

Nitrogen Fertilizer Utilization by Winter Wheat Under Dry Spring Conditions at Minot

Summary: The primary objective of this study was to observe the effects of nitrogen fertilizer applied at various growth stages of winter wheat. The study was conducted during the 2018, 2019 and 2020 growing seasons, and the table below are combined means. The study sustained a lack of early season precipitation all three years which affected infiltration and root absorption of surface applied urea treatments, resulting in abnormal overall growing conditions. Nitrogen fertilizer rates and application timing had no statistically significant effect on heading date, NDVI (plant greenness) rating, plant height or grain yield. Significant differences between fertilizer treatments for test weight were detected but there was not an obvious trend. Uncorrected nitrogen deficiencies in this crop are usually expressed (after the fact) in low grain protein content and conversely, excessive N levels are expressed as high grain protein content. Higher protein levels in this study may be explained by a lack of springtime precipitation resulting in limited nitrogen infiltration as stated above. Statistically significant differences for protein content were observed with a trend of higher levels when N fertilizer was applied at jointing or flowering. Although there were no statistically significant yield responses for N applications in this study, it is well known that kernel formation occurs early in springtime plant growth and that plant nutrition is a key component in kernel formation and development. It is truly remarkable to see the yielding ability of this crop with little or no added fertilizer inputs. This observation should be further evaluated.

Planting Pounds	Applied Nitrogen*			Heading Date June	NDVI 0-1	Plant Height inches	Test Weight lb/bu	Grain Protein %	Grain Yield bu/A
	E Spg	Jointing	Flowering						
0	0	0	0	9a	0.54a	24a	59.8abc	14.1d	49.1a
50	0	0	0	11a	0.57a	24a	59.8abc	14.1d	48.7a
100	0	0	0	10a	0.58a	25a	59.9abc	14.1d	52.4a
50	50	0	0	9a	0.60a	25a	60.0ab	14.4cd	52.8a
0	50	50	0	10a	0.62a	24a	59.4bc	14.8abcd	50.3a
50	0	50	0	10a	0.60a	25a	59.2bc	15.1abc	46.0a
50	50	0	25	10a	0.58a	25a	59.5bc	15.4a	48.2a
50	0	0	25	10a	0.57a	24a	60.4a	15.3ab	46.8a
100	0	0	25	10a	0.61a	25a	59.3bc	14.7abcd	49.5a
0	50	0	0	10a	0.61a	25a	59.3bc	14.5bcd	52.0a
0	100	0	0	9a	0.59a	25a	59.7abc	15.4a	50.6a
0	0	50	0	10a	0.56a	25a	59.5bc	14.8abcd	50.0a
0	0	100	0	10a	0.61a	25a	59.6bc	14.7abcd	51.9a
0	0	0	25	9a	0.55a	24a	59.1c	15.0abc	48.2a
0	50	0	25	9a	0.57a	25a	59.2bc	15.1abc	48.5a
0	100	0	25	9a	0.60a	25a	59.3bc	15.0abc	51.4a

Means followed by the same letter within each column were not statistically different.

*Applied N = actual pounds of N applied in a mid-row band at planting or surface applied as urea in the Spring.

Planting Date: Sept. 21, 2017, Sept. 24, 2018 and Sept. 17, 2019

Planting Rate: 1.3 million PLS/A

Variety: Decade

Harvest Date: July 24, 2018, August 7, 2019 and July 30, 2020

Previous Crop: 2017 and 2018 = Spring Wheat, 2019 = canola

Soil Type: Williams loam

Residual soil N: 2018 = 50 lbs/A, 2019 = 17 lbs/A and 2020 = 46 lbs/A.