Nitrogen Fertilizer Options to Maximize Spring Wheat Yield and Protein

In recent years, there has been an increase in wheat yields with a drop in protein levels as low as 10%, leading to a drop in value by close to $1.50/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 the conversion of N, resulting in more N available 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 contents. 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 and Melfort 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 (Shaw VB, Goodeve VB and Lillian) and the second factor was the type of N (Urea, ESN/Urea and Super U/Urea @ 50:50 and 75:25 blends, Urea/UAN and Check).

Days to maturity, thousand kernel weight and bushel weight were all significantly affected by wheat variety only. Both variety and N type had significant effects on yield and protein. Yield and protein had an inverse relationship (Fig 1); where as yield increased, protein decreased. N type had effects on both yield and protein for the blends relative to the check; however, within the different N types there were no significant differences (Fig 2). Despite the non-significant effects of the N types 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 slightly higher protein for the ESN treatments compared to the Super U treatments (Fig 2). This may be because in dry years, Super U could provide a quicker source of N to the plant compared to ESN (McDonald, 2010). This leaves more N in the ESN blend for later use, leading to the relatively higher protein.

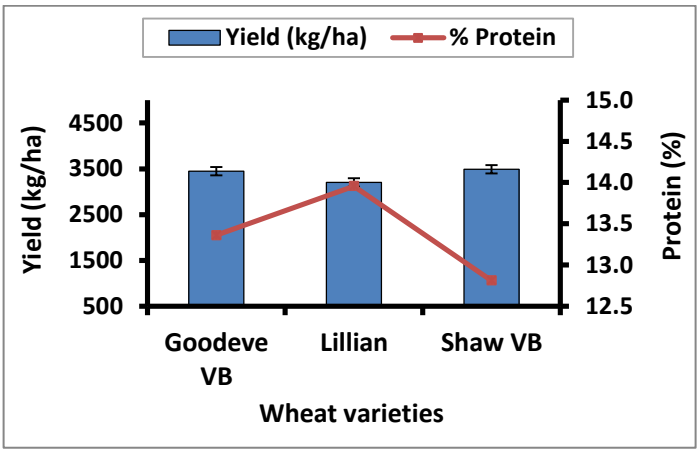

Figure 1. Effects of wheat variety on grain yield (*columns*) and grain protein % (*line*) during the 2015 growing season.

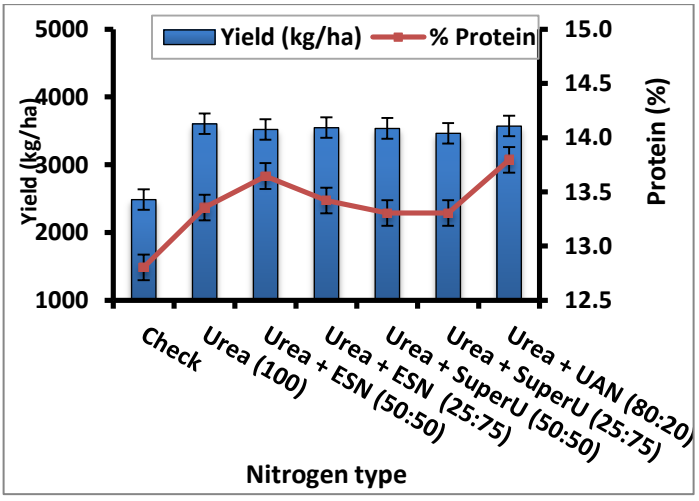

Figure 2. Effects of nitrogen type on grain yield (*columns*) and grain protein % (*line*) during the 2015 growing season

From this demonstration, the most effective strategy for increasing protein in wheat is choosing varieties that are low-yielding but have high protein ratings. Hence, either Lillian or Goodeve VB should be considered for both Scott and Melfort. There is no advantage for the CRNs or for the products ESN and Super U when considering only yield. However, the CRNs could delay N availability until later in the season to increase % protein. Download full reports at: **www.agriarm.ca**

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