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Colorado State University Cooperative Extension

no. 120



# Barley production in Colorado

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## Quick Facts

- Barley will tolerate higher salt levels in the soil than most crops.
- Feed barley will be either two-rowed or six-rowed and may be a spring or winter type. Malting barley varieties usually are two-row spring types.
- High protein grain is desired for feed barley and malting barley must test 12 percent or less.
- Grain must pass minimum germination, test weight, cracking and skinning, color and seed size tests. Seed lots that fail to meet specific standards may be docked in price or rejected.

Barley, *Hordeum vulgare* L., is one of the major cereal crops grown in Colorado. In 1988, 11.7 million bushels were harvested from 175,000 acres.

Barley grown in Colorado may be produced under dryland, but most is irrigated and used for either feed grain or malting purposes. Barley grown as feed grain is produced throughout the state and malting barley production is centered in the San Luis Valley and northeast Colorado along the front range. There are two-row and six-row, spring-planted barley types, and six-row winter types available for feed but most malting barley varieties are two-row spring planted types.

Barley is adapted to a wide variety of soil types that have adequate drainage. High yields are attainable in loam and sandy loam soils by supplying optimum levels of fertilizer and water. Lodging, a problem with irrigated barley, must be addressed by controlling plant height with management practices. Although barley does best at a neutral pH 7.0, it still will produce well on alkaline soils. Barley will withstand higher soil salt levels than any other crop except tall wheatgrass, *Elytrigia elongata* (Host) Nevski, [formerly known as *Agropyron elongatum* (Host) Schultes].

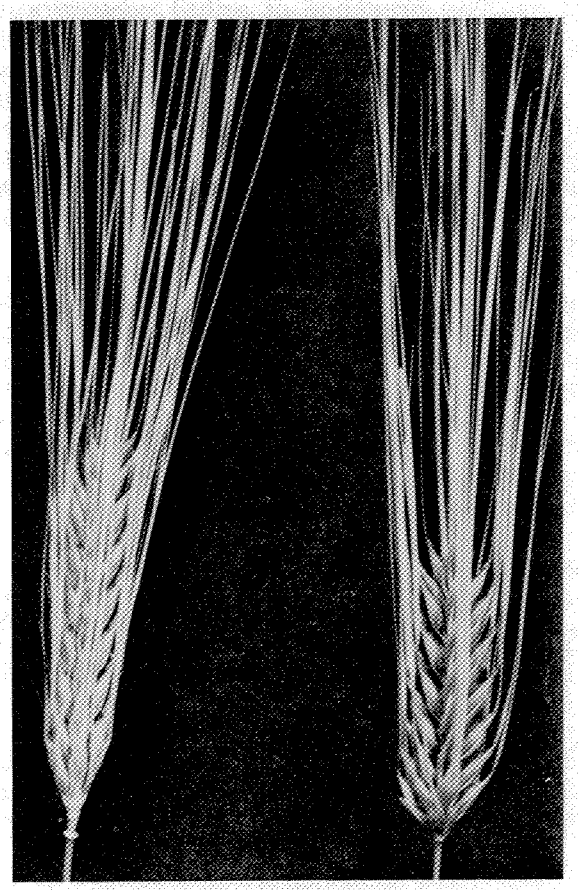

**Figure 1: Six-row barley heads.**

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## Uses

Barley is used for human consumption and livestock feed. Forty to 50 percent of the barley produced in Colorado is used for malting purposes. The rest is used for livestock feed.

**Feed barley**—High protein, high test weight and high yield are desirable traits for feed barley. Low test weight barley will have a greater percentage of hull in proportion to the grain. Feed barley produced under optimum conditions may have crude protein levels above 13 percent and does not have qualities desirable for malting purposes. In many areas, barley may be pastured, harvested for hay, or fed as grain. Because of its nutritive value, barley can be fed to all classes of livestock.

