5.2 BOOSTING PHALARIS GROWTH USING NITROGEN FERTILISER & GIBBERELLIC ACID

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KEY MESSAGES

- Urea applications promoted growth of two-year-old winter active phalaris cultivars by 161 kg DM/ha or an extra 4 kg DM for every 1 kg of urea applied.
- Gibberellic acid produced an additional 106 kg DM/ha at a cheaper cost than urea.
- The existing Australian phalaris did not respond to either of the growth promotants in 2023, this was thought to be unusual and will be investigated further in 2024.

Keywords: pasture, phalaris, urea, gibberellic acid, winter growth

BACKGROUND

This report focuses on boosting phalaris winter growth with gibberellic acid or urea and seeing if there is a varietal response. The response of an existing semi-winter dormant Australian phalaris-based pasture versus the response from newer winter active phalaris varieties is compared.

Applications of nitrogen (N) can help grow extra feed in times when soil available N is limited, and the plants have high nitrogen demands during periods of active growth. Responses to nitrogen are going to be highest in spring and lowest in winter when growth is inhibited by cold temperatures and excessively wet conditions. However, excessively dry conditions and low soil fertility will also impact nitrogen responses (McKenzie 2001). Nitrogen application rates of 15 to 60 kg N/ha will elicit the best responses, given that all other factors are not limiting. The best response from nitrogen applications is to apply to improved pastures, soon after grazing (1200 to 1500 kg DM/ha) as active growth occurs in the first two weeks after grazing and the plants may be limited by nitrogen (McKenzie 2001).

Gibberellic acid is a naturally occurring hormone that stimulates cell expansion resulting in leaves and stems becoming longer. It becomes depleted in plants during cold temperatures and as such responses can occur in winter (Ag Vic 2023). Application works best when soil fertility is adequate, and the paddock is spelled for 2-3 weeks post-application. To get the most out of the extra growth, apply in late June – early July. The maximum response from the application will occur after 3-4 weeks but may continue to have an effect for another 4 weeks. Phalaris pastures are most responsive to gibberellic acid, perennial ryegrass less so, requiring higher rates (20g/ha).

METHOD

The existing pasture on the site consisted of old Australian phalaris. Four newer winter-active varieties of phalaris were sown (Holdfast GT, Confederate, Horizon and GT070) to compare to the existing phalaris pasture. Strips of gibberellic acid and urea were applied in July 2023 across all five phalaris treatments (Table 1). For further information on establishment methods and trial management, refer to the previous article, *Is it Worth Replacing Old Australian Phalaris with New Winter Active Cultivars?*

Table 1. *Growth promoters applied in 2023 to trial ranges 5 and 6 only.*

Product	Rate/ha	Application Date
Gala (100 g/L Gibberellic acid)	40 mL	26-July-23
Urea	87 kg	

Gibberellic acid was applied at a 100 L/ha water rate by hand boom and urea was applied by hand.

Trial Management

Sowing

Four different winter active phalaris cultivars were sown in 6 m by 30 m strips using the SFS cone seeder (with knifepoints and press wheels) on 13 May, 2022, at 4 kg/ha with 100 kg/ha MAP. Single superphosphate was applied post-sowing to newly sown plots at 244 kg/ha and 368 kg/ha on the existing phalaris. Insecticide and slug bait was also applied post-sowing to protect seedlings (Table 2). Urea at 53 kg/ha was applied to all strips in July 2022, to help boost establishment. Grazing is done rotationally, but in August 2022 the trial may have been overgrazed, possibly hindering growth for that year (Figure 2).

Table 2. *Trial inputs and applications.*

Input	Application Date	Product	Rate/ha
Herbicide	17-Dec-21	Crucial	1.8 L
	11-May-22	Crucial + AMS (adjuvant)	1.8 L 2L
	1-Jun-23	Legacy MA	1 L
Fertiliser	13-May-22	MAP	100 kg
	17-May-22	Single superphosphate	244 kg to sown plots, 368 kg to existing Australian
	22-July-22	Urea	53 kg
	23-May-23	Single superphosphate	369 kg
	12-Oct-23	Urea	30 kg
	16-May-24	Single superphosphate	270 kg
Insecticide	12-Oct-21	Alpha Duo	50 mL
	19-May-22	Pyrinex Super	1 L
Bait	23-Feb-22	Hy-Mal treated grain	110 ml per 10 kg grain
	20-May-22 26-May-22	Metarex Inov	5kg
	15-Feb-24	Hy-Mal treated grain	110 ml per 10 kg grain

Figure 2. *Photo taken August 4, 2022, phalaris has been overgrazed.*

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Measurements

Pasture production was collected using a ride-on mower with a built-in weighing system to measure standing pasture in each plot. A hand-cut sub-sample was also taken and weighed and dried to measure moisture content. The two measurements were used to determine the kg DM/ha for the treatment. Cutting occurs when pasture is about 2000 kg DM/ha (approximately 10 cm) to a residual height of 5 cm. The trial was cut 4 and 10 weeks after the growth promotants were applied.

