



Overview

Currently, winter barley (*Hordeum vulgare*) is not in commercial production in Minnesota. However, we have been conducting research over the past nine years to develop barley as a winter annual crop that can produce high quality grain for the malting and brewing industries. In general, winter barley is less winter hardy than winter wheat or winter rye. Thus, a primary focus of our breeding and genetics research is to increase the winter hardiness of winter barley. Fall planting of barley as a winter annual has many features that would make it **attractive to producers and end-users**. Fall planting and earlier harvest in the spring gives growers additional options to optimize their operations. Winter barley will typically have **higher yields** than spring barley in many regions. Winter cover crops provide important ecosystem services (**limit soil erosion**, sequester carbon as organic matter, provide **wildlife habitat**, and reduce nutrient leakage to surface and subsurface **water reservoirs**). Earlier harvest may help **avoid important diseases** such as stem rust and Fusarium head blight. It may also be possible to **double crop** winter barley with soybeans, enabling barley to potentially share some of the large soybean acreage in Minnesota. There is a **strong demand** for barley in Minnesota as the state is home to the largest malt production site in the world at Rahr Malting in Shakopee and there is a rapidly expanding craft brewing industry. Large and small end-users alike have expressed strong interest in more **locally produced** barley and winter barley could help satisfy that interest.



Forever Green Initiative: WINTER BARLEY

An annual cover crop that will support malting and brewing industries

More information:

Don Wyse: wyses001@umn.edu

www.forevergreen.umn.edu



College of Food, Agricultural
and Natural Resource Sciences

UNIVERSITY OF MINNESOTA

Research Status and Goals

AGROECOLOGY

Best management practices for producing spring barley in Minnesota are well established and production guidelines are easily available through Extension (www.extension.umn.edu/agriculture/small-grains). Many of these practices will be applicable to winter barley, however, additional research is being conducted that is specific to winter barley.

Activities: The timing of planting and seeding rate can be manipulated to optimize the number of plants that survive the winter. We have shown that a planting date near Oct. 1 is optimal for southern Minnesota to maximize winter survival. Winter survival is also influenced by snow cover, so tillage practices that leave crop residue to trap snow will enhance yields of fall-sown barley. Managing the level of soil nitrogen is important for both grain yield and protein content. The different planting to harvest window for winter barley will affect which diseases pose the greatest threat.

Outcomes: A Winter Barley Production Guide to help Minnesota producers successfully integrate winter barley into their cropping systems.

BREEDING AND GENETICS

Currently available winter barley varieties are capable of surviving five of the past nine winters in St. Paul. Winters with cold temperatures and little to no snow cover present the biggest challenge.

Activities: To identify sources of winter hardiness, the University program has collaborated in the screening of over 2,000 accessions from around the world for survival in Minnesota winters and identified around 20 that are being used in breeding. We use genomics resources and new breeding methods like genomic selection to develop “facultative” barley, which is capable of surviving winters, but does not require the six-week cold period necessary to transition to flowering. Facultative barley provides flexibility for breeding and producers as it can be planted in the spring or fall. This will be important for seed production as seed increases can be planted in the spring to provide seed for fall planting. We currently have advanced breeding lines with improved winter survival and good malting quality that will soon enter industry testing.

FOOD SCIENCE

Many grain and malt characteristics determine the malting quality of a barley variety. New varieties must meet current industry standards in order to be utilized in malting and brewing.

Activities: The barley breeding program works with the USDA Cereal Crops Research Unit and Rahr Malting to evaluate the malting quality of breeding lines. These laboratories process hundreds of samples each year from yield trials conducted across the state.

Outcomes: Advanced lines that are potential new varieties will be evaluated at a pilot scale by local brewers and the American Malting Barley Association (www.ambainc.org).

Pilot Studies

The University barley breeding program already coordinates a national winter malting barley trial that provides useful information for variety selection. We will expand variety testing to additional Minnesota on-farm trials to provide similar information for our growers. We have initiated a dual cropping system experiment where soybean will follow winter barley in either a double or relay cropping system. Studies will quantify the potential of this summer and winter annual cropping system and be expanded to compare dual and summer cropping systems for soil moisture, total biomass, and nutrient loss. Data will provide information to quantify the value of environmental impacts.

COMMERCIALIZATION PLAN

Barley is a significant U.S. crop with average annual production of 212 million bushels valued at \$894 million as a raw agricultural commodity (2004-2013). The impact of barley on the U.S. economy is even more significant if the value-added products resulting from its utilization as an animal feed, in malt beverages, and in food products are considered. About 100,000 acres of barley are planted in Minnesota annually. However, as recently as 1988 more than a million acres were planted. New winter barley varieties that perform well in the field and in the malt house and brewery will easily find their way into the marketplace. The recent explosion in small craft brewers, over 100 in Minnesota alone, will create increased demand for locally produced malting barley. Publicly released varieties will be distributed through Minnesota Crop Improvement Association.

TIMELINE

Agroecology research in the next five years will establish solid guidelines for winter barley production in Minnesota. Ongoing genetics research will provide new selection tools that will be implemented in the breeding program as developed. The first winter barley malting varieties should be available for industry testing by 2018 with a continuous stream following. Malting quality research will accompany breeding activities to assure new varieties fit end-user needs.