3.4.3 To develop and validate the concept of delayed nitrogen principles when applied to 1st rotation barley - Inverleigh, Vic

Location:
Inverleigh Research Site.

Funding:
GRDC; Project No. SFS00017, 2.2.01 Optimising cereal profitability in the high rainfall zone through the integration of disease management and canopy management principles.

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Background/Aim:
The trial examines how two different plant populations and five different nitrogen timings influence the structure, yield & quality of the barley crop canopy in a 1st cereal situation.

Within the trial there are a number of specific objectives, which are as follows:

- To maximize the yield potential of barley with a combination of optimal rotation position & canopy management to handle fertility.
- To determine whether nitrogen timing interacts with plant population in terms of yield, crop structure and predisposition to lodging
- To determine the influence of stem elongation nitrogen versus up front nitrogen in terms crop structure, yield components and quality parameters
- To examine how nitrogen timing and rate influences green area index and green leaf retention during grain fill.

Take home messages:

- The average yield of first cereal barley (Capstan) sown 1st May at Inverleigh in 2009 was 6.45 t/ha.
- Crop canopies resulting from lower plant populations (101 plants/m2) had an average yield of 6.6 t/ha, significantly (p=0.05) higher than the higher plant population (168 plants/m2) which yielded 6.3 t/ha.
- There was a small but significant response to nitrogen overall, but this was slightly more evident at the lower plant population (0.36 t/ha) than it was at the higher population (0.24 t/ha.
- No nitrogen plots were yielding over 6t/ha in this 1st cereal situation following canola.
- No significant difference in yield was observed between nitrogen timings, however the split application of nitrogen was observed to be the highest.
- Upfront nitrogen increase biomass production at stem elongation, with nitrogen applied at GS30/31 having the greater biomass at maturity.
- The 2009 season at Inverleigh produced near optimal growing conditions through the growing season. However, a sustained period of unseasonal hot conditions in early November may have reduced the yield potential of some treatments.

Treatments:

Seed Rate/Established Plant Population

1. 101 plants/m2 (target 100 plants/m2)
2. 168 plants/m2 (target 200 plants/m2)

Nitrogen timing (nitrogen rates are expressed as kg/ha N NOT product)

1. No nitrogen
   (0-60cm profile N was 32.5 mg/kg or70.5 kg N/ha)
2. 75 kg/ha N Seedbed
3. 75 kg/ha N GS30
4. 75 kg/ha N GS33
5. 50:50 split between seedbed & GS30
   (37.5 kg/ha N at each timing)

Results and discussion:
In this 1st cereal situation following canola Capstan feed barley produced a small response (0.3 t/ha) to an applied nitrogen of 75 kg N/ha, despite only having an initial soil profile of 70 kg N/ha (0-60 cm). Five nitrogen timings strategies evaluated the effect of nitrogen timing on the barley crop canopy as described in the treatment list. The effect of nitrogen timing on dry matter production was measured throughout the growing season. Nitrogen applied at seeding significantly (p=0.01) increased the biomass of the crop canopy during the stem elongation phase (GS30 and GS33). This response to upfront nitrogen may be a benefit in some management strategies where the opportunity of grazing is available.

At flowering (GS61), nitrogen applied at sowing, GS30, or split between seedbed and GS30 was found to produce significantly (p=0.01) more dry matter then the nitrogen applied at GS33 or zero no nitrogen plots. At harvest it was found that the no nitrogen treatments had a significantly (p=0.05) smaller canopy than the N applied plots, the largest canopy was produced by nitrogen applied at GS30; however this was not significantly different to the upfront nitrogen treatments. No significant difference in yield was observed between nitrogen timings.

Two plant populations of 101 and 168 plants/m^2 were established to evaluate the effects of seeding rate on the crop canopy. Dry matter production was assessed throughout the growing season. Between the stem elongation phase and flowering there was no significant difference in biomass production between the two plant populations (Figure 2). However, as a trend, it was observed that the lower plant population had produced a greater quantity of biomass through this phase. This observation is consistent with the results observed in the 2008 trial at Inverleigh.

At harvest, it was found that the lower plant population (101 plants/m^2) had a significantly ($p=0.01$) greater biomass than the higher plant population (168 plants/m^2). The lower plant population also had a significantly ($p=0.05$) greater yield of 6.6 t/ha compared to 6.3 t/ha for the higher plant population.