**Malt barley**—Barley grown for malt is produced under limited soil nitrate levels and must meet standards set by each brewer. A large, plump, mellow, uniform-size kernel, with a firm hull not easily damaged in handling is required by brewers. Most brewers require seed to pass over a 6/64-inch screen, have less than 12 percent to 13 percent protein, have 13 percent or less moisture, and not more than 2 percent damaged kernels. Seed must be mature, plump, bright, and have a germination above 95 percent. Barley harvested for malting purposes must be carefully threshed to prevent cracked and peeled kernels, a condition that reduces percent seed germination. Kernel discoloration, excessive protein, and small seed may cause dockage penalties or result in rejection of a seed lot. Specific guidelines vary depending on individual contractors.

## Seedbed Preparation

Dryland winter barley seedbeds should be prepared to prevent wind erosion and weed growth during the fallow period. The essential feature of tillage is to create a cloddy or stubble-mulch condition adequate to prevent wind erosion. The soil should be free from compaction to allow rapid water penetration and root growth.

Irrigated fields should be prepared to allow optimum seed placement, germination and subsequent irrigations. Field preparation may include disking, chiseling and mulching.

## Seeding Practices

It is favorable to seed dryland spring barley between March 1 and April 20, depending on the geographical location in Colorado, at rates of 48 to 60 pounds per acre in 12- to 14-inch rows. Plant winter barley between September 1 and 15 at rates of 40 to 60 pounds per acre.

In northern Colorado, plant spring barley between April 1 to April 15 and before March 10 in the Arkansas Valley. Irrigated barley should be seeded at 70 to 100 pounds per acre in 6- to 7-inch rows. Seed 60 pounds per acre when feed barley is planted as a companion crop for alfalfa or other perennial forage mixtures. Malting barley is not recommended as a companion crop. Barley should not be planted more than 2-inches deep.

## Rotations

Malting barley must fit into a rotational pattern that prevents volunteer grain from contaminating the barley crop. Additional restrictions limit malting barley production from being planted on fields highly fertilized the previous year. These highly fertilized fields are likely to have unacceptable high soil nitrate concentrations that contribute to elevated grain protein levels. Organic sources of nitrogen, such as manure, also may cause high soil nitrate levels.

## Fertilizer

**Dryland barley**—When soil moisture is adequate, dryland barley responds to added fertilizer. Fertilize according to a current soil test. General recommendations suggest 30 to 50 pounds of nitrogen per acre.

**Irrigated barley**—By applying 80 to 100 pounds of nitrogen per acre, fertility levels should be adequate for 100 bushels of barley per acre. Twenty to 40 pounds of phosphorus may be needed. High protein, the result of excessive nitrogen application, is discouraged for malt barley production but higher protein levels are encouraged in feed barley. Nitrogen application on fields grown for malting purposes should equal 1.2 pounds of nitrogen per bushel of barley with a maximum of 100 pounds per acre available *from all sources*. Deep soil nitrates, nitrates in irrigation water and other sources, must be included in this 100-pound limit.

Application methods include broadcasting dry material prior to planting or liquid application through sprinkler systems. Usually the total application is applied at once using dry material or over several irrigations using injected fertilizer. Nitrogen applied during late boot to grain fill is expected to increase grain protein more than preplant application.

## Irrigation

In northeastern Colorado, flood irrigation is used frequently. In the Arkansas Valley and western Colorado, furrow and corrugation methods are used successfully. However, recommended methods for efficient irrigation of barley in Colorado are basins, border strips, corrugations, contour ditches, and sprinklers. Barley should be irrigated just prior to heading if soil moisture is deficient. One irrigation is sometimes enough on heavier soils, while on sandier soils, two or more irrigations may be needed. Additional irrigations may be required when fields are irrigated with a center pivot.

## Weed Control

Early weed control is important to reduce competition during the early stages of growth. Weed control is essential to maintain proper dry-

ing conditions during the harvest period. Excessive weeds deplete soil moisture and nutrients, and may contribute to mold and seed discoloration during harvest.

There are a number of herbicides that can be used in barley. For more information on herbicide use, consult your Cooperative Extension agent.

