

Evaluation of Environmentally Stable Nitrogen (ESN) for Winter Wheat

Purpose:

ESN is a new fertilizer product that may have promise in crop production. ESN is a poly coated granular urea product that mitigates volatilization losses and releases nitrogen more slowly over time, which could potentially increase wheat yields over other nitrogen sources. Research data from Dr. Darryl Warnke at Michigan State University showed a statistically significant yield increase to spring applied ESN of 7 bu/ac or 7.5% over 4 years. There is no Ontario data to assess this technology. This project will initiate evaluation of this product.

Methods:

Two replicate field length strip trials were established on 6 winter wheat fields in the spring of 2008. Treatments included ESN and either urea or 28% UAN, or all three products. Nitrogen rates were maintained equal regardless of nitrogen source. All products were applied on the same day wherever possible. Data was also collected from other trials where possible, which allowed some assessment of fall applied (fall 2007) treatments as well.

Results:

Table 1 shows raw yield results for all sites compiled. ESN increased yield in 3 of 7 trials when compared to urea, and in only 1 of 4 trials when compared to 28%. Fall ESN reduced yield in all comparisons. Note that the McGugan site suffered extreme hail just prior to harvest, resulting in very low yield.

Table 2 shows the aggregate results. A slight yield advantage (2.1 bu/ac) is seen with 28% UAN compared to urea, which is consistent with previous research in Ontario and other neighbouring states. Spring ESN is equal to urea, and slightly lower yielding than 28% UAN in this dataset. Fall applied ESN reduced yield by 11 bu/ac on average, showing that fall application of ESN released the nitrogen prior to the wheat crop needing the N. This may be due to an extremely warm early October in the fall of 2007.

Table 3 indicates the protein level found with the various N sources and time of application. Spring ESN increased protein in the grain in over 80% of the samples, with a final increase of 0.6%. This increase in protein could be significant, particularly in hard wheat production. It is of less value in soft wheat production.

The lack of response to ESN technology may partially be due to a very cool, damp May, which may have delayed release of the ESN. The other possible explanation is mishandling of the ESN causing damage to the poly coating, essentially rendering it equal to urea. While it is not possible to determine which of these is the

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cause, the increase in grain protein with spring ESN suggests that it was late release due to the cool May conditions.

Table 1: Individual site yield data

Co-operator	# Reps	ESN Fall	ESN Spring	Urea	28% UAN	25% ESN	50% ESN
Williams	2		81.9	75.8			
Anlee	2		90.9		97.5		
McCracken	1	72.5			91.7		74.1
Van Gorkum	1		89.0	89.2	91.5		
Veldman	2		109.2	109.2	113.6		
Straatman	2		102.4	99.5			
Buurma	2		107.6	103.9	103.6		
Grant	1		94.0	102.4			
Stewart	1			90.6		94.0	103.1
C-Craig	1	95.7			106.2		94.3
C-Walnut Grove	1	76.8			91.1		89.4
C- McColl	1	89.5			102.3		94.0
C-Christina	1	89.0			90.0		90.0
Robson	1	83.0			94.0		
Rolling Ridge	1	86.0			94.0		
McGugan	1		48.8	56.4			

Table 2: Yield summary table

Trials	Reps	ESN Fall	ESN Spring	Urea	UAN	Urea + POT
Fall ESN vs 28%	7	84.6			95.6	
Spring ESN vs Urea	6		94.0	93.2		
Spring ESN vs 28%	7		100.6		103.0	
Urea vs Urea POT	1			99.5		100.3
Urea vs 28%	5			103.1	105.2	

Table 3: Source impact on Grain Protein

	ESN fall	ESN spring	28%	Urea
Protein	9.6	10.7	10.1	10.0

Summary:

These results show that fall applied ESN should not be recommended in Ontario, as the risk far outweighs any potential benefit. Spring ESN did not increase yield; however, this too may be due to weather impacts. Where spring ESN is considered, growers should apply early in the spring to give as much time as possible for the nitrogen to be released when the crop needs it. Spring ESN has potential, showing increased protein levels, and should reduce the risk of lodging, although lodging was not an issue in any trial locations in 2008.

Next Steps:

This project should be repeated to verify results under different weather conditions.

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