

Mechanisms that lead to grain yield loss after grazing – Trial 2: Late Nitrogen Application

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Key messages

- The addition of nitrogen at anthesis lead to significantly greater grain yields up to 50 kg N/ha
- The extra nitrogen incrementally increased grain protein contents significantly with each additional 25 kg N/ha adding approximately 0.5% protein.
- Beaufort was the highest yielding variety in the trial when not grazed, however lost the greatest amount of yield when subject to grazing compared to Mace and Trojan.

Why do the trial?

It is generally considered in the agricultural industry that nitrogen applications after the booting stage of cereals are unlikely to increase yields, only grain protein contents. With the exceptionally wet spring of 2016 negating the need for irrigation treatments, it was decided to utilise the now spare plots to run a late nitrogen application trial. The trial was set up to quantify 1) How much extra grain yield could be gained by anthesis nitrogen applications and 2) Determine the extra grain protein content that could be derived from additional nitrogen applications.

How was it done?

The trial was established at the MNHRZ site at Navan, between Riverton and Tarlee, in the mid north of SA.

3 wheat varieties were sown on April 27th 2016 in a randomised block design consisting of 4 replicates. The varieties were Mace, Trojan and Beaufort – all were sown at 300 seeds/m², with 60 kg/ha MAP.

Simulated grazing was practised on half the plots with no grazing of the remainder. The simulated grazing involved mowing with mown material removed from plots. Mowing commenced 3 weeks after emergence and continued at 7-10 day intervals until GS30 was reached in ungrazed plots of each variety. Grazing continued on each variety until it reached GS30.

No nitrogen was applied at seeding. Nitrogen was applied to grazed and ungrazed plots when grazing ceased for that variety. The basal nitrogen rate of 120 kg/ha (over 2 applications) was applied as urea on to damp soil with rainfall received within 2 days.

For trial 2, nitrogen rates of 0,25,50 and 75 kg/ha were applied to all varieties in the form of urea at anthesis of ungrazed Trojan.

Plots were harvested using a plot harvester and protein determinations using an NIR analyser.

What happened?

Table 1: Variety Grain Yield (kg/ha) and Protein (%) vs. Grazing Treatment, MNHRZ, 2016

	Ungrazed		Grazed	
	Yield	Protein	Yield	Protein
Beaufort	10978.0	8.1	8203.6	7.8
Mace	8263.5	11.8	7091.9	9.8
Trojan	9738.9	10.1	8229.2	9.0
<i>LSD 5%</i>	<i>Yield - 738.96, Protein - 0.52</i>			

Table 2: Grain Yield (kg/ha) and Protein (%) vs Nitrogen, MNHRZ, 2016

Nitrogen	Yield	Protein
Nil	7321.5	7.6
25	8782.5	9.5
50	9541.4	10.0
75	9501.3	10.5
<i>LSD 5%</i>	<i>603.36</i>	<i>0.42</i>

Figure 1: Beaufort Grain Yield (t/ha) and Protein (%) vs Nitrogen rate and Grazing, MNHRZ, 2016

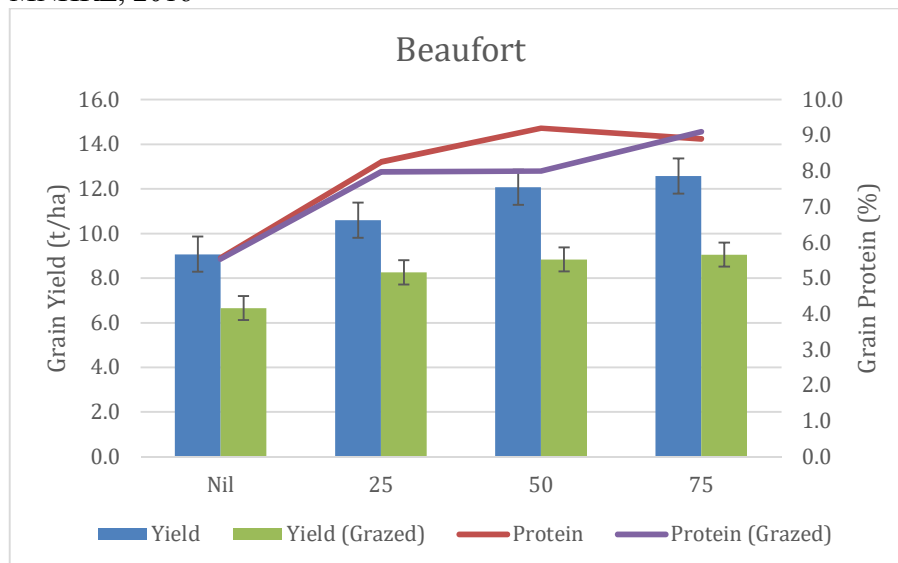


Figure 2: Mace Grain Yield (t/ha) and Protein (%) vs Nitrogen rate and Grazing, MNHRZ, 2016

