Wheat Response to Fall vs. Spring Manure Application

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Introduction: Many questions are asked concerning the right time to apply manure. Is there a difference in nitrogen (N) availability if it is applied in the spring or the fall? To answer this question, a study was initiated to determine the impact of fall- vs. spring-applied manure on hard red spring wheat yield. Treatments included: fall-applied manure, spring-applied manure, spring-applied urea N and a check with no N. To challenge the availability of the manure N, the plot area was no-tilled. The treatments were applied to supply 114 lbs. of N/acre plus soil residual N for a target yield of 60 bu/acre. The fall manure was applied on 11/16/07, spring manure on 4/14/08 and urea on 4/23/08. The urea was applied during a light rain to decrease volatilization losses. At the boot stage, a normalized differentiated vegetative index (NDVI) reading was taken using a near infrared sensor to determine any differences in plant color that could be correlated to N level in the plant. At maturity, plant height, spike count, yield, test weight and protein were determined.

Results: According to Table 1, there was no difference in plant height except the urea treatment was significantly taller. The NDVI was not different except the check was significantly less than the other treatments. For yield, urea was greater than fall manure which was greater than spring manure which was greater than equal to the check. Protein was similar among the treatments except the urea treatment had significantly higher protein than the other treatments. There was no difference among the treatments for spike count or test weight.

Table 1. Response of Hard Red Spring Wheat to Fall- and Spring-Applied Manure.

Treatment	Height (cm)	Spike Count (spikes/m)	NDVI (% VI)[1]	Yield (bu/acre)	Test Weight (lb/bu)	Protein (%)
Check	71 [b]	9.5	0.34 [b]	26 [c]	63	13.1 [b]
Spring Urea	82 [a]	12.3	0.53 [a]	51 [a]	62	15.2 [a]
Fall Manure	75 [b]	11.6	0.50 [a]	39 [b]	63	13.4 [b]
Spring Manure	73 [b]	11.9	0.47 [a]	34 [bc]	63	13.3 [b]

[1]VI = vegetative index, the darkness and volume of green per plant

LSD = 0.05

[abc] Values with the same letter are not significantly different.

Discussion: The yield results of this study are different from other manure studies that have been conducted at the CREC. In most studies, the manure behaves similar to commercial N. There is an explanation why this may have happened. The weather conditions played a role since it was extremely dry in the fall of 2007, there was no appreciable snow over the winter, temperatures were significantly cold in the spring of 2008 and there was no spring rainfall until very late May of 2008. Manure N needs to be converted by soil bacteria from an organic to an inorganic form to be available for plant uptake. For this to happen, the soil bacteria require appreciable moisture and a certain level of heat. Because of the dry and cold conditions of fall ’07 and spring ’08, the soil bacteria were inhibited from converting the manure N to plant available N. By the time the crop received rain in late May, the bacteria were able to convert the manure N but it was too late for the crop to utilize it because wheat is a short-season crop with high N demand early in the growing season. The bacteria did have a longer period of time to convert the manure N from the fall-applied manure but since it was so dry, conditions were still

not sufficient for the manure treatments to yield as well as the urea treatment. This study will be repeated in 2009 to determine the results under different growing conditions.

Conclusion: The timing of manure application may have a negative impact on N availability especially under adversely dry or cold growing conditions.