Demonstrating N Fertilizer Options to Maximize Spring Wheat Yield and Protein

In recent years, increased wheat yields has been associated with a drop in protein levels as low as 10 %, leading to a drop in crop value by close to $ 1.5/bu. Attempts to increase protein by applying more N fertilizer often leads to increased lodging, yield loss, and/or difficulty during harvest. The dilemma that growers face is in knowing which option or combination of options would be most effective to adopt. The use of several controlled release nitrogen (CRN) fertilizers can delay conversion of N, resulting in more N for protein formation. Another option is to grow lodging resistant varieties, which allow higher rates of untreated N fertilizer to be applied at seeding. A third option is to grow varieties with higher inherent % protein. The objective of this study was to demonstrate the effects of CRN fertilizers on grain yield and % protein of three spring wheat varieties with differing grain yield and protein potentials.

Field trials were conducted at Scott in the 2015 growing season. A 3 x 7 factorial experiment in a randomized complete block design with four replicates was set up. The first factor was wheat variety (Lillian, Goodeve VB and Shaw VB) and the second factor was the type of N (Urea, ENS/Urea and Super U/Urea @ 50:50 and 75:25 blends, Urea/UAN and Check).

Grain yield, days to maturity, thousand kernel weights and bushel weight were all significantly affected by wheat varieties only. Both wheat varieties and N blend had significant effects on % protein. Yield and protein had an inverse relationship (Fig 1); where yield increased and protein decreased. N application had an effect on protein for all the blends relative to the check; however, within the different N blends there weren't significant differences (Fig 2).

Despite the non-significant effects of the N blends on grain yield, urea alone (100 %) had the highest yield relative to all the blends (Fig 2). The UAN blend had the highest % protein relative to the ESN and Super U blends, possibly because 20% of the N was applied as liquid UAN at the flag leaf stage rather than at seeding. There was a slightly higher protein % for the ESN treatments compared to the Super U treatments (Fig 2). This may be because in drought years Super U could provide a quicker source of N to the plant compared to ESN (McDonald, 2010).

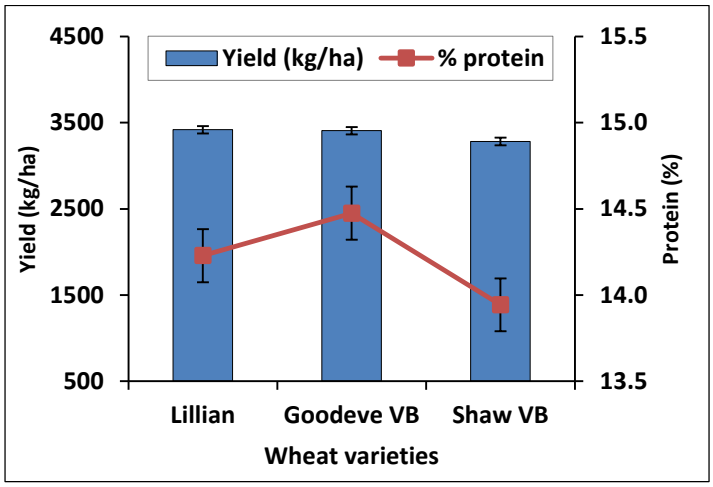

Figure 1. Effects of wheat variety on grain yield (*columns*) and grain protein % (*line*) during the 2015 growing season.

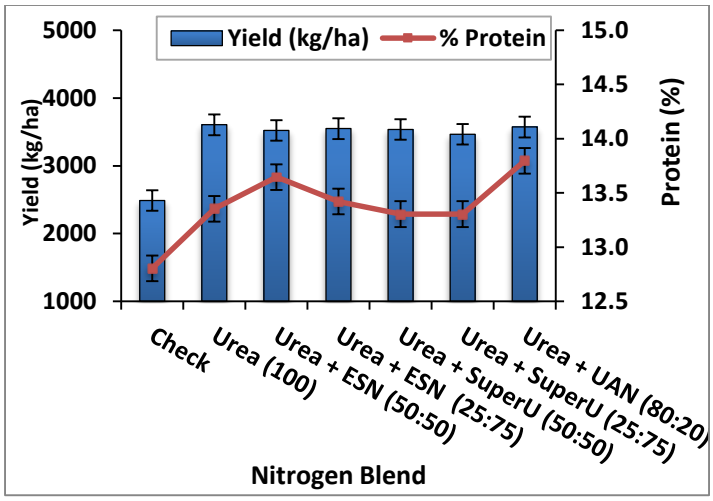

Figure 2. Effects of nitrogen blend on grain yield (*columns*) and grain protein % (*line*) during the 2015 growing season

From this demonstration the most effective strategy for increasing protein in wheat is choosing varieties that are low-yielding but have high % protein. Hence, either Lillian or Goodeve VB should be considered for both Scott and NW SK. There is no advantage for the CRNs or for the products ENS and Super U when considering only yield. However, the CRNs could delay N availability until later in the season to increase % protein. Read the full report at: http://www.westernappliedresearch.com/research/warc-annual-reports/2015/

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