

Factsheet: Demonstrating nitrogen fertilizer options to maximize spring wheat grain yield and protein



Objective:

The objective of this project was to demonstrate the effects of several enhanced efficiency nitrogen (N) fertilizer treatments on lodging and grain yield and protein content of three spring wheat cultivars with contrasting lodging resistance and grain yield and protein potential.

Methodology:

This demonstration was conducted at the AAFC Scott Research Farm in 2015. The demonstration was set up as a 3 x 7 factorial in a randomized complete block design with four replicates. The first factor was wheat variety (Shaw VB, Goodeve VB and Lillian) and the second factor was the type of nitrogen source (N blends). On May 15, all the wheat varieties were seeded at a rate of 250 seeds m⁻² with an R-Tech drill seeder in 10 inch row spacing and at a depth of 3-4cm. Fertilizer was applied at seeding according to the treatments except UAN that was applied at early heading. Weeds were controlled using a pre-seed burndown and registered in-crop herbicides.

Table 1. Detailed treatment list for the “*Demonstrating nitrogen fertilizer options to maximize spring wheat grain yield and protein*” at Scott, Saskatchewan, 2015.

Treatment #	Wheat variety	N fertilizer options
1	Shaw VB	90 kg/ha of N urea
2	Shaw VB	90 kg/ha of N (50/50 blend ESN/urea)
3	Shaw VB	90 kg/ha of N (50/50 blend Super U/urea)
4	Shaw VB	90 kg/ha of N (75/25 blend ESN/urea)
5	Shaw VB	90 kg /ha of N (75/25 blend Super U/urea)
6	Shaw VB	80 kg/ha of N urea + 20 kg/ha of N UAN dribble banded @ early heading
7	Shaw VB	No N fertilizer (check)
8	Goodeve VB	90 kg/ha of N urea
9	Goodeve VB	90 kg/ha of N (50/50 blend ESN/urea)
10	Goodeve VB	90 kg/ha of N (50/50 blend Super U/urea)
11	Goodeve VB	90 kg/ha of N (75/25 blend ESN/urea)
12	Goodeve VB	90 kg /ha of N (75/25 blend Super U/urea)
13	Goodeve VB	80 kg/ha of N urea + 20 kg/ha of N UAN dribble banded @ early heading
14	Goodeve VB	No N fertilizer (check)
15	Lillian	90 kg/ha of N urea
16	Lillian	90 kg/ha of N (50/50 blend ESN/urea)
17	Lillian	90 kg/ha of N (50/50 blend Super U/urea)
18	Lillian	90 kg/ha of N (75/25 blend ESN/urea)
19	Lillian	90 kg /ha of N (75/25 blend Super U/urea)
20	Lillian	80 kg/ha of N urea + 20 kg/ha of N UAN dribble banded@ early heading
21	Lillian	No N fertilizer (check)

Key Findings:

- 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).

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- 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).
- 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.

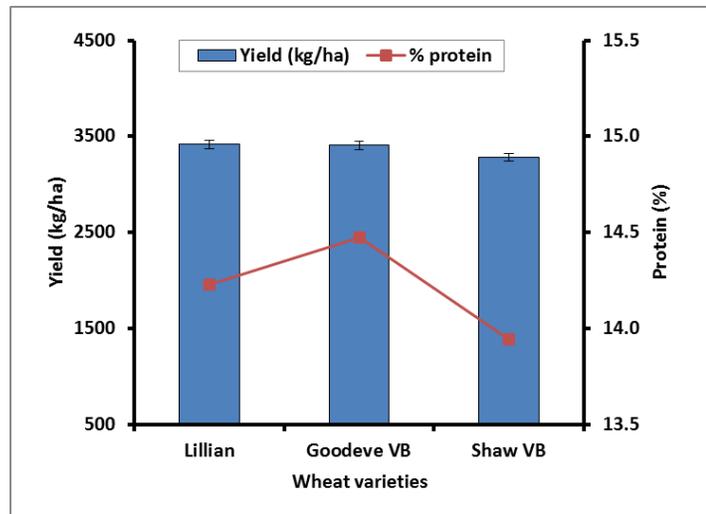


Figure 1. Effects of wheat variety on grain yield (*columns*) and grain protein % (*line*) at Scott, SK during the 2015 growing season

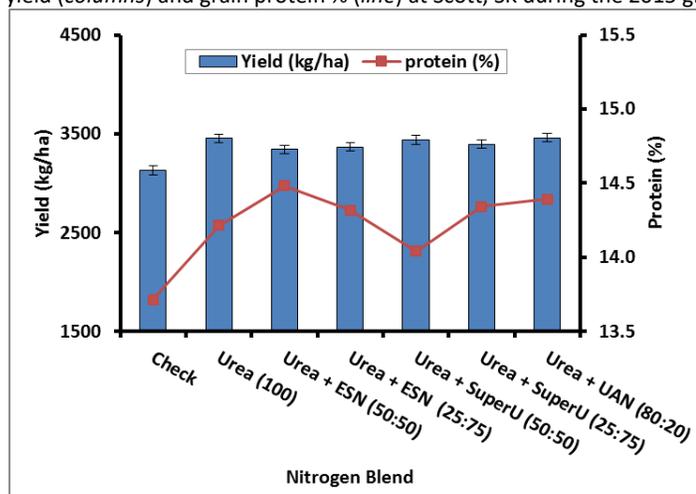


Figure 2. Effects of nitrogen blend on grain yield (*columns*) and grain protein % (*line*) at Scott, SK during the 2015 growing season.