Comparison of Dairy Manure and Urea as Spring Top-Dress Nitrogen Sources on Wheat Yield

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Objectives:

1. To compare soft red winter wheat yield response to nitrogen applied at spring top-dress as dairy manure and as urea.
2. To compare soft red winter wheat yield response to nitrogen at spring top-dress as dairy manure (nitrogen content enhanced with 28% UAN) and as urea.

Background

Crop Year:	2010	Tillage:	Conservation tillage
County:	Putnam	Variety:	Agripro W114
County/Town:	Glandorf, OH	Soil Test:	pH 6.5, P 103 ppm, K 138 ppm, OM 2.7%
Soil Type:	Del Rey Silt Loam		
Drainage:	No Subsurface	Planting Date:	September 30, 2009
Previous Crop:	Soybeans	Harvest Date:	July 3, 2010

Methods

A randomized block design with three treatments and four replications was used. Manure plots were 26 feet wide and urea plots were 40 feet wide. All plots were 790 feet long. Liquid dairy manure from an outside dairy storage pond was surface applied using a 6,700 gallon tanker on April 3rd. Urea was applied using a standard fertilizer buggy on the same day.

Urea application rate was 95 pounds of nitrogen per acre. The liquid dairy manure application rate was 8,000 gallons per acre. The liquid dairy manure enhanced with 28% UAN application rate was 4,000 gallons per acre. The enhanced dairy manure had 24 gallons of 28% UAN added to the 6,700 gallon tanker increasing the total nitrogen content of the manure contained in the tanker by 72 total pounds of nitrogen or 10.7 pounds per 1,000 gallons.

Manure sample results indicated 8.1 pounds of ammonia-nitrogen and 14.9 pounds of organic nitrogen per 1,000 gallons of dairy manure. The 8,000 gal/ac dairy manure treatments received 103 pounds of estimated plant available N, 69 lbs/ac P_2O_5 and 170 lbs/ac K_2O. The 4,000 gal/ac dairy manure treatments received 102.4 pounds of estimated plant available N, 34 lb/ac P_2O_5 and 85 lb/ac K_2O. The dairy manure pond was not stirred prior to pumping and the manure was siphoned from near the bottom.

Dairy Manure Analysis

Nutrient	lbs per 1,000 Gallons
Ammonia-Nitrogen	8.1
Organic Nitrogen	14.9
Plant available N	12.9

Phosphorus as P_2O_5	8.7
Potassium as K_2O	21.3

Weather conditions during the time of manure application were sunny and 65 degrees. Field conditions were firm during application. The plot received almost double the normal rainfall for the 2010 growing season. Yields were negatively impacted by Fusarium Head Scab and Stagonospora nodorum Blotch across all treatments.

Table 1Treatment Summary

Treatment	Description
Treatment 1 (T1)	95 lbs. nitrogen per acre as urea
Treatment 2 (T2)	103.2 lbs. of plant available N as 8,000 gal/ac dairy manure
Treatment 3 (T3)	102.4 lbs. of N as 4,000 gal/ac dairy manure + 28% UAN

Results and Discussion

Table 2 Yield Summary

Treatment	Yield (bu/ac)
Treatment 1 (T1)	63.4 a
Treatment 2 (T2)	57.7 b
Treatment 3 (T3)	60.1 a

The results of this plot did indicate a significant statistical difference for yield between the urea treatment and the dairy manure treatment (LSD (0.05) =3.67). There was no statistical difference between the urea treatment and the manure enhanced with 28% UAN treatments.

The organic portion of the nitrogen in the dairy manure does not appear to become available for the wheat crop in time to produce yields statistically similar to urea. The addition of 28% UAN did improve the yield of the manure replications. Farmers utilizing dairy manure as a spring fertilizer source for wheat should plan consider adding additional nitrogen and also plan to utilize the excess phosphorus and potassium applied in the following crop rotation.

Urea cost was $0.65 per pound. Urea replications had $61.75 per acre in fertilizer expense plus the cost of application. The manure was available from the farmer's manure storage pond at no cost. Application costs for the manure would vary depending on the farm's equipment and labor costs.

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