Managing nitrogen topdressing in a wet

Clint Sheather
IPF Technical Agronomist

Many parts of southern and central NSW have received above average rainfall this year, resulting in high yield potential but significant waterlogging. The challenge for growers is to determine how much nitrogen will be required to optimise yield and protein, and when is the best time to apply it.

Some questions to consider are:

- what was the starting soil-nitrogen level and how much has the crop used?
- how much nitrogen been lost due to leaching, denitrification, volatilisation, and immobilisation?
- how efficient was the previous nitrogen strategy and did it optimise yield?
- should nitrogen be applied later (after stem elongation) to improve grain quality?
- how much will be in the nitrogen bank if minimal rates of nitrogen are applied?

Soil and tissue sampling will be important tools for this year's winter crop.

Don't topdress waterlogged crops

This season make sure the crop isn't waterlogged. It is important that water has started to recede, and plants are actively growing before applying any nitrogen. Crop type, growth stage and the duration of the inundation will determine how well a crop tolerates a waterlogging event and if nitrogen should be applied.

IMPROVING NITROGEN USE EFFICIENCY

Research shows that the nitrogen use efficiency of Australian grain crops on average is 44%. To improve this, farmers need to minimise losses from leaching, denitrification and volatilisation.

Some of the factors that contribute to losses are not manageable, such as rainfall, temperature, and soil characteristics. However, farmers can influence application timing, fertiliser source and method of application. Implementing the 4 Rs of fertiliser management – selecting the right product, right rate, right timing, and right placement – will reduce losses. It is also important to match nitrogen applications to plant demand.

Losses

Leaching losses are greatest on lighter textured soils where large rainfall events can move the nitrate-N past the root zone.

Dentification losses occur in heavy soil types that have been saturated for longer than 7 days. The losses are greatest in alkaline soils with high organic matter. The losses accelerate in soil temperatures between 15-30˚C and peak between 23-27˚C.

Ammonium based fertilisers such as urea and Gran-Am® are all susceptible to nitrogen losses through volatilisation. The volatilisation process is dependent on several variables such as soil pH, moisture, temperature, wind, cation exchange capacity, crop residue, fertiliser type and rate. The safest applications are those made to dry clay soils, in low humidity conditions with no wind and sufficient rainfall to move the urea into the soil within a few days of the application.

Past performance

The challenge is knowing when and how much additional nitrogen is required to optimise yield and protein. Historical crop records are an indicator of likely crop and nitrogen performance. Often low protein wheat is a sign of reduced yield potential and strategic nitrogen applications can help minimise low protein wheat. As a guide, a wheat crop with a protein level of less than 10.5% is nitrogen limited while a crop with protein between 11.5-13% is unlikely to have benefited from additional nitrogen as yield and protein were maximised (Figure 1).

Managing nitrogen topdressing in a wet year

Nitrogen bank

The nitrogen bank is a method of maintaining a base level of mineral-nitrogen in paddocks where the risk of leaching and denitrification losses are low. A target level of soil-nitrogen is set based on local and climatic conditions, so crops are not deficient.

When using this strategy, minimal input into the N bank can result in nitrogen deficiency in the current year, but also mining of soil nitrogen reserves and a reduction in the carryover of residual nitrogen for the following crop. Growers can assure that late topdressing can increase the N bank for the following year if the nitrogen is not used by the current crop.

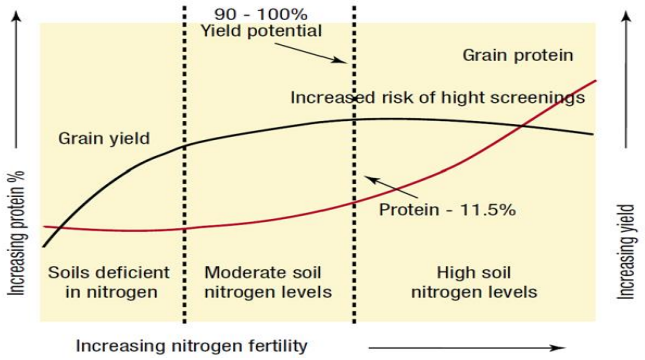

Figure 1: Typical grain yield and protein responses to nitrogen in wheat. Source: Incitec Pivot Fertilisers.

THERE'S STILL TIME

Nitrogen is crucial in high rainfall years, and there is still time to ensure that nitrogen will not be the limiting factor this season.

In wheat, nitrogen applied:

- during tillering (GS21-GS30) is critical to set yield potential.
- from stem elongation to flag leaf emergence (GS31-39) mainly increase grain protein and to a lesser extent yield.
- around flag leaf emergence (GS39) will increase protein, especially if yield is already maximised and rainfall is above average.
- from the end of head emergence to flowering (GS59-GS65) will increase grain quality and protein but have no effect on yield.

