Macalister Demonstration Farm

Pasture Response to Gibberellic Acid and Nitrogen Fertilizer

MDF Information Sheet 7
December 2009

BACKGROUND TO THE PROJECT

In a partnership, Incitec Pivot and the MDF have undertaken a trial of the effect on pasture growth of Gibberellic Acid at different levels of Nitrogen application. The project aimed to identify the optimum level of Nitrogen application in a typical flood irrigated paddock at the MDF and to assess the production and financial benefit of Gibberellic Acid on dry matter production when combined with different rates of nitrogen application.

Objectives

On an established grazed flood irrigated perennial ryegrass dairy pasture:

- compare the effectiveness of Easy N®, Green Urea™, and granular urea;
- with and without Gibberellic Acid (GA);
- assess effectiveness of Easy N at 3 different rates

Key results

- At the standard nitrogen rate, Green Urea produced the most dry matter production at the lower cost per extra unit of dry matter compared with urea;
- All nitrogen treatments were effective in improving dry matter production, but some treatments like Easy N provided more costly dry matter production;
- GA needs to be applied in combination with nitrogen to improve dry matter production.

Materials and Methods

This trial looked at 462 days of dry matter production comparing twelve nitrogen (N) fertiliser treatment combinations, applied 13 times, including EasyN at 4 rates 0, 30, 60 and 120L/Ha, Green Urea and straight granular Urea applied at the middle EasyN rate equivalent of 55kg/Ha or 25.5 kg N/ha. All treatments were applied with or without GA at 20g/Ha during the colder winter period.

The experiment was laid out on a section of grazed flood irrigated perennial ryegrass dairy pasture that was newly sown the year prior (photos below). The trial consisted of a randomized block design with 4 replicates of each. The plots each measured 2m x 5m. The granular treatments were applied by hand, while the liquid treatments were applied using a hand-held gas operated boom spray unit. All treatments were re-applied immediately after topping the trial area with a mower post-grazing by dairy cows.

Pasture dry matter measurements were calculated from each plot by harvesting with mower and catcher. Other measurements included analysis of plant tissue from each plot for N, P, K and S mineral contents, which were expressed per unit of dry matter. A grab sample at harvest from each of the treatments from the first replication of the trial was also included to send off to the Feedtest laboratory for feed-quality analysis.

Results

It is worth considering three aspects of the different treatments:

1. The **quality of the grass**. It is best if the energy, fibre and protein levels of the grass produced are improved.
2. The **quantity of dry matter** the treatment produces. It's good if a treatment can produce a lot of extra grass.
3. The **price of the extra grass**, calculated by dividing the amount spent (the product itself and any application costs) by the extra quantity produced. The price may be higher than grass grown without any treatment, but not so high that other feed alternatives are cheaper.

Figure 1 shows the quality of the dry matter, as it changes over the year. It shows that generally during the hotter months the pasture quality is poorer, the fibre level increases, and the energy level and protein levels decrease.

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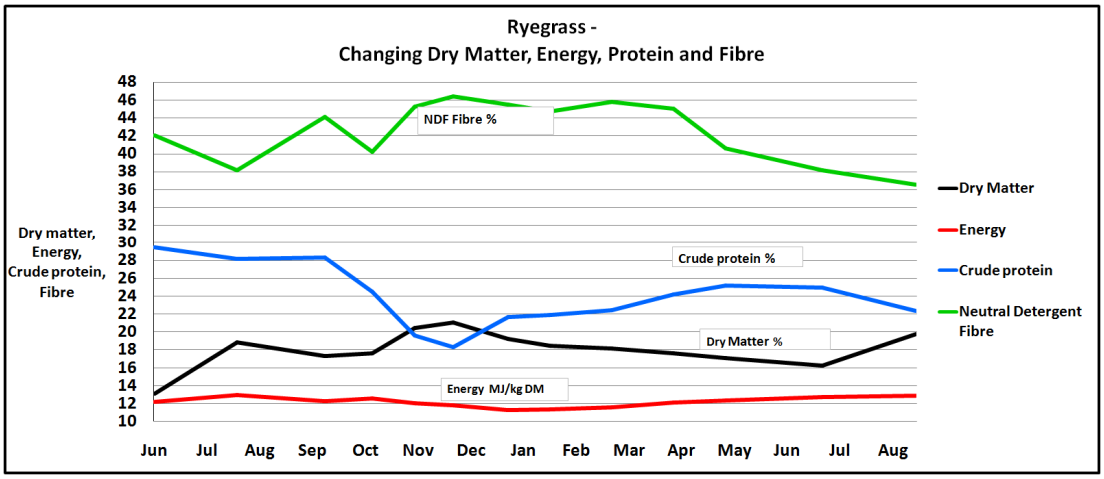
Figure 1. Changes in pasture quality over the season



There were two distinct periods of increased growth, coinciding with the seasons of spring (September to December) and summer/autumn (January to March). These periods are also when Green Urea appears to produce more dry matter than Urea. These periods coincide with fertiliser applications in September, October and November and appear to diminish in December only to reappear after application in January, which also occurred prior to a reasonable rain event. This reappearance may best coincide with the suitability of growing conditions at these periods of year for ryegrass or soil moisture trends.

Extra dry matter production is presented in Table 1. In this Table, the number after the name of the nitrogen product represents the application rate (e.g. EasyN120 was applied at 120 L/Ha) and '+GA' signifies the treatment had Gibberellic Acid applied in the winter period.

