Foundations of MANITOBA AGRICULTURE

Barley

HISTORY

Barley has been a valued grain in food products, including bread, for many millennia. References can be found from Neolithic times; Israelite, Egyptian and Greek cultures; and the Middle Ages in Europe.

Although wheat shares a similar past with barley, wheat has only recently become a predominant food grain due to its greater versatility and more refined consumer tastes. The current trend away from fully refined flours and toward whole grains – especially grains with high nutritional value such as barley – is therefore both a step back in history and a leap forward in healthy eating.

Barley and other small grain cereals were brought to Canada in the early 17th century by European colonists. That barley was the *two-row* type (see below) and targeted for making beer. The first Canadian brewery was built in Quebec City in 1668.

PRODUCTION

Barley does well in Manitoba thanks to our central location and climate. Farmers like it because it grows efficiently in a variety of soils, from sandy loams to heavy clays.

Farmers begin seeding barley as early as possible to ensure higher yields – usually in May. Many farmers first prepare the seed bed through *tillage*. Tilling with tools or equipment turns over and breaks up the soil, which loosens and aerates it. More farmers now practice *reduced tillage* or *conservation tillage*, techniques that minimize disturbing the soil and help conserve water, capture or sequester CO_2 from the air, prevent erosion, and reduce fuel emissions from farming vehicles and equipment.

Farmers seed 22 to 25 plants per square foot, 4 to 5 centimetres below the soil surface – just deep enough to reach moisture – and usually fertilize with nitrogen, phosphate, potassium and/or sulphur, depending on the soil. Producers must be extra cautious with applying nitrogen fertilizer if they're growing malting barley. High rates of nitrogen could produce protein levels in the grain that are too high for the barley to be accepted for malting grade.

Farmers use a range of practices to manage insects, weeds and disease. *Integrated pest management* involves carefully selecting the variety of barley they grow, *scouting* (monitoring) their crop as it grows, and crop rotation. Farmers implement cultural, mechanical, biological and pesticide control measures that consider potential damage, cost and value, as well as impact on other pests, beneficial organisms and the environment. Maintaining a disease, pest and weed-free field is especially important for farmers trying to meet the grade for malting barley.

Germination begins when the barley seed starts to absorb water. This triggers enzymes in the seed that break down starch and protein in the *endosperm*, which move into the embryo and provide energy for growth. Soil temperature and moisture determine how quickly germination occurs. Soon, the embryo pushes out a *radicle* or seed root, which grows downward, followed by the *coleoptile*, a tube that grows upwards to the surface. The first true leaf of the barley seedling emerges from the coleoptile and begins to grow. The resulting *seedling* usually emerges above the soil about seven days after germination.

DID YOU KNOW?

Barley was the food of Roman gladiators, who were called *hordearii* or "barley men." They believed that barley bread gave them greater strength and increased stamina compared with other foods.

After the barley plant develops three to four leaves, it begins growing *tillers* (additional stems). The stems elongate and grow *heads* or *spikes*. This starts the flowering or reproductive phase. Most barley is *self-pollinating*, which means pollen fertilizes the ovary of the same flowering parent plant. After pollination, the plant begins to *ripen* or mature, turning a straw colour. The *kernels* or seeds in the head become very hard.

Ideally, malting barley is harvested when it reaches 16 to 18 per cent moisture content. It is then dried down in the bin to 13.5 per cent. This reduces risk of degrading grain quality at harvest due to poor conditions such as rain.

Barley can be *swathed* (cut down with a machine called a swather, and then laid down in rows). A farmer can also choose to *straight cut* their barley by allowing the barley to dry completely, then using the combine to cut and thresh the barley in a single pass. A *combine* is a piece of equipment that cuts the stems and separates the barley kernels from the seed stalks. The decision to swath or straight cut depends on the farmer's preference, the uniformity of the crop in the field, and the expected weather at harvest.

VARIETIES

Barley is primarily used for malting, and human and livestock consumption. Most barley consumed by humans is in the form of beer, although barley is sometimes used in bread and other baked products, pasta, and soups. Lower-quality barley grain unsuitable for malt is used for livestock feed. Some barley is intentionally grown for feed because of its nutritional value.

When used as a livestock feed, the grain is often cracked for cattle, and ground for hogs and chickens. This makes it more digestible to the animal. Cattle are fed *feed grade grain* not intended for human consumption. This grain was either grown specifically for feed, or didn't make the grade for malting or human consumption.

Forage barleys are specifically developed as forage for grazing cattle. While any type of barley can be used as forage, forage barleys provide more energy per tonne, making them a high-quality, cost-effective food source.