Approved herbicides must be applied by ground methods prior to stem elongation. Wheel tracks from ground sprayers cause stem breakage and initiate late growth. Aerial application is acceptable for early applications.

## Variety Selection

Barley variety selection depends on intended use and varietal characteristics, such as quality, disease resistance, straw strength and yield. Lodging caused by weak straw is a serious problem that producers must address. Some varieties have deciduous awns that fall before grain maturity. This trait does not appear to effect yield. The following varieties of winter and spring barley grow well in Colorado.

## Winter

**Dundy**—Dundy is a six-row, winter-feed barley developed by the Nebraska Agricultural Experiment Station and released in 1982. It is a short-straw, early maturing variety. Winter hardiness is equal to or superior to most winter barley varieties currently grown.

**Hitchcock**—Hitchcock is a high yielding, stiff straw, six-row, rough awned winter feed barley developed by the Nebraska Agricultural Experiment Station and released in 1984. Hitchcock is slightly shorter and a day later in maturity than Kearney. It has good test weight. The spike of Hitchcock is moderately dense and erect at maturity.

**Post**—Post is a six-row, greenbug resistant winter barley developed by the Oklahoma Agricultural Experiment Station. Post has excellent straw strength and is usually shorter than Will, with moderately dense spikes. The test weight and yield is slightly better than Will. Post is equal to Will in winter hardiness.

**Schuyler**—Schuyler is a feed-type, six-rowed, winter barley developed by the New York Agricultural Experiment Station-Cornell. It exhibits excellent resistance to powdery mildew and leaf scald. Schuyler is medium in maturity when grown in Colorado. It is shorter, has better straw strength, and is more shatter resistant than other varieties grown here. Winter hardiness of Schuyler is acceptable.

**Will**—Released by the Oklahoma Agricultural Experiment Station in 1963, a feed barley, is a selection from a cross between Roger x Kearney. It shows excellent standability and good yield potential in Colorado. Will ranks behind Chase and Kearney in winter hardiness, although it is hardier than Pueblo and Hudson and survives the winter when soil moisture is adequate.

## Spring

**AB 1201**—AB 1201 is a spring, malting, two-row, mid-tall variety that has plump white kernels, good standability and excellent yields. AB 1201, released by Anheuser Busch, does best in northern Colorado.

**AB 1202**—AB 1202, another Anheuser Busch release, is a spring, malting, two-row, mid-tall plump white-kerneled high yielding variety with good standability developed for the San Luis Valley.

**Columbia**—Columbia is a short stature late maturing, six-row feed, spring barley developed by Northrup King. The spike of Columbia is medium in length and erect but not dense. The kernels are white with a blue aleurone. Columbia is adapted to the barley growing areas of Arizona, California, Colorado, Idaho, Montana, Utah and Washington.

**Cougbar**—Cougbar is a six-row, mid-season, spring barley released by the Washington Agricultural Research Center, and Oregon and Idaho Agricultural Experiment Stations in 1985. Cougbar is similar to Steptoe, with medium height. Like Steptoe, Cougbar is adaptable to a wide range of conditions and generally has a higher test weight than Steptoe.

**Klages**—Klages is a malting type, two-row, mid-season, white kernel spring barley, developed by USDA and Idaho Experiment Station. It has lax, mid-long to long heads with rough awns and long rachilla hairs. When grown under irrigation, Klages has good test weight, and fair straw strength.

**Moravian III**—The variety Moravian III, developed by Adolph Coors Co., is a two-row, rough awned, heavy bushel weight malting barley, that has similar to superior malting characteristics than Moravian. Moravian III is superior to Moravian in yield and is fair in straw strength.

**Morex**—Morex is a high yielding, six-row malting barley developed by the Minnesota Agricultural Experiment Station and released in 1978. Morex is similar to Larker in maturity, plant height and kernel plumpness, however it is more resistant to lodging.