Conclusion:
The 2009 growing season was reasonable despite being below average rainfall, the finish to the season was not favourable for achieve grain yield and quality potential. The trial found that nitrogen applied at seeding was found to significantly ($p=0.01$) increase the biomass of the crop canopy during the stem elongation phase. At maturity, nitrogen applied at GS30 was found to produce the greater biomass.

The trial found that yields were not significantly altered between nitrogen timing, however nitrogen timing did significantly affect biomass production at key growth stages. A sustained period of unseasonal hot conditions in early November caused a rapid loss of green leaf area, and the yield potential of these treatments may have been reduced.

The lower seeding rate (101 plants/m^2) had a yield of 6.6 t/ha, this was significantly ($p=0.05$) higher than the 6.3 t/ha achieved with the higher seeding rate (168 plants/m2). Throughout the growing season it was observed that the lower seeding rate had the great biomass production compared to the higher seeding rate.

Figure 1: Effect of Nitrogen Timing on Yield and Dry Matter Production (both seeding rates).

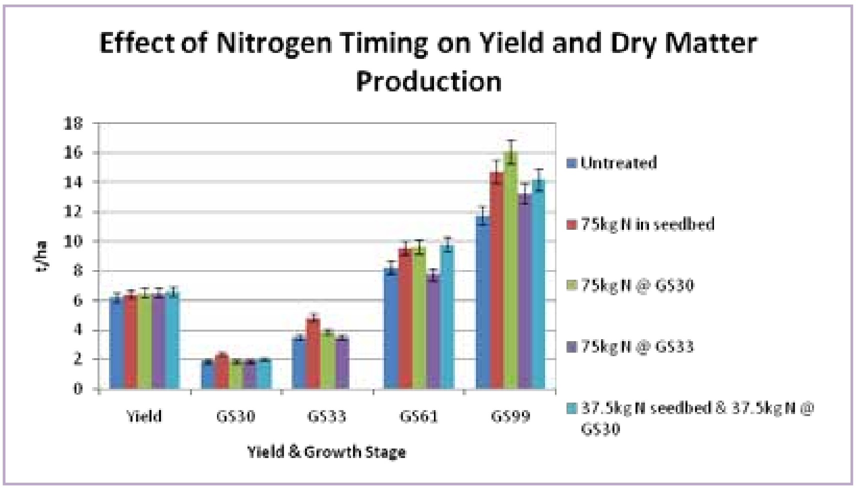

Figure 2: Effect of Nitrogen Timing and plant population on Yield.

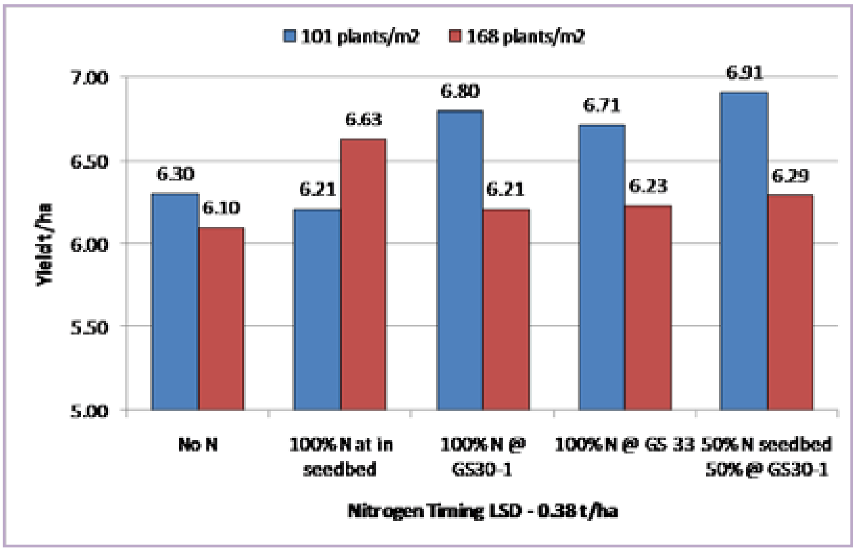

Figure 3: Effect of Seeding Rate on Yield and Dry Matter Production (all nitrogen timings).