# PERFORMANCE OF UREA FERTILIZER WITH DIFFERENT ADDITIVES ON WHEAT ON A SOMEWHAT POORLY DRAINED SOIL

Lloyd Murdock, John James and Dottie Call
Plant & Soil Sciences Department
University of Kentucky, Princeton, KY 42445
PH: (270) 365-7541, Ext. 207; Email: lmurdock@uky.edu

**Objective:**

The objective of this experiment was to evaluate urea with Agrotain and N-(n-butyl)thiophosphoric triamide (DCD) against urea and polymer coated urea (ESN). ESN can be used to fertilize wheat on somewhat poorly drained soils and can be applied in January or February without much loss of the N that is caused by excessive rainfall. Early applications of urea can sometimes result in significant losses of N. Since Agrotain protects urea from volatilization losses and DCD protects urea from denitrification losses, urea with these two inhibitors was compared with urea alone and the ESN (coated urea) under conditions where one would expect severe losses.

**Methods:**

The experiment was established at Princeton, Ky. On a somewhat poorly drained soil (Zanesville silt loam). The wheat was no-tilled into corn residue harvested in September. The area was fertilized (P, K and lime) according to fall soil test and UK recommendations. A fall contact herbicide was used at planting and an insecticide about 30 days after planting. An herbicide and insecticide were applied in March and a fungicide at initial heading.

The N treatments were broadcast on the soil surface by hand. Super U® is a commercial product that contains Agrotain and DCD. This product was used as one of the treatments. The second treatment was urea and the third treatment was ESN. The treatments were applied at the rate of 60 lbs/a N on January 18. There were 4 replications of each treatment.

**Results:**

The results of the study can be seen in Table 1. The yields are not high due to the lower amount of nitrogen used (60 lbs/ac) and heavy amounts of rain (27 inches were received during the study period February through May). This resulted in a significant amount of nitrogen loss, mainly due to denitrification as well as root damage due to long periods of saturated soils.

The plants were measured for chlorophyll content using a Greenseeker handheld remote sensing device at Feekes 5 and 6 (jointing). The readings were in the same order as the yields. All three treatments showed yellowing due to nitrogen deficiency during the spring but the ESN treatment was always greener.

The yields (Table 1) show that the ESN, a slow release plastic coated urea prill, was much more effective in preventing loss of nitrogen and increasing the efficiency of the nitrogen use by plant. The DCD additive helps reduce nitrogen loss when excessive prolonged moisture is present due to denitrification. However, its effectiveness is somewhat limited by its weaker inhibitory properties and the length of time of its effectiveness. This is

reflected in the yields. The yields of the treatment using urea with Agrotain and DCD are higher than the urea treatment but they are not significantly higher. The Agrotain and DCD treatment was a little greener most of the spring than the urea treatment. However, this difference diminished with time. The treatment simply was not effective enough over this long period of time.

**Conclusions:**

Urea with Agrotain and DCD (Super U) is not as effective at preventing nitrogen losses and increasing nitrogen use efficiency as ESN fertilizer. Urea with Agrotain and DCD would be helpful in reducing nitrogen losses when nitrogen is applied at the recommended rates and time. ESN gives greater protection from losses of nitrogen, especially when applied before the traditional recommended times.

**Table 1. Effect of Different Nitrogen Sources and Additives on Nitrogen Loss and Yields**

| Nitrogen Source | Additive | Nitrogen Rate | Yield (bu/ac) |
|---|---|---|---|
| Urea | None | 60 | 61.4 B |
| Urea | Agrotain DCD | 60 | 63.2 B |
| ESN | Coated | 60 | 76.0 A |