**Otis**—Otis is a two-row, semi-smooth awn, feed barley that tillers prolifically and has heavy bushel weight. It resulted from a cross of Munsing x Spartan. Otis is adapted to dryland and therefore is a good barley for most western states. Otis has poor straw strength and may lodge under irrigated high yield conditions.

**Steptoe**—Steptoe was developed and released by Washington State Experiment Station. It is a high yielding, spring type, six-row, feed barley. In irrigated tests, it is mid-tall.

**Triumph**—Triumph is a two-row barley developed in Europe. Triumph is distributed in Colorado and adjacent states by Colorado Seed Company and Arkansas Valley Seed Company as a high test weight, high yielding feed barley for irrigated land. Adolph Coors has been contracting Triumph for malting purposes.

**Westbred 501**—Westbred 501 is a semi-dwarf, six-row spring barley released by Western Plant Breeders, Inc. Westbred 501 is mid-season in maturity, and well adapted to the irrigated barley growing areas in the western states.

## Diseases

Barley Yellow Dwarf (BYD) is a virus disease that causes serious losses in barley, wheat, and oats in Colorado. The symptoms of BYD usually are overlooked or mistaken for nutritional disorders. The presence of aphid vectors and the occurrence of yellow, stunted plants found singly or in small groups among normal plants is a way to diagnose the disease. Leaf discoloration varies from shades of yellow to red or purple. More than 20 species of aphid vectors are known to spread the virus. The most important aphid vectors are: bird-cherry oat, corn leaf, English grain, and greenbug.

**Smut**—Covered smut, (*Ustilago hordei* Pers. Lagerh.) and black semi-loose smut (*Ustilago nigra* Tapke) are other widely distributed diseases of barley that cause considerable losses. In areas where smut is present, the use of clean seed is a must, otherwise seed treatment is recommended. Seed produced from treated seed is usually smut-free for one generation without seed treatment.

## Insects

**Pale western cutworm**—Pale western cutworm (*Agrotis orthogonia* Morrison) is a cutworm typically found on semi-arid and arid lands. Cutworm eggs are laid in the soil in late September and early October, but hatching of larvae does not occur until the following February or March. Most larvae are mature in Colorado by April or May and may feed on the plant until late June.

**Aphids**—Several kinds of aphids infest barley and other small grains. A few of them are bird-cherry oat, corn leaf, English grain, Russian wheat and the greenbug. Some aphids cause damage by injecting toxic saliva into the plants, and sucking the sap (the Russian wheat aphid is especially devastating to barley). Others transmit disease organisms, such as Barley yellow dwarf. It is very important to distinguish the aphid species before applying insecticides. A preventive, planting-time application of a granular systemic insecticide, Disyston 15G, for barley, oats and wheat, applied in fall or spring, may be used prior to the appearance of the Russian wheat aphid or damage symptoms.

**Grasshoppers**—Grasshoppers feed on barley and other small grains. They usually start feeding on weedy areas of roadside, fence rows, irrigation ditches and other noncrop areas before moving to irrigated fields of barley and other small grains. The feeding starts first on field margins then continues inward.

Grasshoppers can be controlled with low rates of insecticides in small weedy areas. Early control is important to reduce damage and grasshopper numbers in subsequent generations. Contact your Cooperative Extension county agent or agricultural chemical dealer for current insecticide recommendations.

## Harvest and Storage

Most of the barley grown in Colorado, under irrigation or dryland systems, is harvested directly with combines. The moisture content of the grain should be 14 percent or less at harvest for optimum threshing and storage.

Weedy barley fields should be harvested by cutting, windrowing the crop, and allowing heads to fully ripen and weeds to dry out. If this is not done, grain absorbs moisture from broken bits of green weedy plants when combined directly.

Barley under a malting contract must be stored on the farm, sometimes more than eight weeks, until required tests are completed. Tests on plump mature kernels, grown during cool filling and harvest conditions, occasionally develop post-harvest dormancy indicating sub-standard germination. When sub-standard germination occurs on what appears to be the highest quality, plump seed, retest after several weeks. Lots that fail to pass required tests must be marketed as feed barley.