2014 Landmark fertiliser trial

Background

Farmers have traditionally applied fertiliser to pastures to boost pasture growth rates. In recent years the advent of many new products may provide improvements upon standard practices for growing ryegrass hay.

In 2013 Landmark conducted trial work investigating the role of the nitrogen stabilisers and plant stimulants on pastures. Dow Agro Science's eNtrench™ alone increased dry matter yield by over 30% & Awaken™ foliar 14%. This raised the question, were the results just seasonal and what else can we do to maximise yield. This year's trial focussed on the use of nitrogen stabilisers, fertiliser blends and plant stimulants in combination.

What was done

A site was selected on the property of D & B Westbrook on the Stokes Bay Rd. The soil type was typical of most on the plateau, being an acidic sandy loam with light gravel present.

The trial was sown June 7th 2014 with Vortex Ryegrass at 25kg/ha. Starter fertiliser was drilled at sowing with the seed. After sowing a bare earth spray of Talstar® and dimethoate was applied to control red legged earth mite, followed by a liberal baiting for slugs.

On July 27th top-dressing treatments were spread at early tillering and a foliar treatment of Mancozin™ (1L/ha) was applied with a Kamba® M + Hammer® weed spray across the site. Some capeweed that escaped the initial weed spray and working up, survived and out competed the ryegrass in isolated patches of plots. Only two significant rainfall events occurred (9.2mm & 7.6mm) up to cutting, with a total of 80mm of rain between seeding and harvest – however there were above average temperatures which rendered the minor rainfall events negligible due to evaporation.

The control was representative standard practice for many locally grown ryegrass hay crops with some extras to ensure no obvious limiting factors. Each treatment was replicated four times.

Several treatments were included for interest's sake and are not really comparable to others but the replicates were all randomly placed across the trial site for ease of management. *The treatments were replacing a significant treatment of the control or in addition to the control.*

FIGURE 1: **Trial site**

1. **Control** - Thumper Xtra (13:19:0:7 +0.2%Zn 0.1% Cu @ 100kg/ha sown with seed.
   Urea @ 100kg/ha top-dressed at tillering
2. **NS 5:1 (urea + SOA)** (38:0:0:8) @ 120kg/ha **top-dressed** in place of urea
3. **eNtrench™** @ 2.5L/ha sprayed at **sowing** on top of control.
4. **NS 5:1** (38:0:0:8)@ 120kg/ha **top-dressed + eNtrench™** @ 2.5L/ha sprayed at **tillering**
5. **eNtrench™** @ 2.5L/ha sprayed at **tillering** on top of control.
6. **Awaken™ ST** (seed dressing) @ 375ml/100kg in addition to control.
7. **Thumper Xtra** (starter fertiliser) **spread** not drilled @ 100kg/ha.
8. **Awaken™** foliar 1L/ha @ **tillering** on top of control
9. **Blacklabel Zinc** @ 25L/ha applied bare earth after sowing on top of control.
10. **eNtrench™** @ 2.5L/ha + **Awaken™** foliar 1L/ha @ **tillering**.
11. **Phenomena Plus** (10:14:8:8 + 0.3% Zn 0.2% Cu) **sown** @ 135kg/ha in place of starter fert.
12. **Progibb®** @ 20g/ha sprayed at **tillering** on top control.
13. **Progibb®** @ 10g/ha + **Awaken™** foliar @ 500ml/ha sprayed at **tillering** on top of control.
14. **ENTEC®** coated urea @ 100kg/ha **top-dressed** at tillering.

Initial soil test results have not been presented, as after the site was sown, two very distinct soil types were found on the trial site. More extensive soil tests have now been conducted to determine any obvious variance that impacted on trial performance – see discussion.

TABLE 1: **Treatments and yields.**

No.	Name	Yield DM t/ha		% Gain	Difference $ Cost vs Control
1	Control (Thumper xtra @100kg/ha + urea 100kg/ha)	11.151	d	0%	$ 0.00
2	NS 5:1 (38:0:0:8) @120 kg/ha	11.363	d	2%	$ 6.00
3	eNtrench™ @ sowing	12.474	bcd	12%	$25.00
4	NS 5:1 (38:0:0:8) @120 kg/ha + eNtrench™ @ tillering	13.554	ab	22%	$31.00
5	eNtrench™ @ tillering	13.009	bcd	17%	$25.00
6	Awaken™ ST	12.187	bcd	10%	$ 3.00
7	Thumper Xtra (spread) 100kg/ha	11.325	d	2%	$ 0.00
8	Awaken™ @ 1L/ha	11.582	cd	4%	$10.00
9	Black Label® Zinc @ 25L/ha	13.376	bc	20%	$40.00º
10	eNtrench™ + Awaken™ foliar 1L/ha @ tillering	15.662	a	41%	$35.00
11	Phenomena Plus (10:14:8:8: +Cu,Zn) @ 135kg/ha	12.003	bcd	8%	$43.00
12	Pro Gibb® 20g/ha	12.750	bcd	14%	$13.00
13	Pro Gibb® 10g/ha + Awaken 500ml/ha	12.805	bcd	15%	$11.50
14	ENTEC® on Urea - top dressing	12.739	bcd	14%	$19.00
LSD (P=.05)					
Standard Deviation		0.667t			
CV		5.9			

The site became very wet soon after sowing, but the lack of spring rainfall was evident by early October with warm conditions. With only two rainfall events of significance (above 5mm) after topdressing there was assumed limited potential leaching of nutrients.

