in South Dakota in 1958, 71.4% of the malting barley was graded down because of skinned and broken kernels. Proper adjustment of the thresher or combine and operating with a minimum cylinder speed could in most cases correct this damage to the barley kernels.

#### DISEASES

**Rust.** Certain races of wheat stem rust fungus can also attack barley. Fortunately, many barley varieties are resistant to stem rust. Of the barley varieties recommended in South Dakota, only Spartan is susceptible. All commercial barley varieties appear to be equally susceptible to leaf rust; however, leaf rust has not been of economic importance in recent years. Barley leaf rust is caused by a different species of rust than that which causes leaf rust on wheat.

**Smut.** This fungus disease results in two types of smutted heads known as covered and loose smut. It is difficult to tell one from the other in the field, as both result in brown to purplish-black spore masses

which appear at heading time in place of healthy grain. Covered smut is seed borne and can be controlled by using seed treatments containing mercury (see Fact Sheet 193 on seed treatment for small grains). Loose smut becomes established inside the seed and, therefore, cannot be controlled by seed treatment materials presently available. Other methods of control are possible, but the use of certified seed is the most effective and practical.

**Leaf Blights.** Spot blotch is a fungus disease characterized by brown to black spots, irregular in size, on leaves and leaf sheaths. This fungus can attack plants at any stage of their development and often results in seedling as well as head blights.

Septoria leaf spot is a less common fungus disease; but under certain conditions, it can be very damaging. It is recognized by tan to straw colored spots of various sizes within which black pimple-like bodies can be seen.

Bacterial leaf blight results in irregular, narrow, glossy-surfaced stripes which may be relatively short or extend the entire length of the leaf. Often a white resinous exudate or a thin film of exudate develops on the surface of the stripes.

No variety has a high degree of resistance to these leaf diseases, but certain varieties appear to be less damaged than others.

**Scab.** Symptoms of this fungus disease occur soon after flowering causing the diseased spikelets to appear bleached or prematurely ripened while healthy spikelets are still green. Scab is more severe when wet, humid conditions exist during the flowering period. The crop will be nearly scab-free if the weather is dry. Infected kernels are shriveled and have a scabby appearance. No resistant varieties are available for South Dakota. Complete plowing under of small grain and corn residues will help in controlling this disease. Crop rotations that include legumes may be helpful.

**Virus.** There are two virus diseases, yellow-dwarf and stripe mosaic, which are of concern to barley growers. Barley yellow-dwarf is a virus disease that is transmitted by certain species of aphids. It is recognized by a bright yellowing of the leaves. If infection occurs before the jointing stage, severe stunting and loss in yield can be expected. This is the same virus that causes the "red leaf" disease on oats. All of the recommended barley varieties are susceptible. Early planting, proper soil fertilization and management are the only measures for control at the present time.

**Stripe Mosaic,** also called false stripe, is caused by a virus which is systemic and transmitted within

the seed. It cannot, however, be controlled by seed treatment. It is characterized by chlorotic to brown mottled stripes in the leaf, reduced plant height, and an increase in tiller development in some varieties.

**Root and Crown Rots.** Soil and seed-borne fungus organisms cause root and crown rot. Plants from the seedling stage or even later are stunted, lack vigor, and are pale green, purplish, yellow, or bleached. Damage occurs to individual plants or in small to large patches within fields. Affected plants are easily pulled up. The roots are often brown to black with water-soaked areas. Later the roots die and slough off. Infected crown tissue is bleached, brown or black, and decayed. Under stress of wind and rain, lodging is common and may be severe. Heads may be blasted or poorly filled with a few shriveled seeds. Infected plants commonly suffer from drought. No one practice will control root and crown rots; but several measures, when carried out collectively, will help reduce losses. Use thoroughly cleaned, certified, disease and crack-free seed of adapted varieties recommended for your area. The seed should be treated with a mercury-containing fungicide before planting. (See Fact Sheet 193 on seed treatment of small grains). Plant in a fertile, well-prepared, well-drained seedbed at the time recommended for your area. Planting on the early side often helps to control several root and crown rots.

## 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 shown 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 adaptation areas," are given in 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 may merely represent duplication of qualities already available.

Variety	Yield	Plant height	Maturity	Lodging resistance	Bushel weight	Seed size	Malting* quality	Aleurone color	Disease reaction†			
									Stem rust	Spot blotch	Loose smut	
<b>Recommended</b>												
Dickson.....	High	Medium	Medium	Good	Medium	Medium	§	White	R	MR	S	
Larker.....	High	Medium	Medium	Good	Medium	Medium	Good	White	R	MS	S	
Liberty.....	High	Medium	Medium	Good	Medium	Medium	Poor	White	R	S	S	
Plains.....	Medium	Short	Early	Good	High	Medium	Poor	White	R	MS	S	
Spartan‡.....	Medium	Medium	Early	Good	High	Large	Poor	White	S	S	S	
Trophy.....	High	Medium	Medium	Good	Medium	Medium	Good	White	R	MS	S	
<b>Not recommended</b>												
Betzes†.....	Medium	Short	Late	Good	High	Large	§	White	S	S	S	
Compana‡.....	Medium	Short	Early	Good	High	Large	Poor	White	S	S	S	
Conquest.....	High	Tall	Medium	Good	Medium	Medium	§	Blue	R	MS	R	
Kindred (L).....	Medium	Medium	Medium	Poor	Medium	Medium	Good	White	R	MS	S	
Parkland.....	Medium	Tall	Late	Good	Medium	Medium	§	Blue	R	MS	S	
Tregal.....	High	Medium	Medium	Medium	Medium	Medium	Poor	White	S	S	R	
Otis‡.....	Medium	Short	Medium	Good	Medium	Large	Poor	White	S	MS	S	
Trail.....	High	Medium	Medium	Good	Medium	Medium	Good	White	R	MS	S	

\*Inheritable characteristics affecting malting quality and desired in a variety are: (1) A mellow, starchy endosperm; (2) Medium to high level of enzyme activity; (3) Seeds with a firm hull; (4) White aleurone layer (pearl white) is preferred; (5) Bright, plump kernels.

†All 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 the virus diseases, yellow dwarf and false stripe. R=resistant; MR=moderately resistant; MS=Moderately susceptible; S=susceptible; VS=very susceptible.

‡Two-row variety.

§According 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. Dickson and Conquest have not been approved yet for malting.

Read these Fact Sheets for additional information on barley production:

- Crop Variety Recommendations
- Seed Treatment
- Fertilizing Small Grains
- Weed Control in Small Grains
- Control and Elimination of Wild Oats

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