Increasing Wheat Protein with a Post-Emergent Application of UAN

Post-emergent applications of nitrogen fertilizer are one of the only options to increase grain protein during the growing season. Recently, most work has been targeting the post-anthesis stage for increasing protein in wheat. However, applying nitrogen (N) at the boot stage instead of post-anthesis stage has shown to be more consistent at increasing protein, but it is highly dependent on N supply and weather conditions. The boot application time has a higher probability of response, reduced potential for leaf burn, increased likelihood of precipitation, potential for increased yield and growth stages are more easily identifiable.

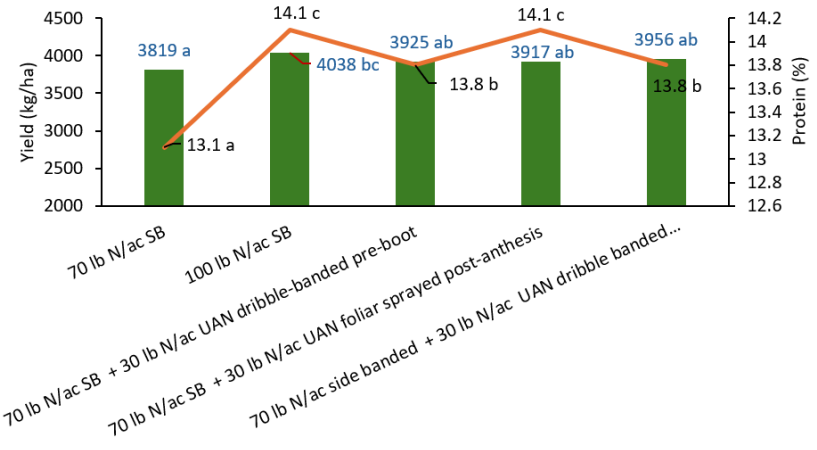
Often, post-emergent applications of liquid urea-ammonium nitrate (UAN) are most economical when yield potential is high and soil N is inadequate to maintain high protein levels. Split applications of N have the benefit of supplying higher levels of N without the increased risk of lodging that comes with supplying all the nitrogen at seeding. However, split applications may cause a nitrogen deficiency in high yielding wheat before the second application. Dribble banding mid-season is the most effective way to apply liquid nitrogen while minimizing leaf burn and minimizing losses to volatilization. Foliar broadcast sprays can cause significant leaf burning but UAN can be diluted with water 50:50 to reduce leaf burn. Foliar broadcast spray applications of UAN post-anthesis frequently increase protein, but this practice does not always prove to be economical.

A study was conducted at seven locations (Yorkton, Indian Head, Melfort, Redvers, Outlook, Scott, Swift Current) in 2018 to determine if wheat yield and/or protein could be increased by applying 30 lbs N/ac of UAN at pre-boot or post-anthesis. UAN was subsequently applied in addition to base rates of 70 or 100 lbs N/ac of side-banded urea. The in-crop N was either dribble banded pre-boot or post-anthesis or foliar sprayed post-anthesis.

Leaf burning was most severe with the foliar spray application, and dribble banding pre-boot resulted in the least amount of crop damage. On average, the supplemental application of 30 lbs N/ac increased grain protein by 0.8 and 0.6% when applied to base rates of 70 and 100 lbs N/ac, respectively (Figure 1). This supports the hypothesis that supplemental N can increase grain protein more when N deficiency is greater. While applying supplemental N increased protein, it did not increase either yield or protein compared to side banding that additional 30 lbs N/ac at seeding, and in some instances split applications resulted in less yield and/or protein.

In this study, nitrogen use efficiency was better when all the nitrogen was side-banded at seeding. However, if a crop has been fertilized below its potential, a late season application of 30 lbs N/ac can increase protein by 0.8%; this protein increase alone will only prove to be economical when the protein spreads are at historical highs; therefore, the need for N should be identified early enough that yield can also be increased.

Figure 1. Impact of late season nitrogen on wheat yield and protein, averaged over total N and locations



Funded for this project was provided by the Saskatchewan Wheat Development Commission and the Agricultural Demonstration of Practices and Technologies (ADOPT) initiative under the Canada-Saskatchewan Growing Forward 2 bi-lateral agreement.