Irrigation Practices and Solum Barley Test Weight and Yield, 2001

M. J. Ottman and M. T. Rogers

Summary

Solum is a barley bred for reduced water use that tends to have low test weight. This is the second year of an experiment 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. A single irrigation resulted in low yield (2043 lbs/acre) and unacceptable test weight (45.2 lbs/acre). Two or three irrigations increased yield and test weight in most cases. Applying a second irrigation at the 1 node, 2-3 node, or boot stages resulted in yield of 2694, 2877, and 2670 lbs/acre and test weight of 48.5, 49.0, and 49.5 lbs/bu, respectively. Applying a second irrigation at boot and a third irrigation between flowering and soft dough resulted in an average yield of 3008 lbs/acre and an average test weight of 50.0 lbs/bu. Delaying the second irrigation of Solum barley until boot reduces the risk of lodging and low test weight, and results in high yields.

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. This is the second year of this research.

Materials and Methods

An experiment was conducted at the Maricopa Agriculture Center on a Casa Grande sandy loam soil. The previous crop was cotton. Solum barley was planted at a rate of 80 lbs/acre and germinated with an irrigation on December 4, 2000. Irrigation treatments were initiated in February on borders that were 23 ft x 660 ft, or 0.35 acre per border. The experimental design was a randomized complete block with 4 replications and 12 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.

Plant height and lodging were noted at harvest. An area of 5 ft x 650 ft was harvested on May 3 and 4 with a small plot combine. The grain from each plot was weighed 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.

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Results and Discussion

The 2000-01 barley growing season can be characterized as cool (initially) and wet except for December (Table 1). Precipitation was above average in January, March, and April. The maximum daily temperature was below average in January and February, near average in March and April, and above average in May. Minimum daily temperature was within 1 to 2°F of the long term average except in March and April where it was more than 2°F above average. The relatively cool early season temperatures delayed crop development initially.

One irrigation resulted in low grain yield and unacceptable test weight of below 48 lbs/bu (Table 2). Two or three irrigations increased test weight compared to a single irrigation except where the second irrigation was applied at tillering or soft dough. Two or three irrigations also increased grain yield compared to a single irrigation except where the second irrigation was applied at the kernel watery or soft dough stage. The 2-3 node stage was the optimum time to apply a second irrigation for grain yield, and resulted in grain with an acceptable test weight of 49.0 lbs/bu. Three irrigations did not result in statistically higher yields than two irrigations with the second applied at the 2-3 node stage. Applying a second irrigation at 1 node and a third irrigation at soft dough resulted in the tallest plants and the most lodging. Applying a second irrigation at the 1 node or 2-3 node stages also resulted in some lodging.

The results of the study this year suggest that yield and test weight of Solum barley are optimized by applying a second irrigation at the 2-3 node stage. Yield was optimized in last year's study by applying a second irrigation at the 1 node stage, but test weight was unacceptably low (Ottman and Rogers, 2000). Therefore, based on the results from both years, a second irrigation should be delayed until near boot to reduce the risk of lodging and low test weight in Solum barley. Applying a third irrigation after boot may or may not increase yield.

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Table 1. Climatic data for Maricopa for the 2000-01 growing season compared to the long-term average.

Climate variable	Year(s)	Dec	Jan	Feb	Mar	Apr
Max Temp. (ºF)	2000-01	69	63	68	77	83
	Avg. ‡	67	68	71	76	84
Min Temp. (ºF)	2000-01	34	36	37	45	51
	Avg. ‡	36	35	37	42	47
Ppt. (in)	2000-01	0	1.30	0.63	1.06	1.02
	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 4.

Second irrigation	Third irrigation	Grain yield	Test weight	Kernel weight	Plant height	Lodging
		lbs/acre	lbs/bu	g/1000	inches	%
None	None	2043	45.2	35.2	29.5	1
Tillering (Jan 26)	None	2501	46.4	36.3	32.3	3
1 node (Feb 16)	None	2694	48.5	39.2	33.0	10
2-3 nodes (Mar 1)	None	2877	49.0	40.2	30.8	10
Boot (Mar 9)	None	2670	49.5	41.2	32.0	2
Kernel watery (Mar 26)	None	2306	48.7	41.6	30.0	0
Soft dough (Apr 6)	None	2436	45.7	36.6	28.3	0
1 node (Feb 16)	Soft dough (April 6)	2782	47.8	38.4	35.3	24
Boot (Mar 9)	Flower (Mar 16)	2905	50.0	42.7	31.8	2
Boot (Mar 9)	Water (Mar 23)	3111	50.6	44.2	32.0	5
Boot (Mar 9)	Milk (Mar 30)	2929	50.2	43.9	33.8	2
Boot (Mar 9)	Soft dough (April 6)	3090	49.2	42.3	31.0	0
LSD (5%)		416	1.3	1.8	3.6	16