ISSUE 75 NOVEMBER 2024

NEWS, VIEWS AND PRODUCT REVIEWS TO HELP YOU MAXIMISE YOUR YIELD AND PROTECT YOUR CROPS AND LIVESTOCK

INSIDE THIS MONTH'S ISSUE

THE AGRONOMIST

Nutrien Ag Solutions™

Proudly supporting WA Country football since 1974.

Final message for 2024 from Nutrien Ag Solutions

This will be the final edition for 2024 our next edition will be March 2025. We would like to thank the below list of suppliers for making this newsletter possible. We wish you the best of luck with your harvest and we hope you have a safe and merry festive season.

ADAMA

BASF We create chemistry

BAYER

CORTEVA agriscience Agriculture Division of DowDuPont

Dyna-Gro SEED

FMC

Genfarm

KENSO agcare Together we grow

Loveland AGRI PRODUCTS Get Growing

Nufarm

nuSEED

PACIFIC SEEDS

PIONEER BRAND - PRODUCTS

SIPCAM

syngenta

Long-term N-Bank trials; 1st year lessons

Richard Stone – Research Agronomist, Northern WA

KEY MESSAGES

- **In trials on good soils, more yield and higher gross margins were achieved by applying higher than district average N rates**
- **Good results were achieved despite low rainfall at trial locations in 2023**
- **It took unrealistically high N rates to 'cook the crop' (screenings, test weight)**
- **Growers with good soils (fixed constraints and good P & K nutrition) may be able to push their standard N rates in cereals with minimal risk**
- **Consult a local Nutrien agronomist for specific advice on your scenario**

Nitrogen – The challenge

According to a recent study, nitrogen (N) deficiency is the biggest cause of the gap between the yields farmers are achieving and potential yields in Australian rainfed wheat systems [1].

N deficiency was identified as even more yield limiting than moisture loss caused by conventional tillage, or poor summer weed control, and the study claimed that alleviation has the potential to increase yields by 40%.

The question is, how do we alleviate N deficiency? As every grower knows, there are several strategic challenges in planning N applications in any given season:

- The amount of useable rainfall received dictates how much N the crop requires.
- Western Australian (WA) rainfall is highly variable.
- We don't know what our final rainfall figure (and yield potential) for each season will be prior to the N application window closing.

These challenges have resulted in WA growers practicing relatively conservative N strategies, largely aimed at minimising loss risk of loss from over-applying N in poorer seasons. After all, we know that too much N in poorer seasons will lose yield, downgrade quality, waste unused N, and ultimately cost us, don't we?

N-Bank strategy – The solution?

Nutrien commenced a series of long-term trials in 2023 which explore an N strategy designed to increase the ability of a given system to capitalise on the better rainfall years, while not losing out too much on the poorer seasons. It's called the N-Bank strategy, as described by Professor James Hunt of Melbourne University. The research in Victorian farming systems demonstrated that 'N-Banking' is a profitable approach [2].

James Hunt's approach to the N-Bank strategy is:

- We need to ensure there's enough N supplied from the soil and fertiliser applications to achieve water limited yield potential in most seasons.
- James suggests a Decile 7 rainfall year as the upper limit, i.e., our N supply target is set to cover potential yield in all but the top 30% rainfall years.
- We do that by soil testing as deep as possible prior to sowing to ascertain mineralised N, then we top-up to the N supply target in-season with fertiliser.
- Deep soil tests and N top-ups via fertiliser in each subsequent season are conducted to ensure the N-Bank can supply the Decile 7 rainfall potential yield.

Benefits

The N-Bank strategy is designed to capture unrealised profit in better seasons; for example, season '21 & '22 in WA, where sub-optimal yields and low protein were commonplace. Further, the strategy removes the guesswork and 'decision fatigue' associated with seasonal N application decisions. It is a simple, objective management system that allows N expenditure to be better planned.

Furthermore, the N-Bank system offers potentially improved long-term farm profitability and soil quality through reversing soil organic carbon decline [2, 3].

Risks

But, given the (perhaps substantially) higher N rates required in most seasons, what about average to poorer seasons? The issue of 'cooking' the crop, losing yield and quality downgrades is still relevant, regardless of N strategy, and increasing N rates only exacerbates financial risk.

