# Cultural Practices for Producing Dryland Malt Barley: Planting Rate

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Fertilizer Facts

Fertilizer √off

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## Introduction

Production of malting barley is expected to increase in non-traditional barley producing areas of north central Montana due to the expected increase in contracts from the International Malt facility located in Great Falls, MT and traditional spring wheat producers seeking alternative crops with less nitrogen (N) fertilizer requirements. Generally the requirements and the effects of N on malt barley are well known (Jackson, 2000); however, little information about the combined effects of sulfur (S), N, and planting rate is available. Thus field research was initiated at several locations to evaluate S, N, and planting rates on the yield and quality of malting barley. Fertilizer Fact 48 reports on effects of S while this Fertilizer Fact reports the effect of planting rate.

## Methods

Planting rates of 10, 15, and 20 seeds/ft$^2$, N rates of 0, 30, and 60 lbs/acre, and S rates of 0, 10, and 20 lbs/acre were applied in all possible combinations to Metcalfe (2004 and 2005) or Hockett barley (2006). Locations in 2004 included: Western Triangle Agricultural. Research Center (WTARC) north of Conrad, Knees community east of Brady, north of Joplin, east of Sunburst, and east of Ethridge. The same locations were established in 2005 and 2006 with an additional location north of Cut Bank. Research plots were established in chemical fallow fields however the Sunburst, 2004 site was planted no-till into barley stubble and all WTARC sites were planted into conventional fallow. In 2004, plots were planted with a double disc drill that broadcast N as urea and 25 lbs/acre of potassium (K) as KCl while planting, and S as potassium thiosulfate or ammonium thiosulfate was dribbled on the soil surface about two inches from the seed row while planting. In 2005 and 2006, N as urea, 25 lbs/acre of K as KCl, and S as potassium sulfate was applied while seeding in a band approximately one inch above and to the side of the seed row using a hoe opener. All plots received 30 lbs $P_2O_5$/ acre as 0-45-0 applied with seed. Soils at each location were sampled initially for water, nitrate-N, and sulfate-S in foot increments to a depth of three feet. Surface soil samples (0-6 in.) were collected for standard soil analyses including pH, organic matter, and Olsen P. Plots were harvested with a small plot combine, and the grain weighed and tested for plump kernels, protein, and S content.

## Results

Highest average yields were almost 100 bu/acre measured at three locations, but most yields were in the 70 to 80 bu/acre range. Two locations, Sunburst, 2004 and Joplin, 2006 suffered severe drought and very low yields. Figures 1 and 2 show the 10 locations with significant grain yield increases due to planting rate. Grain yields at the remaining locations were unaffected by planting rate. Optimum planting rate was usually between 15 and 20 seeds/ft$^2$. The effects of planting rate on plump kernels are summarized in Figures 3 and 4. As expected, due to less available water, percent plump declined with increasing planting rate at 11 locations; however, only one site had less than 75% plump kernels (the malting industry will usually accept dryland malt barley with greater than 75% plump kernels and less than 13.5% protein). Increasing planting rate resulted in significant protein content declines for seven site years (Table 1); for the other 10 site years, protein levels were unaffected by planting rate. There were no interactions between planting rate, N, and S treatments; therefore, the data shown represents the mean of all N and S treatments.

## Fertilizer Facts:

- Dryland malt barley grain yield, plump, and protein content interactions between planting rate, N rate, and S rate were all non-significant.
- Dryland malt barley optimum planting rate is approximately 15 seeds/ft$^2$ when considering desired grain yield, plumpness, and protein content.

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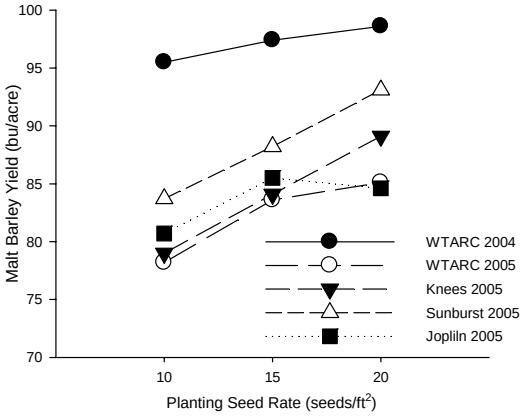


Figure 1. Effects of planting rate on malt barley grain yield (2004 &2005). Only site years that had significant yield differences are shown.