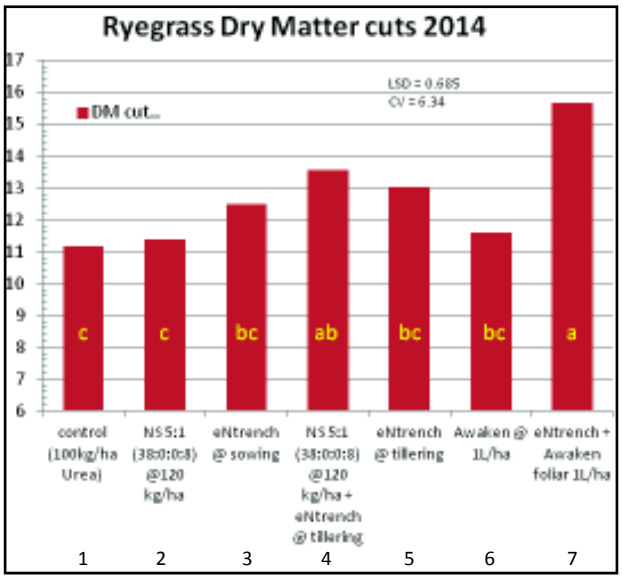
Dry matter cuts (t/ha) were taken on the 16th and 17th October. All cuts were to ground level and are not indicative of true hay yields i.e. much higher yield due to no losses in this process compared to hay making. Due to the distinct variation of soil types only three cuts out of three replicates of each treatment were taken, giving 9 data points for analysis. The northern end of the site suffered significant yield loss and was abandoned for data collection.

Results & Discussion

FIGURE 2 below highlights how managing nitrogen can boost hay production. Treatment 7 has yielded an extra 40% above the control (or standard practice). This increase in production is not from the application of extra nutrients, but due to the plants being able to more efficiently source/manage the nutrients actually applied.

Treatments 2 & 4 highlight that the extra sulphur didn't contribute to yield, more than likely the sight had sufficient sulphur & this wasn't the most limiting factor. The soil test confirmed this along with the applied sulphur in the starter fertiliser to ensure adequate sulphur. This implies that switching to sulphate of ammonia for topdressing will not ensure better yields. Each paddock is different as is how each soil type for nutrient levels and how the plants will perform.

FIGURE 2: **Ryegrass Dry Matter cuts**



Using eNtrench™ at sowing is a flexible option that will provide some benefit of (FIGURE 1. Treatment 3 = 12%), but this is not as efficient as in conjunction with topdressing seen in other treatments. On the typical lighter soils of Kangaroo island potentially eNtrench™ may lose its effectiveness too quickly due to warmer soil temperatures and hence biological activity breaking it down.

The two highest yielding treatments 4 & 7 were the combination of Awaken™ + eNtrench™. The eNtrench™ stabilises the applied and mineralised nitrogen in the soil allowing the plants to source it for longer periods rather than it leaching out of the root zone. The Awaken™ stimulates plant growth during stressful periods i.e. cold & wet. It promotes root growth in particular which proves better for extracting nutrients and moisture to result in more biomass production. The combination treatments appear to be a good strategy to enhance dry matter production. Note the starter fertiliser also contained zinc and copper with the objective of preventing them limiting production. Total yields reflect a very high potential, providing nutrients can be extracted from the soil. Neither product supplies more nutrient, they only enhance the nutritional package supplied.

The main yield responses were from the stabilised nitrogen or plant stimulants. Timing of application of these products also plays an important role in response. Typically the temperature is holding back growth and demand is relatively low at application. By stimulating growth and the plants ability to source/ extract nutrients, will result in an improvement of yield. This will be the case with Hay production because generally moisture is not limiting at any stage.

The observations were that treatments that yield higher had more dense tillers and thicker stems which contributed to the dry matter increase – even though plant height was not significantly different. This would agree with the science that plants grow more densely with nitrogen supplied as ammonium than nitrate.

Other treatments of note:

Progibb® definitely was significant as well as the combination with **Awaken™**. This could also be an economical treatment at a broad scale on desirable pastures. Again timing of application would need to be suitable.

The spreading of the starter fertiliser was comparable to the control, sown with the seed. This is due the more than adequate phosphorus levels common on this farm observed in numerous soil tests – I would not suggest this is a suitable approach on lower base levels of phosphorus.

Blacklabel Zinc is a humic acid base fertiliser designed to help improve soils and increase nutrient availability. It essentially does this by increasing the cation exchange capacity (CEC) in a small localised zone available to the plant roots, again a stabilising of nutrition concept that works in the sandy loams of KI.

Further work is now required to see if the digestibility or nutritional value of the pasture is enhanced or only the yield from these standout treatments.

The return on investment (ROI) is often used to help ascertain if the extra cost of treatments is worth it. The application costs were not included as they would have been done as part of existing operations and considered a fixed cost. The highest yielding treatment from TABLE 1 (10) cost an extra $35/ha. If dry matter was valued at $100/t it would only take an extra 350kg of dry matter/ha to cover this. Even on a poor hay crop, yielding 2-3t/ha, this cost is easily returned in extra yield alone.

Take home messages

- The use of eNtrench™, adequate sulphur at sowing, Awaken™ foliar all should be considered to enhance hay yields.
- A more complete approach to nutrition (sulphur, zinc & copper) is only beneficial if the nutrition is managed within the environment provided. This is what Awaken™, eNtrench™ & Pro Gibb take advantage of.
- By stabilising the nitrogen, big gains in utilisation were able, which results in more efficient use of land for hay production which could be adopted easily as all changes fit with existing operations.
- The extra costs are easily returned in yield, even in a poor rainfall season.
- The adoption of these products is not difficult as they fit as part of existing regimes.

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For further information contact

Daniel Pledge
Branch Manager / Agronomist - Landmark
Ph: 08 8553 2082 Mobile: 0428 810 224
E: daniel.pledge@landmark.com.au