Also, the theory assumes unused N really be recovered in following seasons. That might work in the heavier Victorian soils, but what about the potential for leaching in WA's lighter soils. Would a more conservative N supply target rate or a Decile 5 rainfall target be more profitable in poorer seasons?

1st year lessons – crop 'cooking'?

With the first year of trials completed, insightful data on yield, quality and profitability in a poorer season was collected from the Jennapullin (20 km north or Northam) and Wyalkatchem sites, which both received average or below annual and growing season rainfall (AR and GSR).

All N-Bank trial designs used long-term rainfall data to ascertain Decile 7 rainfall for the trial location. Water limited yield potential was then calculated, and a Decile 7 N target rate was ascertained (accounting for soil N). An N rate range was then built around this rate (0% to 200% of Dec. 7 rate requirements), and an area standard practice and local agronomist recommendation were also included.

Wyalkatchem

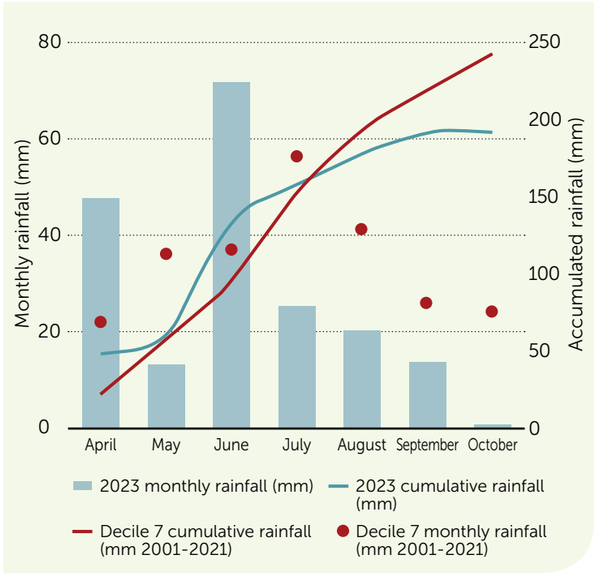

FIGURE 1. Wyalkatchem 2023, and 2001-2021 Decile 7 growing season rainfall (https://weather.agric.wa.gov.au/station/KO001, & https://www.armonline.com.au).

Although Decile 5 annual and growing season rainfall occurred at the Wyalkatchem site in 2023, July to September was equivalent to a Decile 2 season, and the last useful rainfall occurred on 12th August. Therefore, 2023 qualified as a poorer season with a challenging finish at Wyalkatchem (see **Figure 1**). So, did we cook the crop?

The Wyalkatchem barley site design was based on total N supply to the crop of 160 kg/ha N (70 kg/ha measured in soil + 90 kg/ha N applied) for a theoretical Decile 7 barley yield of 3.4 t/ha on Salmon Gum country with no obvious soil constraints.

Yield and quality

Yield, screenings, test weight and protein metrics answer the crop 'cooking' question.

Although actual yields were well below the calculated Decile 7 target yield, a practical, if not significant yield response was achieved (see **Figure 2**). The Decile 7 N target rate (90 kg/ha N applied) provided a 5% yield increase over the district practice rate (75 kg/ha N applied), while the local agronomist rate (105 kg/ha N applied) provided a 9% improvement.

Screenings followed yield, with the district practice, Decile 7 and local agronomist rates all comfortably below the 20% Malt 1 cut-off. Interestingly, even supplying 200% of the Decile 7 N rate requirement

