EFFECT OF ESN ON WHEAT GROWN ON WET SOILS OF KENTUCKY

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INTRODUCTION

University of Kentucky small plot research conducted since 2003 has shown that ESN (polymer coated urea) is a useful tool for nitrogen management especially in soils that are less than well drained. Wheat production is not common on these soils because they are often too wet in the spring, making timely N fertilization difficult. With increasing wheat prices, planted acreage has been rising. ESN has been shown to broaden the ideal N application window on these soils beginning in late December and lasting up to Feekes 4-5 growth stage (late February) compared to the normal 2 week window for urea and UAN applications. The objective of this research project was to scale up to production size fields compare ESN applications to the farmer's current N management practices.

METHODS

Small plot research demonstrated that ESN applied in January produced very similar wheat yields compared to UAN or urea applied at Feekes 4-5 growth stage (current UK recommended N application time). Large plots (20 acres) were established in producer's fields in Daviess, Union, and Graves counties in 2007 and in Grayson, Webster, and Daviess counties in 2008 and in Webster County (2 sites) in 2009. Many soils in these counties are not well drained which is the reason wheat is not widely grown in these counties. Wheat (variety Branson in 2007, 2009 and Cumberland in 2008) was planted by the producer and fall insecticide and herbicides were applied according to UK recommendations. In the late fall, plant stands were assessed for uniformity and the plot area was established. Half of the area (10 acres) was managed according to the farmers' current practice. Urea was used in Daviess, Graves, Grayson and one site in Webster County, while UAN was used in Union and Webster counties as the N source for the farmer practice treatments. The N source for the other half of the field was ESN and was applied between January 16 and February 16.

During the period of April 6th through April 9th (2007), the region received a severe spring freeze. Temperatures dropped to 16 ^{o}F on April 8th and the high temperature was only 30 ^{o}F. At this time the Graves county location was in the Feekes 10.5 stage (flowering) and was completely destroyed. Union and Daviess counties are farther north and the wheat was not as mature (Feekes 6 and 8, respectively). Farmers in both counties decided to continue the study. At the time of the freeze the ESN treatment was darker green and slightly more advanced than the farmer practice. Growing conditions were much better in 2008, but the period between ESN application and the farmer practice application was extremely wet. Most locations received between 7 and 9 inches of rain in the period. In 2009 the conditions were near normal with the exception of the temperature from late March through early May. The temperatures during this time were cooler than normal and slowed

plant development as well as nitrogen mineralization.

Yield (Tables 1, 2 and 3) was determined using the cooperators combine by harvesting multiple passes within each treatment. Each pass was weighed and a yield was calculated. Because we were left with only two replications (locations) in 2007, each combine pass was considered a replication for statistical purposes. In 2008, each location was a replication.

CONCLUSIONS

In 2007, yields were obviously reduced because of the freeze; however the ESN treatments still was significantly higher than the farmer practice at the Daviess County location (Table 1). This was a surprising result since the damage looked more severe in this treatment. Yields were not significantly different at the Union County location, but moisture was higher for the ESN treatment. This might indicate slightly better N nutrition leading to later maturity.

In 2008, yields ranged from a high of 96 to a low of 37 bu/acre. The Daviess county location showed symptoms of phosphorus deficiency on the eroded side slopes and was confirmed with tissue and soil sampling. The area of P deficiency at this location appeared to be similar for both treatments, but likely explains the low yields at this location. There was no statistical difference between the yield, moisture, or test weight for the two treatments. However, considering the amount of rain received, the fact that January ESN application preformed equally is noteworthy. For these less than well drained soils, ESN applied in early January might reduce the risk of untimely applications of UAN or urea due to wet soil conditions in February and early March.

In 2009, the use of ESN as a nitrogen fertilizer for wheat proved itself again (Table 3). The disease Fusarium Head Scab was very severe and yields were reduced due to this. However, ESN applied in January 07 gave early February as good or higher yields than UAN or urea split applied in April and March. ESN also resulted in higher test weights which may have been a result of more N being available to the plant during late seed development.

Table 1. Yield, Moisture, and Test Weight for the Split Field Comparison of ESN (Polymer Coated Urea) and the Farmer's Regular N Treatment (2007)

LOCATION	TREATMENT	YIELD (BU/ACRE)	MOISTURE (%)	TEST WEIGHT (LBS/BU)
Daviess County	ESN	41.1	12.6	53.7
	Farmer Practice	34.6	12.3	52.4
	LSD ($_{0.10}$)	3.0	0.2	NS*
Union County	ESN	51.5	14.1	58.3
	Farmer Practice	48.8	13.6	57.5
	LSD ($_{0.10}$)	NS	0.3	NS

*Not significantly different at the 0.10 probability level.

Table 2. Yield, Moisture, and Test Weight for the Split Field Comparison of ESN (Polymer Coated Urea) and the Farmer's Regular N Treatment (2008)

	YIELD		MOISTURE		TEST WEIGHT	
COUNTY	ESN	FARMER PRACTICE	ESN	FARMER PRACTICE	ESN	FARMER PRACTICE
	------- bu/acre -------		------ % ------		------ lb/bu ------	
Grayson	75.7	66.4	11.7	11.8	60.0	59.7
Webster	70.3	71.4	12.7	12.8	57.8	58.9
Webster	96.1	93.3	13.9	13.0	58.2	58.1
Webster	68.1	70.3	12.1	11.8	58.1	58.0
Daviess	37.9	36.9	12.3	12.1	57.4	57.1
Average	69.6	67.7	12.5	12.3	58.3	58.3
LSD (0.10)	NS		NS		NS	

Table 3. Yield, Moisture, and Test Weight for the Split Field Comparison of ESN (Polymer Coated Urea) and the Farmer's Regular N Treatment (2009)

LOCATION	TREATMENT	YIELD (BU/AC)	MOISTURE (%)	TEST WEIGHT (LB/BU)
Webster Co. (Mitchell Bros.)	ESN Farmer Practice	77.0 A 72.4 B	11.05 11.20 N.S.	51.6 50.4 N.S.
Webster Co. (Randy Hagan)	ESN Farmer Practice	61.3 63.3 N.S.	19.1 B 19.6 A	51.1 A 48.6 B