Nitrogen Management for Irrigated Malting Barley

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Objective

The objective of this study was to measure the impact of varying nitrogen rates and application strategies on the grain yield, and protein composition of irrigated barley.

Executive Summary

A study was established in 2009 to evaluate the response of four barley varieties to nitrogen rates and application strategies. The nitrogen rates were 0, 30, 60, 90, and 120 lbs. N/ac. The application strategies were: 100% applied pre-plant incorporated (PPI), 100% applied polymer coated pre-plant incorporated (PC PPI), and a split-application (split) with 50% applied pre-plant incorporated followed by 50% post-emergence. The nitrogen fertilizer source material was urea. The polymer coated urea was Nutrisphere-N from Simplot. The barley varieties evaluated were: Stellar-ND, Tradition, Pinnacle, and 2ND21867.

Results:

- Grain protein increased as the nitrogen rate increased. Pinnacle had the lowest grain protein at each nitrogen rate while Stellar-ND and Tradition tended to have the highest grain protein.
- The nitrogen application strategy did not affect grain yield.
- When no fertilizer was applied, grain yields ranged from 101 to 121 bushels per acre. Pinnacle and 2ND21867 produced about 140 bushels per acre with 30 pounds of applied nitrogen.
- A maximum grain yield of 158 bushels per acre was achieved with 2ND21867 and 120 lb of applied nitrogen.
- At the end of the season, soil nitrogen levels were similar for the untreated check and the 90 lb N PPI treatment while the 90 lb N PC PPI and split applications had greater residual nitrogen levels.

Grain Yield

For grain yield there was a nitrogen rate by variety interaction. When averaged over application strategy, grain yields ranged from 101 to 121 bushels per acre with no fertilizer (Table 1). Pinnacle and 2ND21867 produced about 140 bushels per acre with 30 pounds of applied nitrogen. A maximum grain yield of 158 bushels per acre was achieved with 2ND21867 and 120 lbs. N/ac.

For reference, in 2008 there was a nitrogen fertilizer rate by application strategy interaction for grain yield (Table 2). An average of about 74 bushels per acre was produced when no fertilizer was applied. At the 30 and 60 lb N rates there were no differences in grain yields among the three application strategies. At the 90 lb N rate, the polymer coated urea applied pre-emergence (PC PRE) produced 9 bu/ac more than urea applied pre-emergence (PRE), while the split application produced 14 bu/ac more than the PC PRE treatment. The highest grain yields occurred with 90 and 120 lb N applied as a split application and 120 lb N applied pre-emergence with the polymer coated urea (PC PRE).

Table 1. Grain yield and the amount of nitrogen per bushel produced, 2009.

	Nitrogen Rate (lb/ac)					Total Available Nitrogen[a]					
Variety	0	30	60	90	120	95	125	155	185	215	Mean
	Grain Yield (bu/ac)					lb N/bu					
Stellar-ND	101	123	134	136	141	1.00	1.06	1.20	1.40	1.57	1.25
Tradition	103	120	140	145	150	0.98	1.09	1.15	1.32	1.47	1.20
Pinnacle	114	140	143	144	147	0.89	0.94	1.12	1.33	1.50	1.16
2ND21867	121	142	154	151	158	0.83	0.92	1.05	1.27	1.40	1.09
LSD 0.05	8					Mean 0.93	1.00	1.13	1.33	1.49	

[a]Total N = 60 lb soil + 40 lb field pea credit + applied N. LSD 0.05; Total Available Nitrogen = 0.03, Variety = 0.03.

Table 2. Grain yield and the amount of nitrogen per bushel produced, 2008.

Nitrogen Rate	Total N[a]	Grain Yield			[b]Application Stategy			
		PRE	PC PRE	Split	PRE	PC PRE	Split	Mean
lb/ac		bu/ac			lb N/bu			
0	90	81	68	72	1.22	1.35	1.27	1.28
30	120	83	85	86	1.48	1.51	1.41	1.47
60	150	110	111	116	1.39	1.37	1.30	1.35
90	180	112	121	135	1.62	1.51	1.34	1.49
120	210	124	132	137	1.70	1.60	1.55	1.62
LSD 0.05		8			Mean 1.48	1.47	1.37	

[a]Total N = 50 lb soil + 40 lb soybean credit + applied N.

[b]LSD 0.05; Nitrogen Rate = 0.08, Application Strategy = 0.06