Long-term N-Bank trials; 1st year lessons, cont'd

Richard Stone – Research Agronomist, Northern WA

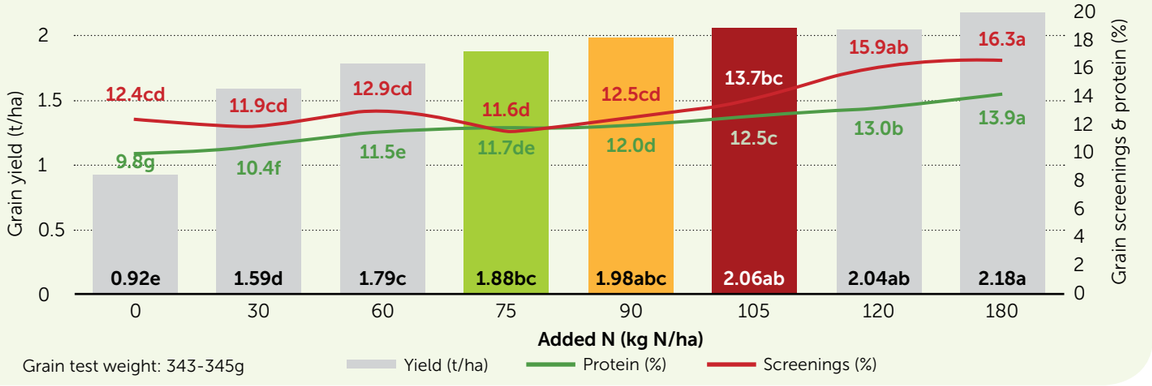

FIGURE 2. Wyalkatchem N-Bank barley trial grain yield and quality results; season 2023 (green column = district average N rate, yellow column = Dec. 7 N target rate, red column = Agronomist recommendation).

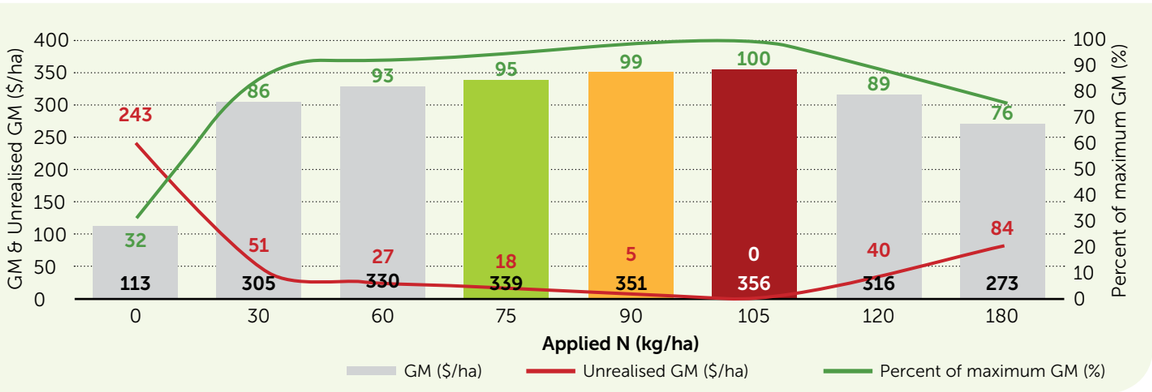

FIGURE 3. Wyalkatchem N-Bank barley trial economics; season 2023 (green column = district average N rate, yellow column = Dec. 7 N target rate, red column = Agronomist recommendation). NOTE: Malt 1: $355/t, Feed: $350/t, $1.54/kg N, non-nutrition costs: $98/ha (excl. operational costs).

(180 kg/ha N) did not cause a screenings quality downgrade.

Grain test weight was comfortably above the Malt 1 cut-off (320 g) and was relatively flat across all N rates. Less than 1% separated the district practice, Decile 7 and local agronomist rates.

The protein metric provided interesting results, and an indication of what is required for quality downgrades in barley. Grain protein increased across the district practice, Decile 7 and local agronomist rates, with all three sitting in the top end of the Malt 1 sweet spot. However, 133% (120 kg/ha N applied) and 200% (180 kg/ha N applied) rates did tip over the Malt 1 cut-off, downgrading these treatments to Feed.

So, did we 'cook' the crop by applying up to 30 more kg/ha N than the district practice (29% increase) in a poorer year? No, in fact, we had to apply 1.6 times more N than the district practice before a quality downgrade occurred, and that was caused by high protein, not screenings.

Economics

What about profitability? Did the modest yield increase of the Decile 7 and agronomist recommended rates over the district practice rate compensate for the additional N expense?

In short, yes. The local agronomist recommended N rate topped profitability at a Gross Margin (GM) (GM = $ income over untreated – cost of N) of $356/ha, with the Decile 7 and district practice rates at GM of $5/ha and $18/ha lower respectively (see **Figure 3**). Even in this poorer season, the conservative district practice rate was not the most profitable, and while the Decile 7 rate was very close to the agronomist recommendation rate, some profit remained unrealised.

