Low Protein Wheat
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HEC Newsletter
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Low Protein Wheat-

Low protein wheat was again a frustration this year. I know that many of the HEC Agronomists have been receiving calls about this issue. Recently, Dave Franzen, NDSU Soil Specialist, put together an article about why our Protein is low in 2009. Here it is:

Nitrogen losses this spring and consequences this fall
Reports on spring wheat yields from across the state are positive, with yields in the east sometimes double what might have been expected given the late planting season. The higher yields are a testament to the importance of a full soil profile of water, a cool growing season and low in-season rainfall to spring wheat and durum production. However, in the east there are many reports of abysmal protein levels. Normally protein falls in the 13-15% range. This year, early protein reports are 9-14%. How did this happen? The following are possible reasons, and many growers may have experienced more than one of these factors leading to very low protein-

1. High early season rainfall and flooding.

Although many soils were frozen when the most serious flooding occurred in April, once flooded the soil thaw was relatively fast, leaving the soil saturated in an unfrozen condition for sometimes a couple weeks. Saturation in the eastern third of the state can lead to gaseous loss of nitrates due to denitrification bacteria, while in the west leaching was a major loss factor. It was likely that after the water left fields, there was virtually no available N left in the top two feet of soil. If soil residual nitrate available N was factored into the N rate for these fields, the field was likely under-fertilized from the beginning of the season.

2. Questionable field conditions for incorporation of urea or application of anhydrous ammonia.

To say that field conditions were seldom ideal across the state for incorporation of urea or for application of anhydrous ammonia is understating the facts. When the soil was worked, instead of a nice seedbed with good distribution and coverage of urea, there were clods and gaps. These conditions lend themselves to N loss from ammonia volatilization. In addition, little rain fell after the serious flooding conditions abated, so rainfall did not incorporate the urea that was not adequately worked into the soil. Anhydrous ammonia was applied to soil that was often wet a few inches below the soil surface, leading to ammonia losses over the course of several days following application. Many growers still suffer from inadequate application trench coverage at the time of application. A nice inch of rain a couple days after application would have made most of these two problems a non-issue, but most areas received no rain for several weeks after planting.

3. The continued mistake of applying urea to the soil surface in no-till fields.

Many growers continue to believe that it will rain shortly after urea is applied to no-till fields. This year, it didn't rain. Urea applied to the soil surface and not incorporated by rain or steel will volatilize, and it likely did in many fields this year.

4. Continued wetness of fields through June in many areas of the Valley.

Although it finally became possible to seed in the far-eastern ND Valley about May 25, the silty-clay loam soils continued to be wet and nearly saturated near the soil surface for several weeks. Nitrate from fertilizer application likely succumbed to denitrification

during this period. My own campus tillage plots received 150 lb N/a as urea incorporated in the conventional till plots, but N deficiency symptoms still appeared at tasseling the first of August. The field had received little rain since early May, but soil a few inches below the surface was still wet about July 1.

5. Our most scab-tolerant wheat varieties are not stellar protein varieties.

Alsen was never a protein blockbuster variety, but N rate trials sometimes resulted in near 15% protein at highest N rates. Faller seems to be even more stingy with protein and so are several other good scab-resistant varieties. It may be necessary to boost N rates on these lower protein varieties to make sure that they reach the protein minimum to avoid dockage in future years.

6. Anticipation of lower yields with later seeding date-

One of the problems with our current N rate formula, and why I will change it December 1 of this year, is that the N rate formula tries to be predictive. It can't be predictive. N rate can't predict yield. Specific yields shouldn't be used to predict N rate. General productivity over time leading to ranges of N rates-yes. Specific yield guess to predict an adequate N rate for a season-no. Because of use of the wheat N rate formula for the last 30 years, it is a part of many growers' psyche to look at conditions and date at planting and to assume things are going to be either better or worse than average. This year was a good example. Coupled with high N costs, the late seeding date and memories of 90 degrees in late June and July led some growers to fertilize very productive soils only modestly in anticipation of perhaps 40 bu/acre. They harvested over 70 bu/acre in some cases. Even if they received high efficiency out of their N fertilizer application, which is doubtful, these fields were doomed to have low protein as soon as the tillers formed, the spikelet number was determined, and the spikelets filled with enormous amounts of grain.

It has been suggested that poor in-season organic matter/residue mineralization might be a cause for lower protein. Early returns in this year's wheat N-rate studies suggest this was not a cause. In fact, this year might have been a great year for mineralization given the moderate temperatures and generally moist subsoil conditions. Check plot yields at Valley City in medium to higher productivity environments on 2.5% to 3.5% organic matter soils were similar in yield to N rates up to 150 lb N/acre, with only 20-40 lb/acre residual soil nitrate in April. The medium productivity check plots averaged about 40 bu/acre and the higher productivity area with higher OM averaged about 60 bu/acre in check plots. 60 bu/acre spring wheat yields with only 40 lb N/a residual soil nitrate in April suggests a large amount of soil mineralization during May and June.

Dave Franzen, NDSU Extension Soil Specialist