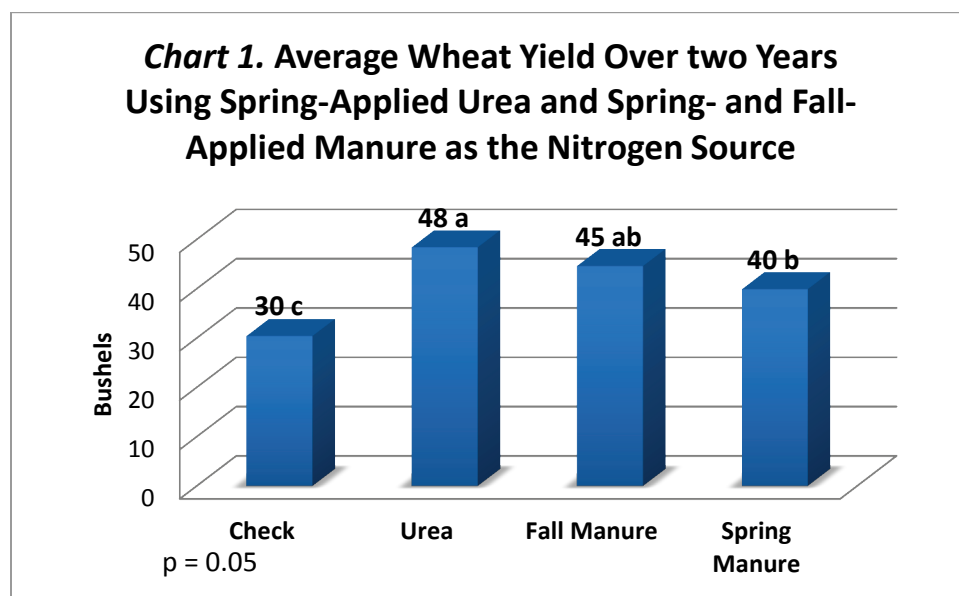


Wheat Response to Fall vs. Spring Manure Application

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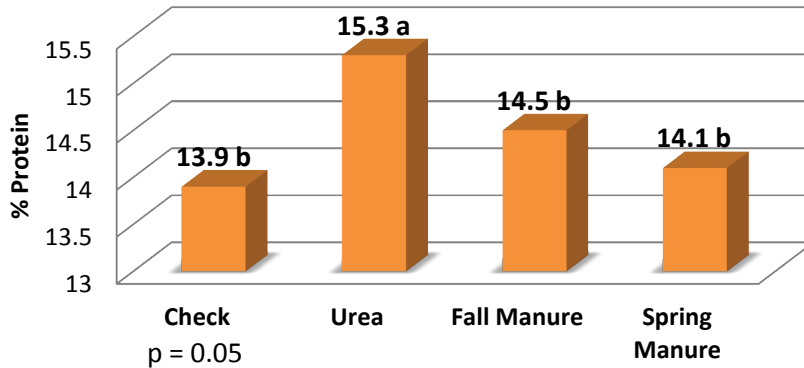
Introduction: Many questions are asked concerning the right time or the right crop to apply manure. Is there a difference in nitrogen (N) availability if it is applied in the spring or the fall? Is there a difference between crops with early season N demand vs. late season N demand? To answer these questions a study was initiated in 2008 and repeated in 2009 to determine the impact of fall- vs. spring-applied manure on hard red spring wheat yield and kernel protein. Treatments included fall-applied manure, spring-applied manure, spring-applied urea N and a check with no N. In 2008, the treatments were applied in a no-till situation and in 2009 the treatments were incorporated with one-pass tillage. The treatments were applied to supply 150 lbs. N/acre after crediting soil residual N. The manure treatments were applied assuming 50% of the total N would be available in the first crop year of application. The fall manure was applied in early-November both years. Spring manure and urea were applied in mid-April both years preceding planting. To decrease N volatilization under no-till in 2008, the urea was applied during a rain event four days before planting. In 2009, the urea was incorporated at the same time as application.

Results: As shown in Chart 1, the spring-applied urea and fall manure treatment had the highest yield. The spring applied manure was significantly less yielding than the urea treatment, but not the fall manure treatment.



In Chart 2, the urea treatment also had the highest percentage of kernel protein. The remaining three treatments were all statistically similar and significantly less than the urea treatment.

Chart 2. Average Wheat Kernel Protein Over two Years Using Spring-Applied Urea and Spring- and Fall-Applied Manure as the Nitrogen Source



Discussion: After two years with different weather conditions, wheat response to manure assuming 50% availability was not as favorable as urea. Manure N needs to be converted by soil bacteria or fungi from an organic to an inorganic form to be available for plant uptake. Wheat is a short season crop with high N demand early in the growing season. Therefore, N mineralized from manure at rates assuming 50% availability may not be available soon enough for the quickly developing wheat crop. Manure application studies conducted at the Carrington Research Extension Center using corn as the target crop have shown no differences in yield when manure or commercial N was used assuming manure N availability calculated at 50%. Several things happen that may impact the wheat vs. corn response to manure. Assuming 50% of the total N in manure is available for crop uptake in year 1 of application may not meet wheat N needs. More research is needed to determine what plant available N percentage assumption is needed for wheat and other short-season cereal grains. Secondly, the spring weather conditions in both 2008 and 2009 were significantly cooler than the average North Dakota spring weather. Since manure N mineralization is driven by biological processes, the cooler than average temperatures may have had more impact on N availability than is typical.

Implications: Manure N for wheat needs to be considered at mineralization rates less than 50% availability to produce similar yields to urea N. That rate has not been accurately determined, and probably changes depending on seasonal temperature and humidity. When manure is applied on fields where wheat will be planted, some supplemental commercial N (20-40 lbs/acre) may need to be applied at planting to overcome the temporal N shortage as soil bacteria mineralize manure N. These results suggest that crops that do not have an early season high N demand may be better targeted as crops for manure application.