RESULTS & DISCUSSION

Urea and gibberellic acid both increased dry matter production across all phalaris treatments in comparison to the control after 4 and 10 weeks (Figure 3). After 10 weeks, the untreated plots produced a total of 417 kg DM/ha compared to the urea treatment which produced a total of 535 kg DM/ha and the gibberellic acid treatment produced a total of 500 kg DM/ha.

After four weeks, Holdfast GT responded the most to urea and only Confederate, Horizon and GT070 responded to gibberellic acid (Figure 4). It can be assumed that the Australian phalaris is not responding to the growth promotants as its untreated dry matter production was already quite high. The growth response after four weeks is important if trying to provide quick feed.

Usually, N responses can occur within 4 weeks, but can occur for up to 8 to 12 weeks (Ag Vic 2024). In Figure 5, responses are still occurring on all the 18-month-old winter active phalaris during spring, but not the Australian phalaris after 10 weeks. The total cumulative DM production for each variety and treatment can be found in Figure 6.

Urea applied at 87 kg/ha in late July produced additional growth averaging 161 kg DM/ha or 4kg of dry matter for each unit of nitrogen used on the new phalaris varieties (Table 3). Nitrogen was applied at 40 kg N/ha, therefore 1 kg N grew an additional 4 kg DM/ha for all varieties. Lee Menhennett, Incitec Pivot (2022), reports ryegrass and phalaris growth at soil temperatures >5°C will respond with 5 to 25 kg DM of additional growth per kilogram of nitrogen. In winter, this is typically 4-5 kg DM/ha in July, 7-8 kg DM/ha in August and 8-14 kg DM/ha in September for pastures with low to medium-quality (McKenzie 2001).

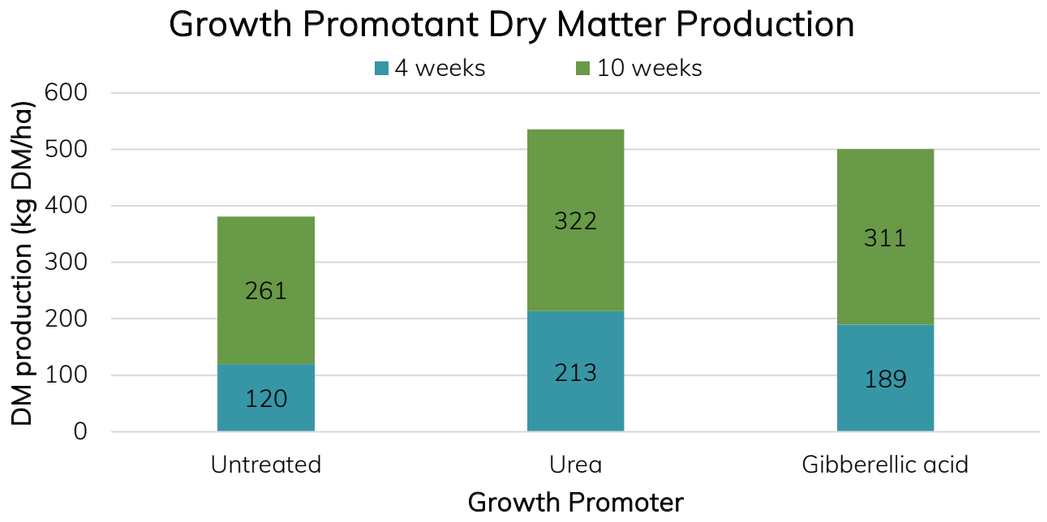

Figure 3. *Average dry matter (DM) production (kg DM/ha) of urea and gibberellic acid strips in comparison to the average growth of all five untreated strips.*