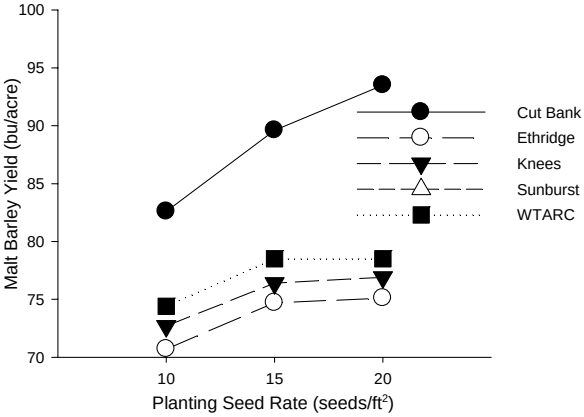


Figure 2. Effects of planting rate on malt barley grain yield (2006). Only site years that had significant yield differences are shown.

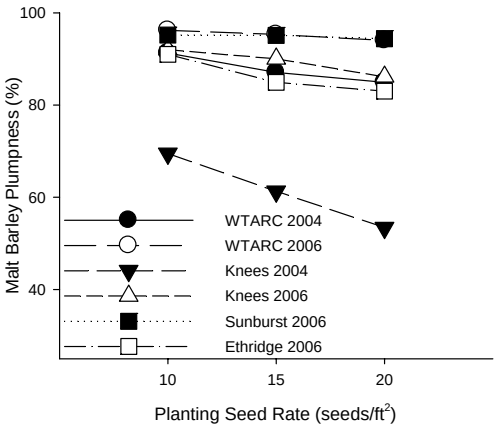


Figure 3. Effects of planting rate on malt barley kernel plumpness (2004 &2006). Only site years that had significant yield differences are shown.

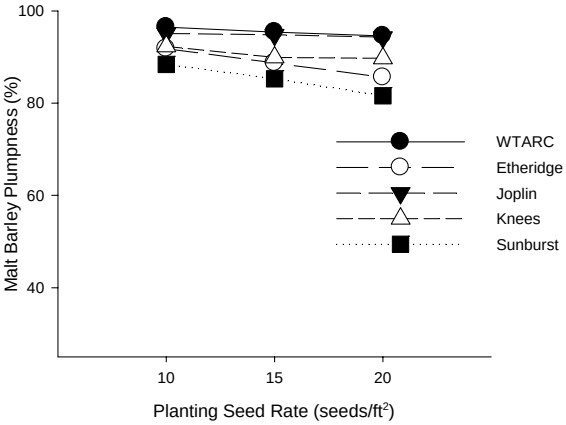


Figure 4. Effects of planting rate on malt barley kernel plumpness (2005). Only site years that had significant yield differences are shown.

Table 1. Effect of planting rate on grain protein content (%) of dryland malt barley. WTARC: Western Triangle Agricultural Research Center. 2004-2006.

| Treatment Planting Rate | Location | | | | | |
|---|---|---|---|---|---|---|
| | Cut Bank | Ethridge | Joplin | Knees | Sunburst | WTARC |
| **2006** | | | | | | |
| 10 seeds/ft$^2$ | 10.02 a | 10.75 a | ND | 11.15 a | 8.82 a | 9.39 a |
| 15 seeds/ft$^2$ | 9.67 b | 10.52 ab | ND | 10.97 a | 8.18 b | 9.31 a |
| 20 seeds/ft$^2$ | 9.72 b | 10.33 b | ND | 11.18 a | 8.02 b | 9.24 a |
| **2005** | | | | | | |
| 10 seeds/ft$^2$ | 10.0 a | 10.3 a | 12.4 a | 12.3 a | 12.6 a | 13.8 a |
| 15 seeds/ft$^2$ | 9.8 ab | 9.9 b | 12.4 a | 12.1 a | 12.4 b | 13.5 a |
| 20 seeds/ft$^2$ | 9.5 b | 9.7 b | 12.2 a | 11.7 b | 12.1 c | 13.4 a |
| **2004** | | | | | | |
| 10 seeds/ft$^2$ | ND | 12.0 a | 12.6 a | 14.7 a | 13.8 a | 11.6 a |
| 15 seeds/ft$^2$ | ND | 11.8 a | 12.6 a | 14.6 a | 13.9 a | 11.1 b |
| 20 seeds/ft$^2$ | ND | 12.0 a | 12.6 a | 14.5 a | 14.4 a | 10.9 b |

Means with the same letter are not significantly different according to the LSD (p=0.05) test. ND=Not Determined.

*Edited by Clain Jones, Extension Soil Fertility Specialist, and Elizabeth D'Imperio, Research Associate*