

Dryland Malt Barley Yield and Quality in Response to Tillage, Cropping Sequence, and Nitrogen Fertilization



Upendra M. Sainju, Joy L. Barsotti (USDA-ARS, Sidney, MT) and Andrew W. Lenssen (Iowa State University, Ames, IA)

Introduction

- Malt barley requirements for malting purposes include sustained grain yield, $\leq 13.5\%$ protein concentration, and $\geq 80\%$ plump kernels.
- Effects of cultivars and N fertilization rates on malt barley yield and quality have been known.
- Little information is available about the effects of tillage and cropping sequence on malt barley yield and quality.
- Information is needed to reduce tillage intensity and N rates on malt barley production for reducing soil erosion, cost of N fertilization, and N leaching.

Objectives

- Evaluate the effects of tillage, cropping sequence, and N fertilization on dryland malt barley yield, protein concentration, kernel plumpness, and N-use efficiency from 2006 to 2011 in eastern Montana.
- Determine a management option that sustains malt barley yield and quality.



Treatments

Four tillage and cropping sequence (main plot):

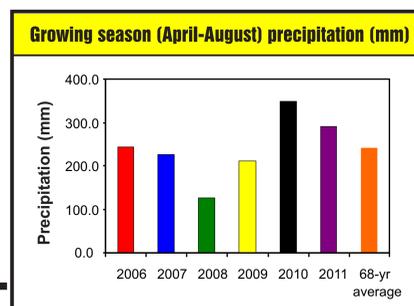
- No-till continuous malt barley (NTCB)
- No-till malt barley-pea (NTB-P)
- No-till malt barley-fallow (NTB-F)
- Conventional till malt barley-fallow (CTB-F)

Four N fertilization rates: (split-plot)

- 0, 40, 80, and 120 kg N ha⁻¹

Randomized complete block with three replications

Location: Sidney, MT
Duration: 2006-2011



Conclusions

- Cropping sequence containing fallow increased malt barley yield compared to continuous cropping, especially during dry years.
- Cropping sequence containing fallow responded less to N fertilization in malt barley yield compared to continuous cropping (NTB-P > NTCB).
- Annualized malt barley grain yield is greater in continuous cropping than in crop-fallow.
- Tillage has no effect on malt barley grain yield, protein concentration, N-use efficiency, and kernel plumpness.
- Increased N fertilization rate increased malt barley grain yield and protein concentration, but reduced N-use efficiency and kernel plumpness.
- For sustaining malt barley yield and quality, no-till malt barley-pea with N rate between 40 to 80 kg N ha⁻¹ may be used. This management option also reduces the potentials of soil erosion, N leaching, N₂O emissions, and incidences of diseases, pests, and weeds compared to conventional till malt barley-fallow