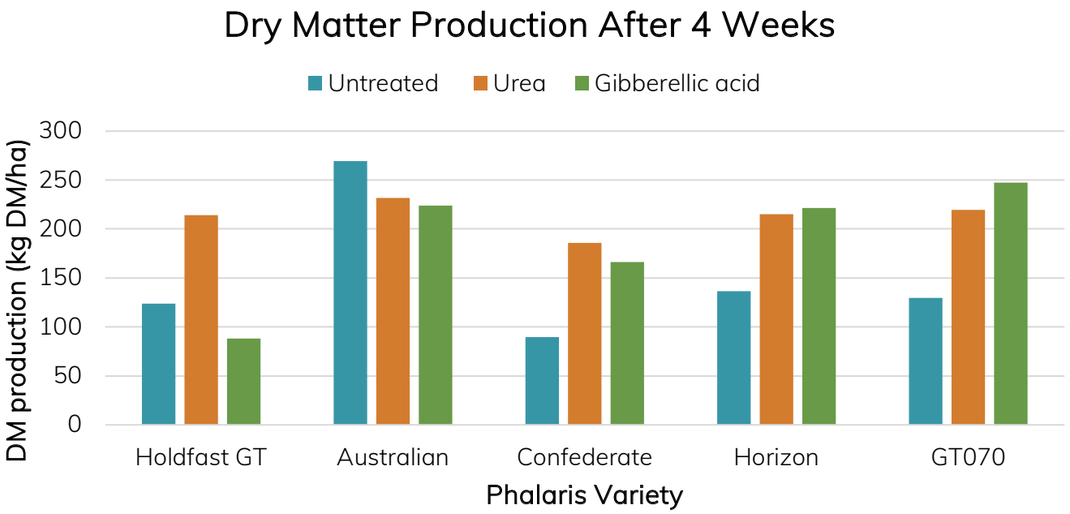

Figure 4. *Dry matter (DM) production (kg DM/ha) 4 weeks after application for each phalaris variety.*

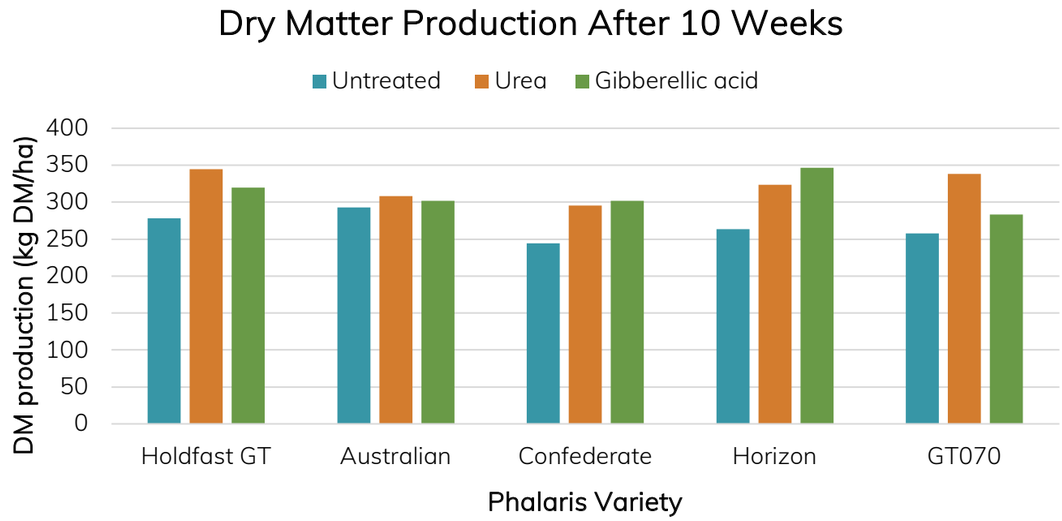

Figure 5. *Dry matter (DM) production (kg DM/ha) response to treatments in spring (10 weeks post application).*

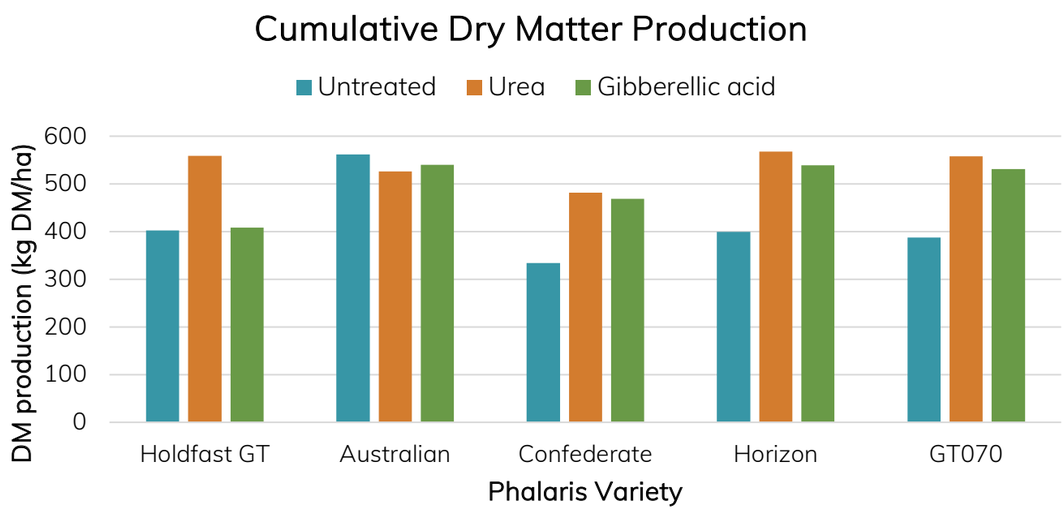

Figure 6. *Cumulative dry matter (DM) production (kg DM/ha) response to treatments up to 10 weeks post application.*