Barley for *malting* (making beer) must be clean and plump, with a high *germination percentage* and vigorous growth – all of which are necessary for the malting process.

Farmers aim to grow barley with a very specific amount of protein in it. Too much protein is a greater problem than too little. Farmers can sometimes influence protein content in barley by altering the application of nitrogen fertilizer. However, they also take protein content into consideration when selecting which variety to grow, as environment, management and the genetics of the variety will all contribute to the protein content of the grain.

Barley comes in either *two-row* or *six-row* varieties. These names refer to the arrangement of kernels on the barley head, and each has different nutritional properties.

- **Two-Row Barley**: This variety is recognized by two kernels set along the seed head. Barley heads have alternating sets of three *spikelets*. In two-row barley, seeds only develop on the central spikelets, which causes a flat-shaped seed head. Two-row barley is often used for malting because it contains more sugar. (Since starch and protein are inversely related, two-row barley also tends to contain less protein.)
- **Six-Row Barley**: This variety is recognized by six kernels set along the seed head. In six-row barley, all three of the spikelets develop kernels. The seeds tend to be rounder than two-row and are also smaller because more seeds grow in the same space.

Canadian barley producers sell far more two-row barley than six-row barley because demand for it is significantly higher. The United States is now following suit, and the overseas export market demands two-row varieties.

In addition to the conventional malting and feed markets, barley breeders are developing varieties for speciality food markets, including *hulless* barley for poultry and hog producers. In hulless barley, the hull is held very loosely onto the seed and is removed during harvesting. Because the hull is mostly fibre, easy removal of the hull means that it has more nutrients and energy compared to its size. Breeders are also developing *high beta-glucan* barley varieties with special starch composition that can lower cholesterol.

Photo: Manitoba Crop Alliance

NUTRITION

Barley is nutritious, and eating it is very likely to help you maintain your overall, long-term health. Whole barley grains are rich in protein, vitamins, minerals and amino acids – all of which are essential for our health.

More importantly, barley is one of the richest sources of *soluble* and *insoluble* fibre. Insoluble fibre aids in proper excretion of waste products in the body, while soluble fibre, which includes beta-glucan, mixes with liquid and binds to fatty substances, allowing them to leave the body.

Beta-glucan has been shown to reduce cholesterol, which may reduce the risk of heart disease. Researchers believe beta-glucan can help regulate blood glucose (which can aid diabetics) and may help stimulate the immune system response. Barley is also rich in *tocotrienols*, antioxidants that lessen the risk of contracting heart disease and developing cholesterol problems.

BY-PRODUCTS

Barley straw is the dried stems of the barley plant after the head that holds the grain kernels has been removed. Straw is often used as a soft, dry bed for livestock. It can also be made into building materials, paper, newsprint, and fibreboard.

Barley can also be cut when green for livestock *silage,* fermented foliage which is used to feed animals. To make silage, the entire plant is cut down, piled, compacted and then allowed to ferment. Silage is useful to farmers because it can be harvested in any weather, as long as its moisture is at the right level. It provides more nutrients per acre than grain and can be made from crops that are otherwise damaged (by hail or frost, for example). Silage is also nutritious and has a taste that appeals to animals.

FARMER PROFILE

SHEILA ELDER Wawanesa, Manitoba

"Barley contributes to better disease, insect and weed management for our entire annual crop rotation, which also includes 1,700 acres of canola, soybean and wheat. We grow barley for malt to make beer. Recently, barley from our farm produced a 'made in Manitoba beer' using only Manitoba hops and barley."

INDUSTRY IN MANITOBA

Production: 432,000 metric tonnes (2021)

Value to Economy: $52 million in exports (2019)

INDUSTRY IN CANADA

Production: 6.6 million metric tonnes (2021)

ENVIRONMENT

Manitoba barley farmers put tremendous effort into making sure the crops they produce are safe and grown in a sustainable way. They use modern agriculture practices and tools to reduce greenhouse gas emissions, address climate change and help build biodiversity. Some of the innovations they use to grow barley crops include:

- **Reduced tillage** and **conservation tillage**
- **Plant breeding research and techniques** to develop high-quality varieties of barley that are more resilient, better yielding and sustainable.
- **GPS and precision agriculture** that help farmers reduce unnecessary seed, fertilizer and pesticide use, and reduce fuel consumption from farming vehicles and equipment.

Photo: Manitoba Crop Alliance

CAREERS

» Grain producer
» Brewer
» Agronomist
» Grain researcher
» Biotechnologist
» Farm manager

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