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Applying Some Starter N at Seeding Critical in Spring Wheat and Canola

Canadian researchers speculate that 50 percent of total N required should be applied at seeding to minimize risks with postemergent N applications.

Summary: *The results for our Indian Head site showed that a minimum of 33 percent of the total nitrogen (N) fertilizer required should be applied at seeding time to assure that none of the yield potential is lost. However, to further minimize the risks of losing any yield potential, we speculate that as high as 50 percent of the total N required should be applied at seeding. The proportion will be dictated by the agro-ecological zone. With spring wheat, applying the N as late as the 5-leaf stage did not appear to reduce grain yields. With canola, applying N as late as the start of flowering did not affect grain yields.*

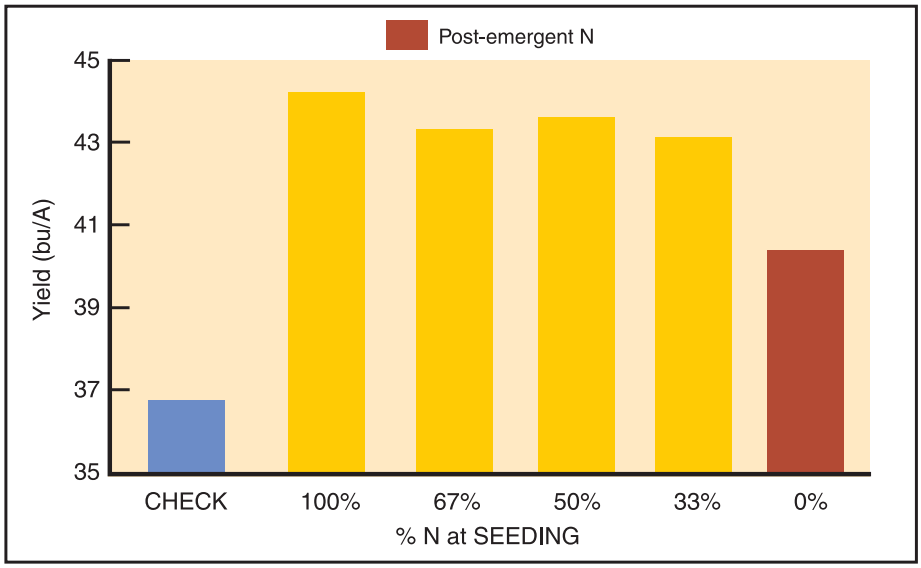

Figure 1. The effect of N timing and starter N levels on yield (average bu/A) of spring wheat at Indian Head, 2004.

When the increasing need for environmental sustainability is combined with increasing demands for food and fiber and current global trade policies and then all of that is superimposed on the need for producers to remain economically viable, attention has to be focused on efficiencies at all levels of the production cycle. The current high prices of oil and natural gas have resulted in substantially higher nitrogen (N) fertilizer prices. This has a direct impact at the farm gate because N fertilizers represent a significant portion of the overall variable cropping costs and account for over 65 percent of all energy requirements to grow a crop. These factors are stimulating agronomic questions on how to improve N-use efficiency (NUE) and the management required to attain higher efficiencies.

It is well recognized that the highest efficiencies for N fertilizer are obtained when N fertilizers are applied as close to crop needs as possible, reducing the opportunity of losses through leaching, denitrification, and immobilization. A number of studies were conducted in the last few years to examine more closely the merits of postemergent N applications using UAN solutions and surface dribble applications as a way to apply N closer to the time of crop needs. The studies showed that this approach was very feasible but it was not without risk and was never better than applying all the fertilizer at the time of seeding as is currently practiced in a one-pass, no-till seeding and fertilizing system. The studies concluded that the unpredictability of rainfall increases the risks of surface dribble bands because some rainfall is required to move the fertilizer into the soil.

In 2003, where no significant rainfall was experienced for the critical part of the growing season, yield losses were experienced with post-emergent N applications due to the inability of the crops to access the N stranded at the surface. The studies also showed that even when a coulter was used to place the fertilizer in the soil in a year like 2003, the yield potential was still not regained. In situations of adequate and timely rainfalls, the coulter provided no advantages over the surface dribble bands. The conclusion was that some N would need to be applied at time of seeding and the proportion would more than likely be greater than 33 percent of the recommended N needs.