Reported responses in good quality pastures have been as high as 8 kg DM/ha during June and July and 12 kg DM/ha in August (McKenzie 2001). The Rokewood sites' low response rates were possibly due to the phalaris content being less than 30% due to the young age of the pasture (1.5 years old), with gaps filled with dying winter grass.

Table 3. Additional growth (kg DM/ha) from July to October in comparison to average untreated phalaris varieties.

Treatment	Urea	Gibberellic Acid
Holdfast GT	+157	+6
Confederate	+148	+135
Horizon	+168	+139
GT070	+171	+144
Average of winter-active	+161	+106

Typical growth responses to gibberellic acid (GA) are 350 kg of additional pasture dry matter for recommended application rates of 15 g/ha of GA (Saul, 2014). However, a trial across central Victoria found an increase in pasture growth after application by on average 133 kg DM/ha and suggested that phalaris needed to make up at least 40 % of the total pasture composition to make a GA application worthwhile (Shea and Campbell 2019). At Rokewood, an extra 100 kg of dry matter was produced (Table 3). From the results, it is suspected that the biggest constraint to pasture growth was nitrogen and until that is addressed, responses to other products could be limited. Interestingly, neither product increased the growth of the old Australian phalaris. However, responses of 667 kg DM/ha in Australian phalaris/clover pasture were achieved after 36 days near Meredith when GA was applied in mid-August (L Miller 2023, personal communication).

Using the urea cost calculator, urea priced at $800/t spread, cost $0.0362/MJ ME of pasture energy, proving it was slightly cheaper to invest in urea than buying grain at $400/t or hay at $250/t, still making it a worthwhile management strategy.

This tool is available from the SFS website https://sfs.org.au/resource/how-to-use-fertiliser-n-successfully-lee-menhennett-incitec-pivot-fertilisers. However, with an increasing price of urea, gibberellic acid becomes a more attractive option as a 250g container of Pro Gibb costs approximately $170 for 400g/kg active product or $0.68/g, costing $13.60/ha for product and $18.00/ha for application cost.

CONCLUSION

Urea and gibberellic acid have been shown to improve pasture growth during winter, but responses will be determined by what is limiting production. Before applying urea or gibberellic acid, make sure that soil fertility is adequate and apply to your best pastures. Responses can be seen in mediocre quality pastures but expect less growth.

In 2023, applying urea had the highest growth response in phalaris compared to gibberellic acid. This suggests nitrogen was a limiting factor of growth, however, this may not be the case in other sites with good clover content or in different seasonal conditions.

In the existing Australian phalaris pasture, neither growth promotant increased dry matter production, but despite Australian phalaris being semi-winter dormant, responses have been previously seen in Australian phalaris and will be monitored in 2024.

ACKNOWLEDGMENTS

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REFERENCES

Agriculture Victoria (2024) 'Driving winter pasture growth rates'. Available online at: https://agriculture.vic.gov.au/farm-management/land-and-pasture-management/driving-winter-pasture-growth-rates [verified 16 July 2024]

McKenzie F (2001) Using Nitrogen Confidently. Department of Primary Industries, Warrnambool. Available at: https://www.researchgate.net/publication/259892583_Using_Nitrogen_Confidently_-_Improving_N_efficiency [verified 16 July 2024]

Menhennett L (2022) 'How to use fertiliser N successfully'. Available at: https://sfs.org.au/resource/how-to-use-fertiliser-n-successfully-lee-menhennett-incitec-pivot-fertilisers [verified 16 July 2024]

Saul G (2014) 'Manage variable seasons – Tactical management to balance feed supply in variable seasons'. EverGraze. Available at: https://www.evergraze.com.au/library-content/manage-variable-seasons/index.html [verified 16 July 2024]

Shea R, Campbell R (2019) Innovative Use of Gibberellic Acid (GA). Meat and Livestock Australia, North Sydney. Available at: https://agriculture.vic.gov.au/__data/assets/pdf_file/0009/579924/L.PDS.1803_-_E.PDS.1410_Gibberellic_Acid_Final_Report.pdf [verified 16 July 2024]