Northam

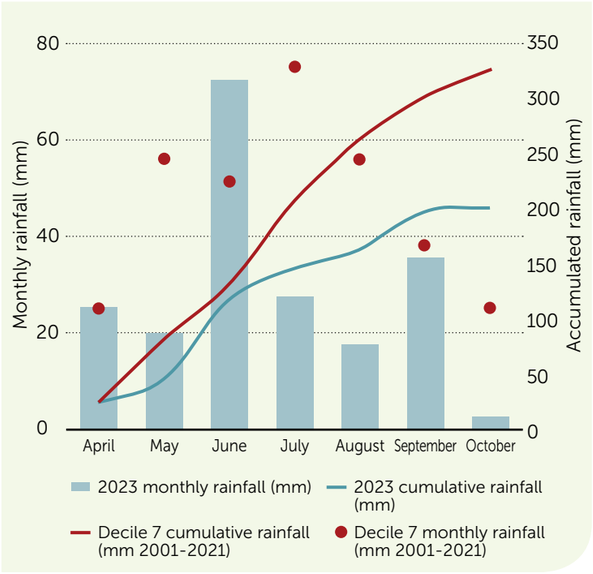

FIGURE 4. Jennapullin 2023, and 2001-2021 Decile 7 growing season rainfall (https://weather.agric.wa.gov.au/station/NO & https://www.armonline.com.au).

The Jennapullin site received the second lowest annual rainfall in the past 20 years, and GSR was only slightly better, at about Decile 3.5. Decile 9 June rainfall, and an extremely useful 20 mm received mid-September buffered yield from an otherwise extremely challenging season.

The Jennapullin wheat site design was based on a total soil supply of 190 kg/ha N (60 kg/ha measured soil N + 130 kg/ha N applied) for a theoretical Decile 7 wheat yield of 4.1-4.5 t/ha on heavy Avon Valley loam with no obvious soil constraints apart from a slightly sodic potential below 30 cm.

Yield and quality

Given the seasonal conditions, actual yields were surprisingly close to the theoretical water limited Decile 7 potential yield, with a yield plateau from 66% (80 kg/ha N applied) to 133% (173 kg/ha N applied) of the Decile 7 N target rate (**Figure 5**). Although the Decile 7 N target rate did top out yield at 4.31 t/ha, there was only 4% difference across all but the 0 and 260 kg/ha N applied rates.

As expected, when N rates are pushed in such a low rainfall season, significant quality differences did occur, which influenced grade and profitability.

Interestingly, screenings sat comfortably below the 5% cut-off up to 173 kg/ha N applied. 260 kg/ha N applied caused a Feed downgrade at 5.5%.

Grain test weight decreased as N rate increased yet remained above the Feed cut-off (370 g), even at 130 kg/ha N applied. At 173 and 260 kg/ha N, sub-370g test weights resulted in downgrades to Feed.

A significant protein response occurred, which also affected quality and profitability. 80 kg/ha N applied was required to reach ASW9 grade, while the district practice (87 kg/ha N applied) and local agronomist recommendation (105 kg/ha N applied) rates provided APW2 and 1 respectively. The 130 kg/ha N applied rate achieved Hard 2, while the 173 kg/ha N applied and 260 kg/ha N applied rates would have secured Hard 1 status except for screenings and/or test weight downgrades.

So, did we 'cook' the crop with an applied N rate of 43 kg/ha N more than district practice (33% increase) in a low rainfall year? No. While yield was very similar, quality upgrades were achieved. In fact, we had to apply twice the district practice N rate before a quality downgrade occurred (test weight), and almost three times the N before screenings and test weight downgrades occurred.