There is also an urgent need to determine the latest crop stage feasible for applying the N fertilizer without jeopardizing the crop's yield potential. The other important aspects of this approach deal with risk management of N applications, especially in the drier

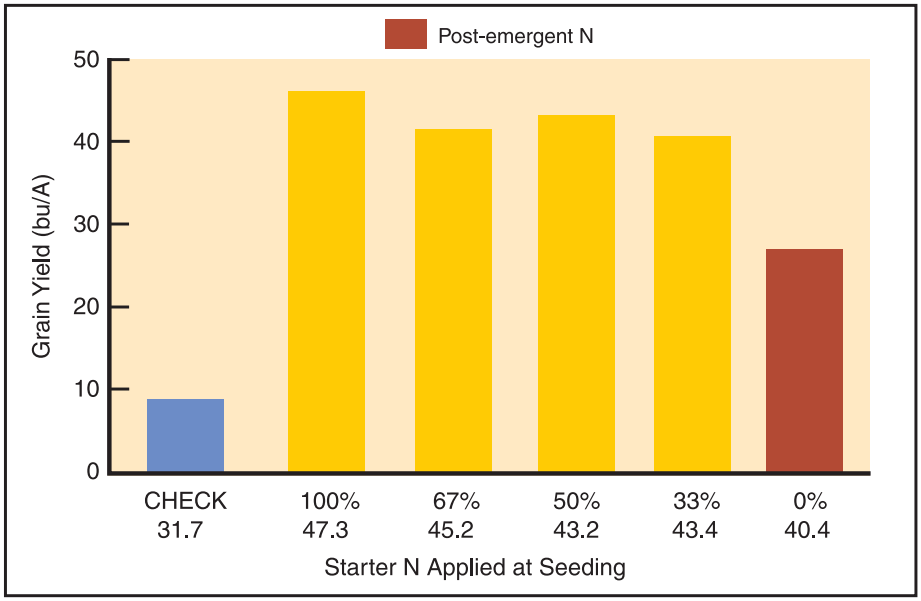

Figure 2. The effect of N timing and starter N levels on yield (average bu/A) of canola when N is applied post-emergent at the 6-leaf stage.

areas of the Northern Great Plains. The unpredictability of rainfall, combined with very small rainfall events, is such that producers are looking at approaches like post-emergent N applications where all the fertilizer does not have to be applied at the time of seeding.

While adopting new approaches, it is important that we understand the risks of post-emergent N applications. A new development in this regard is the GreenSeeker®, an active sensor that has the potential of increasing NUE. Technologies like the GreenSeeker sense crop needs for additional N, which then can be applied at variable rates.

The objective of this study was to look at different proportions of N fertilizer applied during the seeding operation and the balance applied as UAN in a surface dribble at three different growth stages.

Response at seeding

Spring wheat. An overall response to N fertilizer was observed at the Indian Head Research Farm in 2004 (Figure 1). The grain yields were higher where some starter N was applied at seeding (with the balance applied as a surface dribble band) than when all the N was applied as a surface dribble band.

Even adding just 33 percent of the total N fertilizer requirements at the time of seeding, with the balance applied post-emergence, resulted in yields similar to application of all the N fertilizer at the time of seeding. However, the dry year of 2003 showed us that applying 33 percent of all the N fertilizer at seeding was not enough.

In 2004, where no N fertilizer was applied at seeding and all the N was applied post-emergence, the yields were better when applied at the 3-leaf stage than at the 1- or 5-leaf stages. This may simply reflect better rainfall immediately after seeding.

Canola. There was a grain yield response to N fertilizer for the Indian Head trial in 2004 (Figure 2). In addition, we also observed a wheel traffic effect with all application timings of post-emergent N applications, with the largest effect occurring at the last two application dates. In order to correct for this effect, comparisons of treatment means were made to corresponding means associated with the wheel traffic effect at a particular growth stage. The treatment where all the fertilizer was applied at seeding was not significantly different versus where 33, 50, and 67 percent of the fertilizer N was applied at seeding and the balance at the 6-leaf stage. When all the N was applied postemergent, the yields were inferior to the other N treatments. This means that some N is required at seeding but the exact amount will vary with years and agro-ecological zone.

As with the results for spring wheat, applying some starter N at the time of seeding was better overall than applying all the N post-emergence. Adding 33 to 67 percent or more of the N fertilizer requirements at seeding, combined with the two earliest dates of postemergent application, was capable of protecting grain yields.

Conclusions

- Based on the results of 2004 and the observations of 2003, some starter N needs to be applied at the time of seeding in order to protect yield potential and minimize the risks associated with post-emergent N applications
- The best proportion of starter N to post-emergent N will be dictated by the agro-ecological zone in question but should be at least 33 percent, preferably more. Applying at least 50 to 60 percent of the fertilizer needs at time of seeding would greatly reduce the risks associated with post-emergent N applications
- In the drier zones, more starter N will be required and in the wetter zones, less may be required.

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