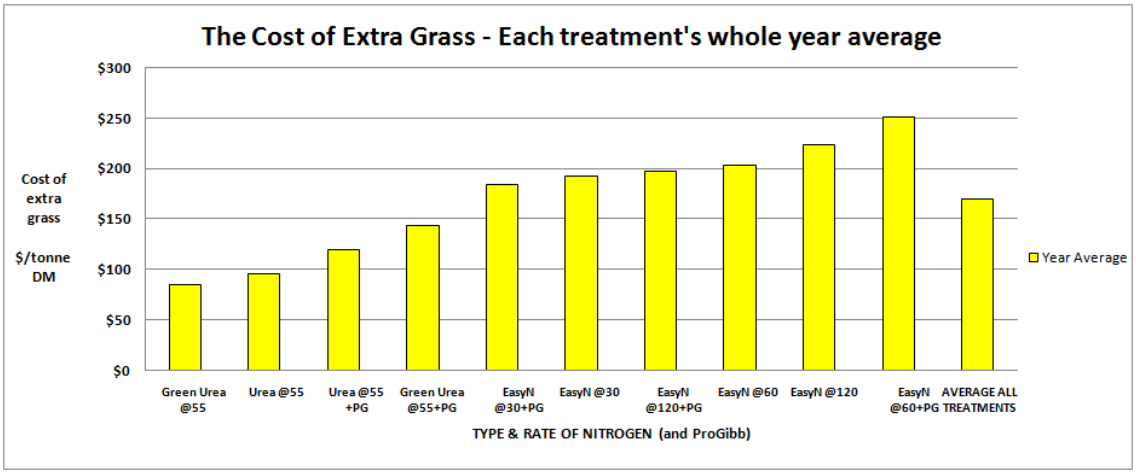
The control plot with no N and no GA added produced 9960.5 kgDM/Ha over the 462 day period. This means that the best performing treatment, EasyN 120 + GA, reached a total dry matter production of 17,317 kgDM/ha.

In some seasons the response to treatment was less than the control. Further investigation is warranted to see if other factors were at play during these periods, however it is assumed that ryegrass was not able to produce at this time as production was very low. This highlights that if the plants can't respond, then you may be wasting money applying nitrogen at this time.

Table 1: Extra dry matter production following treatment over 462 days

Treatment	Extra kgDM/ha Winter 2009	Extra kgDM/ha Spring 2009	Extra kgDM/ha Summer 09/10	Extra kgDM/ha Autumn 2010	Extra kgDM/ha Winter 2010	Extra kgDM/ha Cumulative	Response kgDM/kg N
EasyN 120	619	3353	1095	166	811	6044	9.1
EasyN 120+GA	696	3602	1914	241	904	7356	11.1
EasyN 60	482	2609	554	117	426	4188	82.1
EasyN 60+GA	356	2602	1122	59	798	4938	96.8
EasyN 30	200	1870	379	56	120	2626	103.0
EasyN 30+GA	299	891	884	62	385	2520	98.8
GrUrea55	651	4269	940	-33	701	6527	129.0
GrUrea55+GA	568	2547	1141	230	752	5237	103.5
Urea55	596	3140	663	120	495	5014	99.1
Urea55+GA	672	3134	1024	235	607	5672	112.1
Control	0	0	0	0	0	0	-
Control+GA	154	210	-388	-27	60	10	-

Figure 2. Cost of extra dry matter produced Winter 2009 – Winter 2010



The cost of extra grass grown as a result of each treatment was calculated **for the whole trial period** of 462 days from winter 2009 to winter 2010. The costs of the fertiliser products are based on Incitec Pivot price list 18 May 2010 RRP Excl. GST. Application rates and GA costs are based on local enquiry. The cost of the extra dry matter produced is presented in Figure 2.

When averaged over the whole trial period of 462 days, Green Urea with no GA produces the lowest cost grass ($84/t), followed by Urea with no GA ($96/t). This highlights the importance of growing what you can and when you can and utilising every bit of it.

When calculating the cost of dry matter during the different seasons (data not shown), Green Urea was most effective in spring ($40/t) and summer ($135/t). Urea was most effective in winter ($124/t) when compared to Green Urea ($130/t) and all treatments were relatively expensive in the autumn period.

Easy N created relatively expensive grass, even when applied at three different rates of N element per hectare. This is partly because of the high cost of application (here calculations based on using a spray contractor).

The effect of applying GA is inconsistent. For some Easy N treatments it lowers the cost of grass production, but when added to Green Urea, grass produced increased in cost.

Conclusion

Green Urea was shown to be the best option for growing extra pasture dry matter. It can produce a large extra quantity at an acceptable price per tonne. The periods in which Green Urea most outperformed conventional urea (based on $/t extra grass), was following applications in September, October, November and January.

When comparing the cost of the extra dry matter produced by Green Urea and Urea over the seasons (462 day period) Green Urea seemed to be the most cost effective overall if used for every application.

GA only increased dry matter production when nitrogen was also applied. It was also found there is some antagonistic relationship GA and Green Urea suggesting some interaction between the modes of action of these products.

Easy N gave satisfactory yield results but was not as effective as Green Urea.

This is a guide only, which we hope you find helpful as a general tool. While Incitec Pivot Limited has taken all reasonable care in the preparation of this guide, it should not be relied on as a substitute for tailored professional advice and Incitec Pivot accepts no liability in connection with this guide. Talk to your local Incitec Pivot Fertilisers' Distributor Agronomist about soil testing and arranging a specific fertiliser recommendation that best suits your needs.