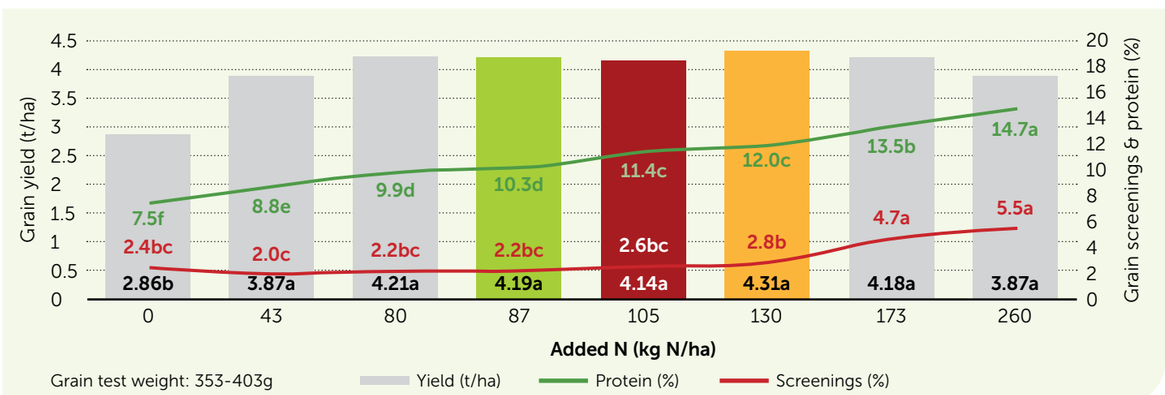

FIGURE 5. Jennapullin N-Bank wheat trial grain yield and quality results; season 2023 (green column = district average N rate, yellow column = Dec. 7 N target rate, red column = Agronomist recommendation).

Long-term N-Bank trials; 1st year lessons, cont'd

Richard Stone – Research Agronomist, Northern WA

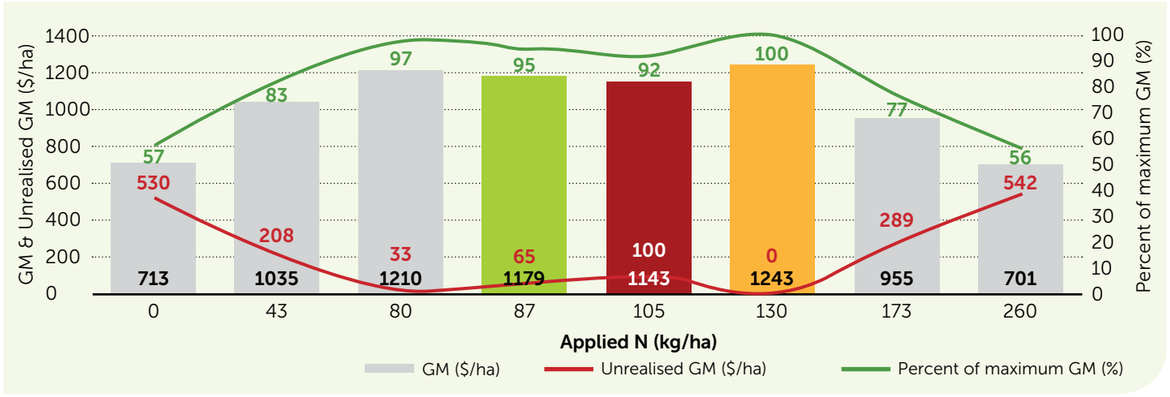

FIGURE 6. Jennapullin N-Bank wheat trial economics; season 2023 (green column = district average N rate, yellow column = Dec. 7 N target rate, red column = Agronomist recommendation). NOTE: Hard 2: $425/t, APW1: $409/t, APW2: $406/t, ASW9: $409/t, Feed: $385/t, $1.54/kg N, non-nutrition costs: $222/ha (excl. operational costs).

The wide yield plateau and the linear protein response suggest there was unused potential in the higher N rates in this challenging season.

Economics

Yield x quality nuances were influential on profitability. The Decile 7 N rate (130 kg/ha N applied) achieved the best GM ($1243/ha), yet the 80 kg/ha N applied rate was only 3% behind ($33/ha lower), a result of yield similarities and the fortuitous ASW9 harvest spot price. The profitability split between the district practice rate and the agronomist recommendation was similar, with the latter's lower yield not being able to capitalise on the small price increase between APW 2 and 1 (see **Figure 6**).

Substantial unrealised profitability was obvious outside the lower end N application rates range.

Takeaway: It takes a lot of N to 'cook' a crop!

So, does applying sufficient N to meet the water limited potential yield requirements of Decile 7 rainfall year cook a cereal crop in a Decile 5 or lower season?

