

Wheat Science News

Research & Education Center, Princeton, KY 42445

April 2008

Volume 12, Issue 2

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NITROGEN LOST DUE TO EXCESSIVE RAIN

Lloyd Murdock, Extension Soil Specialist

We have received a lot of rain the last month and there are questions on how much nitrogen has been lost from fertilizer nitrogen added in the last couple of months. The last time we had a situation similar to this was in 1997. We will look at the rainfall and the nitrogen trials that year to better understand what may have happened this year.

Month	1997	2008
	----- inches -----	
February	3.83	6.76
March	13.11	7.55
April 1-5	0.98	4.60
Total	17.92	18.91

The total rainfall during the two years is similar (Table 1). A major difference was the temperature. It was much warmer in 1997. The warmer temperatures would cause the ammonium in the fertilizers (urea, UAN and ammonium nitrate) to convert more readily to the nitrate form of nitrogen which is the form of nitrogen that is lost due to excessive wetness.

There were two trials concerning nitrogen applications on wheat that year that would allow a comparison for estimating nitrogen loss.

Nitrogen Rate (lb/ac.)			Yield (bu/ac.)
February	March	Total	
0	0	0	47
90	0	90	56
0	90	90	75
45	45	90	79
30	60	90	81
45	60	105	87
40	80	120	89

The first trial used different nitrogen rates and times of application (Table 2). The yields increased as the total amount of nitrogen added was increased but, by far, the most important application was the second one. It appears that a significant amount of the February application was lost. The estimate might be in the range of 50 to 60%. Since the yields of the 105 lb/ac. N treatment was similar to the 120 lb/ac. N treatment, we might conclude that 105 lb/ac. was ample nitrogen. Since this was a tilled field, 90 to 105 lb/ac. of fertilizer nitrogen is all that would usually be required for maximum yield. This test indicates that 10 to 15 lb/ac. of N was probably lost from split applications and more if all the nitrogen was applied in February.

I am not sure that there was much difference in the amount of nitrogen lost due to different tillage systems. In another trial using 90 and 120 lb/ac. of nitrogen in two different tillage systems, the amount of nitrogen lost was about the same (Table 3).

Tillage	Yield (bu/ac.)	
	90 lb/ac. N	120 lb/ac. N
Tilled	85	98
No-Tilled	81	94

Usually 90 lbs/ac. of nitrogen fertilizer applied in a split application in a normal year would have been sufficient for maximum yields in this trial. The extra 30 lbs/ac. of nitrogen was enough and probably more than enough to overcome the nitrogen lost with this split spring application with 1/3 applied in February and 2/3 in March.

Conclusion from 1997

1. Significant nitrogen was lost in 1997 and since it was much warmer in 1997, there was probably more lost in 1997 than 2008. This is because more of the nitrogen would be in the nitrate form which is the only form that can be lost due to excessive water.
2. Most of the nitrogen lost was from the February application and as much as 50 to 60% of this nitrogen may have been lost.
3. If the spring nitrogen applications were split, 30 lb/ac. of additional nitrogen was enough (probably more than enough) to cover the loss that occurred.

Recommendations for 2008

1. Some of the nitrogen from the February applications was probably lost, but not as much as 1997, which was a much warmer year.
2. An additional 10 to 20 lb. of N would probably be required to cover those losses if 30 to 50 were applied at that time.
3. If all of the nitrogen was applied in February, more nitrogen than this was probably lost.
4. Nitrogen applied as ESN is probably safe from much loss since it has been slow to release this year due to cool temperatures.
5. Probably very little of the March applied nitrogen (especially mid-March or later) has been lost, since most of it will still be in the ammonium form and is not susceptible to loss from excessive wetness.

Spring N Applications: How Late is Too Late?

Greg Schwab, Extension Soil Specialist

With the recent rains, many wheat producers have yet to apply spring N. Unfortunately, current weather forecasts predict that N applications may be further delayed. Given the high price of N fertilizer, many farmers are asking how much N should be applied and whether there is a point at which it is too late to apply N to wheat.

