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Managing Irrigation and Nitrogen For Moravian Barley In Southern Idaho

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Moravian barley has become an important variety in southern Idaho and its acreage is still increasing. This 2-row barley tends to lodge soon after heading. The risk of lodging is greater if excess nitrogen is present and if the crop is well-watered before the boot stage. Lodging decreases the barley's malting quality and may lower yield because of harvesting problems.

The main quality factors of 2-row malting barley that are influenced by irrigation and nitrogen management are:

Protein content - Maltsters and brewers prefer 12% or less protein.

Percent plump kernels - Maltsters require at least 80% and prefer over 90% plump kernels.

Germination - Maltsters prefer barley with over 96% germination.

RECOMMENDATIONS

1. Before planting, obtain a soil test for residual nitrate-nitrogen, especially following crops like potatoes, onions and sugarbeets. If the residual nitrate-nitrogen is over 120 lb./acre, do not apply nitrogen fertilizer.

2. If nitrogen fertilizer is needed, apply only enough that the residual plus fertilizer nitrogen does not exceed 120 lb./acre.

3. If winter precipitation has wet the root zone and if germination and tillering are good, delay the first irrigation until the boot stage or the last week in May in the Twin Falls area. Irrigating earlier can cause longer straw which increases the risk of lodging.

4. After the first irrigation, apply 3 to 4 inches of water every 12 to 14 days until the soft dough stage or until the last 5 days in June in the Twin Falls area.

EXPERIMENTS

The objectives of these studies were (1) to determine if straw length and lodging could be decreased by delaying irrigations before the boot stage and (2) to determine the amount of nitrogen required for maximum yield and quality.

We used Moravian No. 8 in furrow-irrigated field experiments near Kimberly in 1971 and 1972, Moravian III in sprinkler-irrigated field experiments near Buhl in 1973 and 1974. Seeding rate was 100 lb./acre each year.

The soil series at each site is a typical Portneuf silt loam. This soil has a cemented layer, which generally restricts the roots, beginning at the 16 to 18 inch depth.

Irrigation Treatments

Two irrigation treatments were used each year. For the normal soil moisture treatment (M-1), irrigations were applied to obtain near-maximum yields (about 65% available soil moisture remained at 18-inch depth). For the second soil moisture treatment (M-2), first irrigation was delayed about 1 week during the jointing stage. After the first irrigation, the M-2 plots were irrigated at the same level of soil moisture depletion as the M-1 plots.

Small furrows spaced 24 inches apart and 12-hour irrigation sets were used in the furrow-irrigated experiments. Water was applied to every-other furrow except for the first irrigation of the M-2 plots, where each furrow was used to replace the larger amount of soil

Table 1. Rainfall from planting to first irrigation.

Year	Planting date	First irrigation date		Rainfall from planting to first irrigation	
		M-1	M-2	M-1	M-2
					(inches)
1971	4/1	6/1	6/8	5.1*	5.6*
1972	3/28	5/19	5/23	0.4	0.7
1973	3/24	5/21	5/30	1.6	1.9
1974	3/28	5/22	5/28	1.1**	1.1**
Average		5/23-24	5/30	2.1	2.3

*Includes 1 inch applied 4/12/71 to improve germination
**Includes 1 inch applied 5/3/74 to improve tillering

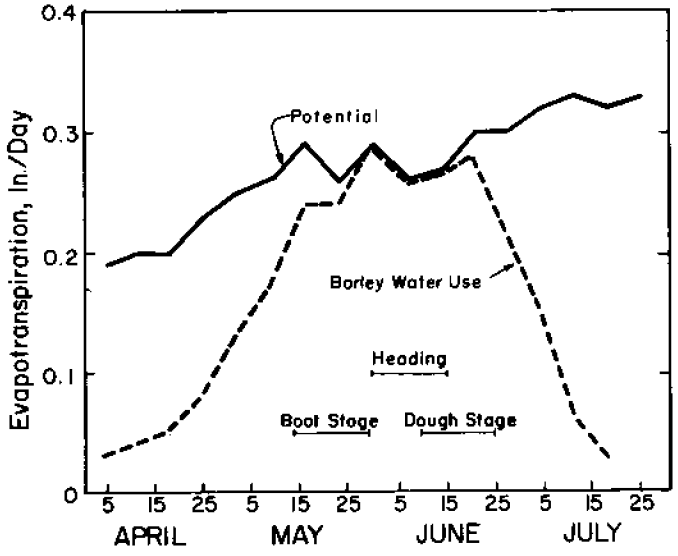

Fig. 1. Estimated daily water use by barley in southern Idaho as compared with daily potential or maximum evapotranspiration.

moisture that had been depleted. The furrows used were alternated for each irrigation.

For the sprinkler irrigation experiments, a solid set system (40- x 50-foot spacing and 9/64-inch nozzles) applied about 3 inches of water at each irrigation, except for the first irrigation on the M-2 plots which received about 4 inches.

The rainfall received from planting to the first irrigation is summarized in Table 1 because the amount of rain during this period determines when the first irrigation is needed. Normally, the M-1 plots were irrigated between May 19 and May 22. In 1971, however, heavy spring rains delayed first irrigation to June 1. On the M-2 plots, the first irrigation was made 6 to 7 days after the M-1 application. Two or three additional irrigations were applied to all plots at about 13-day intervals as indicated by the tensiometers. The last irrigation for both treatments was applied during the soft dough stage (average date, June 27).

Nitrogen Rates

Table 2 shows residual nitrate-nitrogen at each experimental site and the nitrogen fertilizer applied before planting. Soil tests for phosphorus indicated an adequate supply each year (see Current Information Series No. 270, Idaho Fertilizer Guide — Malting Barley).

RESULTS

The estimated daily water-use rate by barley is compared with the maximum or potential rate of evapotranspiration in southcentral Idaho in Fig. 1. Barley will use about 0.25 inch per day from the boot stage through the soft dough stage (from about May 20 until June 20). Before the boot stage, the estimated water-use rate rapidly increases and approaches the potential rate

Table 2. Effect of nitrogen and irrigation on straw length, lodging and yields.

Year	Residual nitrate-nitrogen (N_n) (0-24 inch depth)	Nitrogen fertilizer rates (N_f)	$N_n + N_f$	M-1 plots			M-2 plots		
				Straw length[1]	Lodging	Yield	Straw length	Lodging	Yield
	lb./acre	lb./acre	lb./acre	inches	%	bu/acre	inches	%	bu/acre
				Furrow irrigated					
1971	56	0	56	—	0	60.6	—	7	94.9
		60	116	—	50	73.9	—	67	69.7
		120	176	—	52	80.5	—	80	74.4
1972	29	0	29	—	0	49.7	—	0	48.4
		30	59	—	0	65.3	—	0	61.4
		80	109	—	0	84.8	—	0	84.9
				Sprinkler irrigated					
1973	50	0	50	33	15	111.2	29	0	108.3
		25	75	37	27	112.8	31	5	117.3
		75	125	38	73	123.3	33	10	114.3
		150	200	41	92	101.6	38	15	111.7
1974	17	0	17	25	0	43.0	23	0	56.1
		50	67	33	0	71.3	27	0	74.7
		100	117	36	2	81.9	29	0	88.9
		200	217	36	37	84.6	28	1	83.6

[1]Measured only in 1973 and 1974

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