Results from the first year of our Long-term N-Bank trials suggest not. Yield and quality consistently bettered the district practice, and gross margin on nitrogen spend was also improved.

In fact, we had to apply over 1.5 times more N than the district practice in a Decile 3 rainfall season which had a season-saving mid-September rain, and nearly twice the district practice N rate in a Decile 5 season which experienced an early and hard cut-off, before we suffered yield and/or quality downgrades.

IMPORTANT CAVEAT

- Soil constraints need to be dealt with to maximise water limited yield potential!
- Trial sites had no highly problematic physical or chemical constraints.
- All nutrients other than N were luxuriously supplied as per soil test results.

Current farmer N practices in cereals most likely reflect experiences farming in conditions with subsoil acidity and potentially inadequate K and P nutrition impacting yield. Returns for high rates of N applied will not be realised where yield potential is limited by a constraint or a deficiency in P, K or other nutrient.

Resources:

1 (Hochman & Horan, 2018) Causes of wheat yield gaps and opportunities to advance the water-limited yield frontier in Australia.

2 (Hunt, Murray & Thompson, 2023) Nitrogen banking; a long-term approach to risk. https://groundcover.grdc.com.au/agronomy/soil-and-nutrition/nitrogen-banking-a-long-term-approach-to-risk

3 (Baldock, 2019) Nitrogen and soil organic matter decline – what is needed to fix it? https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2019/02/nitrogen-and-soil-organic-matter-decline-what-is-needed-to-fix-it

Don't waste your money with a poor fungicide seed treatment job

Lachie Biglin – Kojonup & Kulin Agronomist

KEY MESSAGES

- **Even seed to seed coverage is key for good disease protection**
- **Increasing water volume (as per label) in the slurry mix can help to improve coverage**
- **Using good quality seed treatments can result in close to 100% control of smut**
- **Accurately calibrate your on-farm treating equipment or use Seedshield for good results**

Towards the back end of the 2024 growing season there were a lot of concerns around the level of smut infection in barley crops and whether this was worse than previous seasons. Smut often appears to be worse than it is, particularly as heads are first emerging, but it is still important to do some counts to find out a percentage of infected heads. It is recommended that if infection was greater than 5% you should think about replacing your seed with a clean seed source and review your seed treatment options/practices. Using a high-quality seed treatment can result in close to 100% control of loose smut if done properly (**table 1**). Regardless of the level of smut you experienced this season, now is a good time to assess your seed treatment options for season 2025 and make sure that your treating practices are up to scratch. This will ensure you aren't wasting your time and money.

The primary role of fungicide seed treatments is to protect the crop from seedborne diseases (i.e., smuts, bunts and seedborne blotches in barley) and soilborne disease (i.e., rhizoctonia, pythium, crown rot and take-all). Some products (such as Systiva®) can also help to suppress early foliar diseases, such as septoria, rusts, scald and powdery mildew, making them a very valuable tool for the early protection of cereal crops, especially in areas of high disease risk. Your choice of seed treatment isn't the only important thing to consider. The application process is vital to how well the seed treatment will work, so it is important to take time and care throughout the treating process, especially if you are treating your own seed on farm. What are some of the important considerations when it comes to treating seed?

Seed quality/Seed source

Seed quality and size impacts crop germination and vigour, but it also plays a role in the efficacy of seed treatments. Ungraded (or poorly graded) seed can result in the seed source containing small grain, cracked grain, chaff, weed seeds and lots of dust particles. In turn, seed treatments will bind to the dust particles, leading to a loss of product and a poor coverage job. Having poorly graded seed can also cause logistical constraints such as the clogging of machinery and restricted grain flow rates at seeding. Having a clean seed source is also vital when retaining seed because seedborne diseases, such as loose smut in barley, are carried in infected seeds. Weed seeds will also be spread if seed is sourced from a dirty paddock. It is good practice to pick clean paddocks for your seed and still get it graded and treated.

FIGURE 1. Even seed coverage vs a poor seed coverage job. Source: Syngenta.

Seed coverage – Coverage is king!

