

# Irrigation Practices and Solum Barley Test Weight and Yield, 2000

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## Summary

*Solum is a barley bred for reduced water use that tends to have low test weight. An experiment was conducted at the Maricopa Agricultural Center to determine the effect of the number of irrigations and their timing on test weight and grain yield of Solum barley. Applying an irrigation at planting and a second irrigation at jointing resulted in the lowest test weight (44.4 lbs/bu) and nearly the highest grain yield (4315 lbs/acre) recorded in the test. All other irrigation treatments resulted in acceptable test weights above 48 lbs/bu except for irrigating at planting plus tillering, which resulted in 47.0 lb/bu test weight. Irrigating at planting and then delaying the second irrigation until boot or later resulted in acceptable test weight but decreased grain yield by 9% or more compared to applying the second irrigation at jointing. Grain yields similar to that obtained by applying a second irrigation at jointing was obtained by delaying the second irrigation until boot and applying a third irrigation at milk or soft dough. This experiment will be conducted a second year before conclusions are drawn.*

## Introduction

Solum was released about 10 years ago as a low input barley for reduced water use conditions. Typically one or two irrigations are applied, and other cultural inputs are minimal. A disadvantage of Solum that has become more apparent recently is the grain tends to be low in test weight.

The purpose of this work is to determine how low test weight in Solum barley may be alleviated by irrigation practices.

## Materials and Methods

An experiment was conducted at the Maricopa Agriculture Center on a Casa Grande sandy loam soil. The previous crop was cotton and ammonium sulfate was applied before planting at a rate of 52 lbs N/acre. Solum barley was planted at a rate of 80 lbs/acre and germinated with an irrigation on December 16, 1999. Irrigation treatments were initiated in February on borders that were 47 ft x 660 ft, or 0.71 acre per border. The experimental design was a randomized complete block with 4 replications and 10 irrigation treatments. The irrigation treatments consisted of a single irrigation at planting time, an irrigation at planting and a second irrigation anywhere from tillering to soft dough, and an irrigation at planting and boot and a third irrigation from flowering to soft dough. Approximately 6 inches of water were applied per irrigation. The growing season can be characterized as warm and dry, with above average temperature and precipitation only recorded in March [primarily March 6 and 7] (Table 1).

Plant height and lodging were noted on April 25. Plots receiving fewer or earlier irrigations matured first and were harvested as ready to avoid shattering losses typical of Solum. The grain harvest began on April 28 and ended on May 10. The field was "squared off" before harvesting began. A Gleaner combine was used to harvest an area of 10 ft. by 550 ft. within each plot. The grain from each plot was weighed on a truck scale and duplicate 1 qt. samples were obtained for determination of grain moisture, test weight, and kernel weight. Grain yield was calculated and adjusted to 8% moisture. Kernel weight was determined from a 10 g sub-sample.

## Results and Discussion

The jointing stage of growth was the optimum time to apply a second irrigation for grain yield, but resulted in grain with an unacceptable test weight of 44.4 lbs/bu (Table 2). Irrigation at jointing also resulted in the most lodging and the tallest plants of any irrigation treatment. Irrigation at tillering resulted in a marginally acceptable test weight of 47.0 lbs/bu, and slight effects on lodging and plant height. All other irrigation treatments resulted in acceptable test weights above 48 lbs/bu, even the treatment receiving only a single irrigation near planting.

This data suggests that Solum barley should not be irrigated during the jointing stage of growth in order to avoid low test weight. The plant is growing most rapidly during jointing, and delaying irrigation past this stage can shorten the plant and reduce lodging. The grain head is forming during jointing, and water applied at this time seems to encourage the plant to develop more kernels than can be filled properly later in the season. Unfortunately, delaying the second irrigation past jointing until boot may reduce grain yield. This grain yield reduction may be recovered by applying a third irrigation at milk or soft dough. This test will be repeated a second year before conclusions are drawn or recommendations made.

## Acknowledgements

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Table 1. Climatic data for Maricopa for the 1998-99 growing season compared to the long-term average.

| Climate variable | Year(s) | Dec  | Jan  | Feb  | Mar  | Apr  |
|------------------|---------|------|------|------|------|------|
| Max Temp. (°F)   | 1999-00 | 67   | 71   | 73   | 75   | 89   |
|                  | Avg. ‡  | 67   | 68   | 71   | 76   | 84   |
| Min Temp. (°F)   | 1999-00 | 32   | 36   | 39   | 44   | 52   |
|                  | Avg. ‡  | 36   | 35   | 37   | 42   | 47   |
| Ppt. (in)        | 1999-00 | 0.00 | 0.00 | 0.00 | 1.97 | 0.00 |
|                  | Avg. ‡  | 1.53 | 0.59 | 0.83 | 0.67 | 0.39 |

‡Averages based on data summarized by Western Regional Climate Center from 1961-1990.

Table 2. The influence of irrigation practices on grain yield, test weight, kernel weight, plant height, and lodging of Solum barley. The first irrigation was applied at planting on December 14.

| Second irrigation    | Third irrigation     | Grain yield<br>lbs/acre | Test weight<br>lbs/bu | Kernel weight<br>g/1000 | Plant height<br>inches | Lodging<br>% |
|----------------------|----------------------|-------------------------|-----------------------|-------------------------|------------------------|--------------|
| None                 | None                 | 2704                    | 49.7                  | 41.5                    | 26                     | 0            |
| Tillering (Feb 4)    | None                 | 3532                    | 47.1                  | 37.9                    | 33                     | 5            |
| Jointing (Feb 18)    | None                 | 4315                    | 44.4                  | 33.1                    | 38                     | 24           |
| Boot (Mar 7)         | None                 | 3827                    | 48.8                  | 41.7                    | 28                     | 8            |
| Milk (Mar 24)        | None                 | 3790                    | 50.6                  | 45.4                    | 27                     | 0            |
| Soft dough (April 3) | None                 | 3408                    | 49.8                  | 45.8                    | 27                     | 0            |
| Boot (Mar 7)         | Flower (Mar 14)      | 3642                    | 48.0                  | 38.4                    | 26                     | 0            |
| Boot (Mar 7)         | Water (Mar 21)       | 4042                    | 49.1                  | 40.8                    | 28                     | 0            |
| Boot (Mar 7)         | Milk (Mar 28)        | 4286                    | 49.9                  | 42.2                    | 29                     | 0            |
| Boot (Mar 7)         | Soft dough (April 4) | 4594                    | 50.8                  | 42.2                    | 26                     | 0            |
| LSD (5%)             |                      | 535                     | 1.5                   | 4.0                     | 6                      | 13           |