In 2004 and 2005, Dr. Lloyd Murdock and I conducted a study which was funded by the Kentucky Small Grain Growers Association to answer these questions. The research sites were near Princeton and Murray in 2004 and near Princeton and Lexington in 2005. All sites were on soils that were less than well drained. Nitrogen fertilizer (urea) was applied at rates of 0, 40, 80, and 120 lbs N/acre at seven different times within the growing season from planting to complete flag leaf emergence. When averaged over the four site years, yield was highest when fertilizer was applied at the Feekes 3 (early green-up) growth stage. Delaying application beyond Feekes 3 reduced yields 3 of the 4 site-years on these soils. At fourth site (Lexington 2005), Feekes 6 (jointing) and Feekes 7 (2nd node visible) applications produced yields equivalent to and slightly higher than those at the Feekes 3 application. As N application was delayed, the amount of N needed for maximum yield decreased from 120 lb N/acre at Feekes 7, to 80 lb N/acre at Feekes 8, and finally to 40 lb N/acre at Feekes 9 (flag leaf fully emerged).

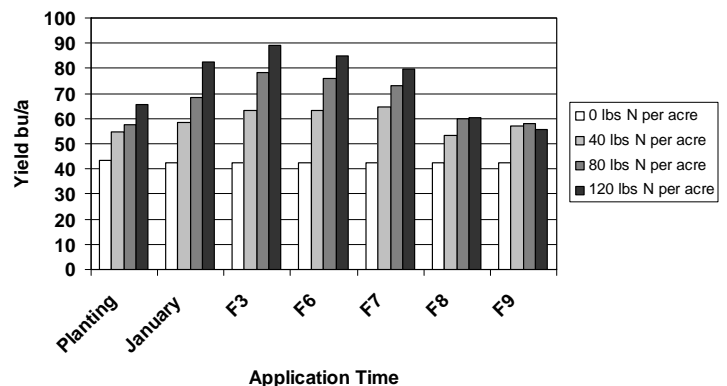


Figure 1. Average wheat yield response to N rate and timing (4 site-years).

One additional problem with later than recommended N applications is volatilization. Volatilization occurs when urea is broadcast on the soil surface and the potential for loss increases as soil temperature increases. At the Murray location in 2004, nitrogen applied at Feekes 7 and Feekes 9 appeared to be more effective than the Feekes 8 application (Figure 2). Volatilization losses could explain this observation and may have been a problem with later applications at other locations as well. If conditions are very favorable for volatilization, you may consider using Agrotain to reduce the risk of volatilization loss.

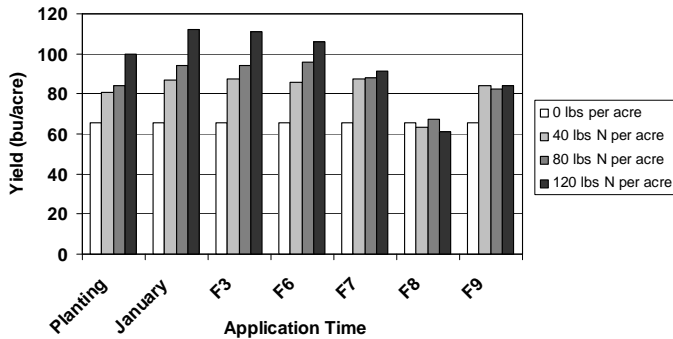


Figure 2. Wheat yield response to N application rate and timing at Murray (Calloway County) in 2004.

In conclusion, it is definitely not too late to apply at least some N to wheat in Kentucky. The rate selected should depend on the growth stage of the wheat at the time of application.



Mark your Calendar

**University of Kentucky
Wheat Field Day**

*May 20, 2008
UKREC Farm
Princeton, KY 42445*

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