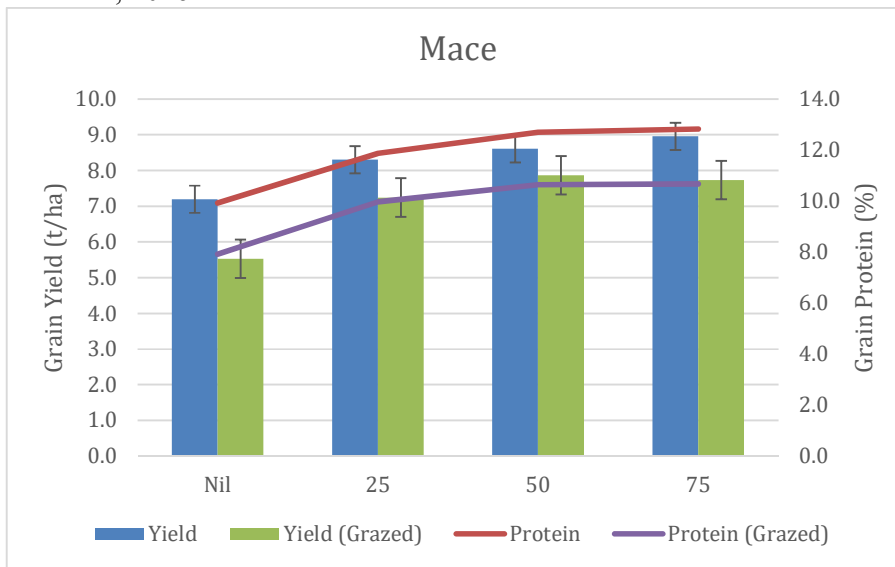
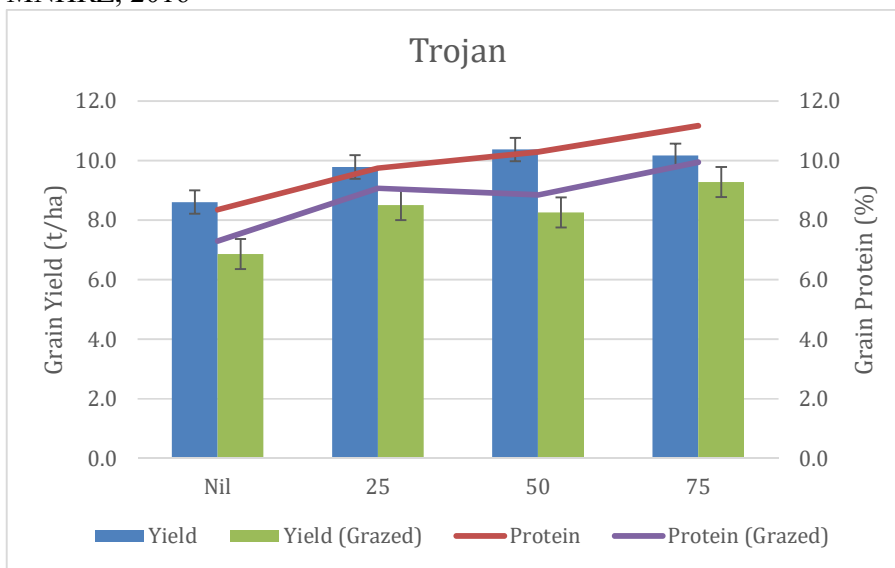


Figure 3: Trojan Grain Yield (t/ha) and Protein (%) vs Nitrogen rate and Grazing, MNHRZ, 2016



What does this mean?

Grain yields increased significantly in all varieties with anthesis applications of nitrogen. In this particular trial grain yields were maximised by the addition of 50 kg N/ha. Grain protein contents continued to increase with increasing N applications. It is interesting to note that all varieties lost significant amounts of yield when grazed. The addition of extra nitrogen at anthesis was able to make up for this yield shortfall in some varieties when compared to the ungrazed treatment without additional nitrogen. Mace and Trojan were able to achieve this when an additional 50 and 75 kg N/ha were applied to the grazed plots. Beaufort was unable to regain this lost yield and may be a result of lack of head number recovery following grazing. The effect of

the additional nitrogen on green leaf retention and resultant head number are apparent in the photos of the Trojan Plots in **Appendix 1**.

This trial demonstrates that yield increases of up to 2t/ha were possible with the addition of anthesis nitrogen to wheat that had a full soil moisture profile on a soil type that could hold a large amount of water. It should also be noted that the plots did not look nitrogen deficient at time of the anthesis nitrogen application, however the resultant increase in green leaf retention and later order tiller survival associated with this application is believed to be the key factor in terms of promoting extra yield.