Uniform coverage on every seed is the fundamental principle of treating seed. Having patchy or uneven coverage can result in poor disease protection due to the fungicide not being applied to all seeds or to the entire seed surface. Over applying seeds can also pose issues as the product will rub off the seed, resulting in reduced efficacy and a loss of product and money. The key factors influencing seed coverage are:

1. Seed quality (clean, good size & dust free seed).
2. Product quality.
3. Total slurry volume applied (product + water).
4. Type of treater used.
5. Amount of mixing and secondary auger movement.

One of the most important of these factors is slurry volume. A volume of about 4-6 L/t of seed is generally required to achieve a nice, even application. Increasing your water rate to create more slurry is an excellent way to improve your on-farm treatment, but it is important to calculate how much by, as using too much water can cause issues also. Too much mixing or auger movement can also lead to product being removed from the seed, so try to limit this as much as logistically possible.

Equipment calibration

Calibrating your equipment correctly is pivotal to achieving uniform seed coverage with the right amount of product. Calibration will vary between crop types and treatment products, so it is important to recalibrate when changing seed and/or treatment. Below is the basic calibration process (Noonan, S., Syngenta (2024). Seed Treatment – Setting Up for Success.):

1. **Calculate grain flow rate**

   Grain flow rate (t/hr) = grain weight (kg) / time (s) x 3.6

   Run auger at a constant speed (50-60% capacity) to get a constant grain flow, then collect grain over a recorded time and weigh.

Don't waste your money with a poor fungicide seed treatment job cont'd

Lachie Biglin – Kojonup & Kulin Agronomist

e.g. measure 330 kg grain in 120 seconds, flow rate = (330/120) x 3.6 = 9.9t/hr

2. Calculate slurry flow rate

Slurry flow rate (L/hr) = slurry volume (ml) / time (s) x 3.6

Mix treatment and water following label instructions, then run spray at constant pressure and collect slurry over a recorded time and measure.

e.g. measure 990 mL slurry in 60 seconds, slurry flow rate = (990/120) x 3.6 = 59.4 L/hr

3. Calculate slurry per t of grain

Slurry rate (per t of grain) = slurry flow rate / grain flow rate

e.g. using above figures, slurry rate = 59.4 / 9.9 = approximately 6 L per t of grain

An alternative option to treating your seed is to get it done at a seed cleaners shed or by a seed grading truck. Seedshield offer a great service when it comes to your seed cleaning and treating needs, and it can all be done on-farm. Seedshield trucks have the capability to treat seed with a range of products, so get in touch with your local Nutrien branch to make a booking or for more details. As for what to treat your seed with, it is important to consider what your key disease or insect targets are and selecting products for those targets. **Table 2** highlights some of the key fungicide products and the diseases they target, but there are plenty more to choose from so make sure to discuss the options with your local agronomist when you are planning for season 2025.

Seed dressing	Esperance	Katanning	Wongan Hills	All sites
Untreated	0	0	0	0[a]
Evergol Energy	100	99	100	99[e]
Vibrance	95	96	98	96[e]
Systiva	96	93	100	96[e]
Vitaflo C	99	99	91	96[e]
Raxil T	70	79	74	74[d]
Baytan T	69	67	67	67[c]
Rancona Dimension	55	60	64	60[b]
Plant Infection (Untreated control)	7%	3%	10%	9%

TABLE 1. Loose smut control (percent reduction in infected plants relative to the untreated) from seed dressings at three sites and the percentage of infected plants in untreated plots. Different letters indicate different levels of control (p = 0.05). Source: Andrea Hills (DPIRD, 2018).

	Rate (ml/100 kg seed)	Cost ($/ha @ 100 kg seeding rate)	Loose Smut	Pythium	Rhizoctonia	Crown Rot
Vibrance®	180 ml	$7.47	**	***	***	
	360 ml	$14.95	***	***	***	
Evergol Energy®	130 ml	$6.93	***	***	***	***
	260 ml	$13.86	***	***	***	
Systiva®	150 ml	$33.75	**		**	
Rancona Dimension®	200 ml	$8.81	**	***	**	***
	320 ml	$14.10	***	***		
Raxil T®	100 ml	$2.45	**			

*** Best control available ** Good suppression efficacy No control

TABLE 2. Some of the common fungicide seed treatments and the level of control they provide on some key diseases, with rough cost per hectare. Source: Bayer.