In canola, nitrogen and sulphur can be applied into early flowering if required.

IPF trial results

IPF trial work in 2015 showed canola yields improved with late nitrogen applications. Split nitrogen applications at stem elongation and 20% flowering increased yield. The non-limiting nitrogen treatment with multiple applications outperformed all other nitrogen treatments.

In 2016 results from IPF's long-term trial site at Grenfell show nitrogen increased yield and protein in a year of above average rainfall (including 120 mm in September) which resulted in both waterlogging and increased yield potential

This shows not only the importance of later application timing but also that late applications can increase grain protein.

CONSIDER GREEN UREA

Late urea applications into spring increase the risk of ammonia volatilisation. Rainfall of more than 10-15 mm is required to reduce losses and make sure the nitrogen is available for crops. Green Urea NV® contains the urease inhibitor NBPT (N-(n-Butyl)-thiophosphoric triamide). When NBPT is added to urea it inhibits the activity of the urease enzyme delaying the hydrolysis process, extending by up to 14 days the time to receive incorporating rainfall. It can be useful when rainfall cannot be guaranteed, daytime temperatures and windy weather is increasing and where soil pH is neutral to alkaline.

SUMMARY

- Be proactive and manage your nitrogen program with all the tools available and ensure other nutrients are not overlooked.
- Use soil and tissue results are important tools to determine nitrogen reserves. Historic records can also be used for nutrient budgeting.
- Take deep soil sampling in increments to show where nitrogen is in the soil profile.
- Increase nitrogen use efficiency by matching the right product with the right rate, right placement, and right timing.
- Don't rely on soil mineralisation to get your crops home. Apply nitrogen through the season and build the nitrogen bank.
- Consider nitrogen applications late in the season to increase yield and protein in cereals.

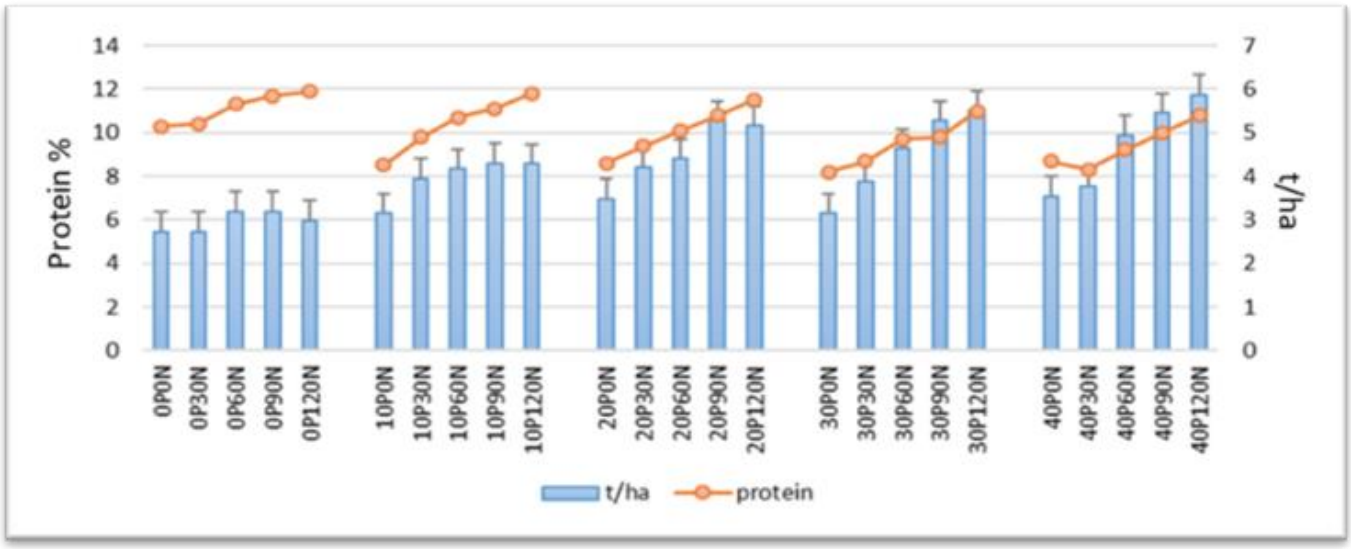

Figure 2: Incitec Pivot Fertilisers' long-term nitrogen and phosphorus trial at Grenfell in 2016 showing the value of nitrogen topdressing in a wet year. All nitrogen treatments have a split application timing, half is applied at sowing and the second half is applied at stem elongation (GS31). LSD <0.05, Yield 0.44, Protein 0.81%.

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FURTHER INFORMATION

For more information or advice about late season topdressing feel free to contact me on 0475 439 316 or clint.sheather@incitecpivot.com.au.

You can also contact:

Jim Laycock jim.laycock@incitecpivot.com.au.

Lee Menhenett lee.menhenett@incitecpivot.com.au

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