Spring Wheat Response to Nutrisphere-N, Carrington, 2009

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Two studies were conducted at the Carrington Research Extension Center to evaluate spring wheat response to Urea and Nutrisphere-N (NSN): 1) applied to the soil surface and 2) in saturated soil conditions.

Materials and Methods

Surface application: The experimental design was a split-split-split plot design with placement (pre-plant incorporated (PPI) and surface applied) as the main plot, nitrogen (N) rate (0, 50, and 100 lbs N/ac) as the sub plot, and N type (urea and NSN) as the sub-sub plot. A May 4, 2009, soil analysis indicated 1 and 9 lbs N/ac in the 0-6" and 6-24" zones. The previous crop was soybean. The fertilizer treatments were applied May 6 to a dry soil surface. The fertilizer was incorporated shortly after application in the PPI plots. 'Glenn' spring wheat was seeded May 7 in 7-inch rows at 1.2 million pure live seeds per acre. On July 2 a hand-held Greenseeker was used to assess plant greenness and vigor. The trial was harvested September 3.

Saturated soil: The experimental design was a split-split-split plot design with soil moisture (dryland and saturated soil) as the main plot, nitrogen rate (0, 50, and 100 lbs N/ac) as the sub plot, and N type (urea and NSN) as the sub-sub plot. An April 30 soil analysis indicated 8 and 9 lbs N/ac in the 0-6" and 6-24" zones. The previous crop was sunflower. The fertilizer treatments were applied and incorporated on May 15. 'Glenn' spring wheat was seeded May 15 in 7-inch rows at 1.2 million pure live seeds per acre. Soil moisture conditions at the site were near field capacity at planting. To achieve the saturated soil conditions, a sprinkler irrigation system was utilized. The saturated soil plots received 5 inches of irrigation June 2-9. The trial was harvested September 4.

Results

Weather: The average temperature was 57°F on the day of application with an average daily temperature of 45°F from May 7 to 11, 9°F below average. The first significant rainfall occurred on May 12, 0.41 inches. April-July rainfall amounts were 4.68 inches below normal (Table 1).

Table 1. April- July Rainfall.

	2009	Normal
April	1.68	1.44
May	1.36	2.49
June	1.61	3.79
July	1.50	3.11
Total	6.15	10.83

Surface application: Since no interactions were detected, only results for main effects will be discussed (data not shown). For all parameters measured no differences were detected among treatments for the two application methods and two N types evaluated (data not shown). There were differences in spring wheat response to N rates (Table 2). The number of spikes per acre, plant height, Greenseeker values, kernel weight, and grain yield increased with the first

increment of N then leveled off. Test weight decreased slightly as the N rate increased, while grain protein increased as the N rate increased.

Table 2. Spring wheat response to nitrogen. Surface application trial. Averaged over placement.

Nitrogen Rate	Spike Count	Plant Height	Greenseeker Values	1000 Kernel Weight	Test Weight	Grain Protein	Grain Yield
lb N/ac	million/ac	inch	NDVI	gram	lb/bu	%	bu/ac
0	1.3	30.9	0.65	33.3	64.7	14.4	44.0
50	1.5	36.0	0.80	34.4	64.7	15.1	57.4
100	1.5	35.5	0.81	34.3	64.6	15.4	58.4
150	1.5	35.4	0.79	34.2	64.4	15.9	58.7
LSD 0.05	0.2	1.2	0.03	0.6	0.2	0.3	3.8

Saturated Soil: A soil moisture by N rate by N type interaction occurred for kernel weight (data not shown). Kernel weight generally increased as the N rate increased. Kernel weight for the 100 lbs N application applied as urea in the dryland soil and as NSN in the saturated soil was lower than the trends. An N rate by soil moisture interaction occurred for grain yield (Table 3). When comparing the saturated and dryland soil moisture, grain yield was greater in the saturated soil at the 100 and 150 lbs N rate and lower at the 50 lbs N rate. When averaged over soil moisture conditions and N rates, grain yield and protein for urea and NSN were 62.2 and 58.4 bu/ac, LSD 0.05 = 3.3 and 13.2 and 13.5 percent, LSD 0.05 = 0.01. When averaged over soil moisture conditions and N type, plant height and grain protein increased as the N rate increased (Table 4).

Table 3. Grain yield response to soil moisture and N rates. Saturated trial. Averaged over N type.

Soil	N rate (lb N/ac)			
Moisture	0	50	100	150
	Grain Yield (bu/ac)			
Dryland	36.2	63.5	63.1	69.8
Saturated	35.0	58.2	69.5	75.7
LSD 0.05	6.3			

Table 4. Spring wheat response to nitrogen. Saturated trial. Averaged over soil moisture.

Nitrogen Rate	Plant Height	Test Weight	Grain Protein
lb N/ac	inch	lb/bu	%
0	35.4	63.2	12.0
50	40.9	63.9	12.5
100	41.1	63.4	14.0
150	42.8	63.2	14.9
LSD 0.05	1.3	0.5	0.3

Summary: Application method or type of fertilizer did not affect grain yield. Minimal N loss is expected when urea is applied to a dry, tilled soil and incorporated within 7 days (0.41" rainfall 6 days after application). Conducting the trial in a no-till setting would provide more opportunities for ammonia loss from the surface application. For the saturated trial, total April-July moisture (6.15' rain + 5" irrigation) was only 0.32 inches above normal. More irrigation should have been applied to effectively evaluate the objectives of the trial.