UNIVERSITY OF MINNESOTA EXTENSION

BARLEY

PROSPECTS FOR GROWING WINTER BARLEY IN THE UPPER MIDWEST

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INTRODUCTION

Historically the Upper Midwest was the nation's leading producer of six-row spring barley supplying 80% of the domestic malting barley. Much of the spring barley production moved to western states and Canada. Winter barley that meets malting standards could help fulfill this market demand.

Planting winter barley in the Upper Midwest could provide agroecosystem services including the reduction of nutrient runoff and soil erosion through establishing ground cover from the fall into the summer.

WINTER BARLEY PRODUCTION MANAGEMENT

Many cultural practices such as varietal selection, planting date, seeding density, and fertility management can greatly influence winter hardiness, an important trait for winter barley production in the region. Winter barley is known to be less winter hardy than winter rye and winter wheat (Andrews, 1987). Therefore, implementing best management practices to improve winter survival will be integral to the successful introduction of winter barley in the Upper Midwest.

Fall Planted

Spring Planted

Photos taken on the same day in late April.

MATERIAL AND METHODS

We conducted a winter barley trial with four planting date treatments between early September to mid-October from 2009-2018. The trials included three winter barley varieties that differed in winter hardiness (Table 1). Trials were grown in five locations in Minnesota (Figure 1).

OVERWINTER SURVIVAL RESULTS

The three locations in southern MN (St. Paul, Rosemount, and Lamberton) experienced much greater survival than the two locations in northern MN (Crookston and Moorhead) (Table 02). Statewide, in nine out of sixteen trials, there was differential (at least 50%) to very strong (100%) winter survival.

Table 1. Winter barley variety information

Variety	Origin	Year of Release	Barley Type	Winter Hardiness Rating
Charles	USDA-ARS, Aberdeen, ID	2005	Two-row, winter malt type	Low to medium
Maja	Oregon Ag Experiment Station	2006	Six-row, malt/feed type winter or spring sowed	Low to medium
McGregor	Seedway, bred in WI	1995?	Six-row, feed winter type	Medium to high

Figure 1. Participating locations

Table 2. Winter barley overall survival at each location/year.

Location	Number of years of strong survival/total participating years
Crookston	1/4
Moorhead	1/3
St. Paul	4/5
Lamberton	2/3
Rosemount	1/1

BEST PLANTING WINDOW FOR WINTER BARLEY

Because growing conditions vary considerably from year to year, we used historical climate data from 1988-2017 and an average range of fall Accumulative Growing Degree Days (AGDD) that led to strong overwinter survival results to determine the optimal planting dates for various locations in Minnesota(Zhong et al., unpublished data). Table 3 shows optimal planting dates for Minnesota.

In addition, avoiding infections of Hessian fly (*Mayetiola destructor*) and *Barley yellow dwarf virus* (BYDV) in the fall are two important considerations. The optimal planting dates in Table 3 take into considering the above insect population and movement in the fall.

Table 3. Optimal Winter barley planting dates in Minnesota

Location	Optimal Winter barley planting dates in Minnesota*
Crookston	9/1-9/17
Morris	9/11-9/22
St. Cloud	9/11-9/25
Lamberton	9/11-9/25
Waseca	9/11-9/26
Rochester	9/11-9/27

ADDITIONAL MANAGEMENT CONSIDERATIONS

- Fertilization application

Fertilizer was applied at the spring malting barley recommendation rate in the planting date trial, link: https://extension.umn.edu/crop-specific-needs/barley-fertilizer-recommendations. We anticipate that a follow-up study on fertilization rate could help us confirm whether this is an appropriate level of fertility for winter barley production.

- Harvest and Storage

Winter barley is harvested between late June to early July, and this is about two weeks prior to winter wheat harvest time. For additional harvest and storage information, please refer to the “Wheat and barley storage” guidelines posted at: https://extension.umn.edu/small-grains-harvest-and-storage/storing-wheat-and-barley.

FUTURE DIRECTIONS

Additional strategies to improve winter survival

Snow cover is critical to the overwinter survival of winter barley, as snow can insulate barley plants from cold temperatures. In the Upper Midwest, wind can cause snow coverage to be inconsistent leading to variation in winterkill across a field (Shulski & Seeley, 2004).

Direct seeding winter cereals into standing stubble can help trap snow (B. D. Fowler, 2012). There is limited information available on tillage and stubble effect on survival of winter barley. However, in winter wheat, a stubble height of four inches is considered the minimum needed to effectively trap snow (D. B. Fowler & Moats, 1995). The snow trapping potential (STP) index can be used to determine if sufficient stubble exists to trap snow.

STP = [stubble height (cm) x standing stems per m2] ÷ 100

Planting at a deeper depth protects the crown tissue of the plant from temperature extremes when compared to shallower depth. Seeding deeper, however, delays emergence, thereby reducing the number of growing degree days for the seedling to grow and store nutrients in the crowns that are needed for the crop to harden off and survive freezing temperatures (Chen, Gusta, & Fowler, 1983).

Double cropping

We are currently investigating a double cropping system utilizing winter barley and short-season soybean. Soybean was chosen as the summer annual partner because it is not a host of FHB and is a high value crop in the Upper Midwest. After winter barley harvest, short-season soybeans are sown in early July. If soybeans mature and are harvested by early October, then winter barley can be subsequently planted again. Winter barley and soybean together could provide year-long living ground coverage to reduce erosion, protect water quality, and generate income from the two crops.

REFERENCES AND FURTHER READING

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