Griffith Irrigated Durum Trial 2011

Rachael Whitworth, District Agronomist Griffith and Kathryn Bechaz, Technical Officer Yanco

March 2012

Key Points

- Caparoi was the highest yielding variety in this trial, yielding 7.03 t/ha; followed by Merinda 6.63 t/ha and then Bellaroi 6.58 t/ha.
- All nitrogen applied upfront gave the highest yield, followed closely by all nitrogen applied at the first node stage and nitrogen split three ways (upfront at the first node stage and at flowering).
- Bellaroi had the highest average protein in this trial with 12.32%; followed by Caparoi 11.82% and Merinda 11.23%.
- Further quality testing specific to durums (including dough strength, colour, grain size & shape, and hard vitreous kernels) will take place in July to determine the comparison between varieties and nitrogen management under SNSW irrigated conditions.

Background

Achieving high quality durum wheat in southern NSW often proves a challenge in our environment. But given appropriate nitrogen management strategies, correct rotation and irrigation management it can be achieved.

Over a number of years farm paddock and small plot nutrition trials have been conducted in the district and surrounding areas. As well as nitrogen, phosphorus, sulphur and potassium these trials have included many of the trace elements such as zinc, copper and molybdenum, which often show up as being deficient in leaf tissue tests

From previous experiments the nutrients which appear to be the most important for crop growth on our soil types are nitrogen, phosphorous and sulphur. These nutrients have been included for analysis in this years' trial.

Trial Aim

To further develop existing nutrition strategies in irrigated durum, enabling grain yield to be maximised, whilst producing high quality DR1 grade durum (13% protein and 80% Hard Vitreous Kernals).

Trial Details

Location: Willbriggie (15km south of Griffith)

Soil type: Grey clay

Soil test results: Taken 5th May, 2011

	0-10cm	10-60cm
Total Nitrogen (mg/kg)	38.6	20.0
P (mg/kg)	64	-
S (mg/kg)	14	-
Organic Carbon (%)	1.0	-
pH (CaCl2)	6.4	7.4
EC (dS/m)	0.2	0.3
ESP	4.0	6.5

Previous crop: Canola

Sowing date: 31st May, 2011

Sowing rate: 120 kg/ha

Herbicide:
Pre-sowing: 1.5 L/ha Glyphosate 540 g/L
In crop: 0.5 L/ha Precept 300EC

Fungicide: 300ml Folicur (plane)

Insecticide: Nil

Irrigations:

1st	5.09.2011	0.9 ML/ha
2nd	21.10.2011	1.0 Ml/ha

Harvest date: 6th December, 2011

Treatments

There were 5 nutrition strategies by 3 varieties, replicated 3 times.

Varieties: Bellaroi (Durum)

Caparoi (Durum)

Merinda (AH) – used to give an indication of the differences between AH and durum under the same management.

Treatments: The nutrition strategies used in this trial were those developed from previous benchmarking trials that Barry Haskins carried out in the Hillston District (2007 to 2009).

The trial design was based on the standard fertiliser practice of 150 kg/ha MAP at sowing.

Other nutrients including sulphur, nitrogen and phosphorous were added. The 5 nutrition strategies are:

Treatment 1: All Nitrogen applied upfront

Treatment 2: Nitrogen split upfront and at DC31 (1st node stage)

Treatment 3: All Nitrogen applied at DC31

Treatment 4: Nitrogen split Upfront and at DC31 and DC50 (flowering)

Treatment 5: Nitrogen and Sulphur applied upfront and at DC31

Table 1 shows the nutrition strategies in more detail.

Table 1: Nutrition Strategies for Durum Trial.

Treatment		Pre drilled fertiliser	Starter fertiliser	Post sowing fertiliser	
				DC 31	Flowering
1	All N upfront	240 kg urea	150 kg MAP	Nil	Nil
2	2 way split	120 kg urea	150 kg MAP	120 kg urea	Nil
3	All N DC31	Nil	150 kg MAP	240kg urea	Nil
4	3 way split	80 kg urea	150 kg MAP	80 kg urea	80 kg urea
5*	N & S split	120 kg SOA	150 kg MAP	120 kg SOA	Nil

* note: treatment 5 had less overall nitrogen applied than the other treatments involving urea. The SOA rate will need to be adjusted in future trials

Seasonal Overview

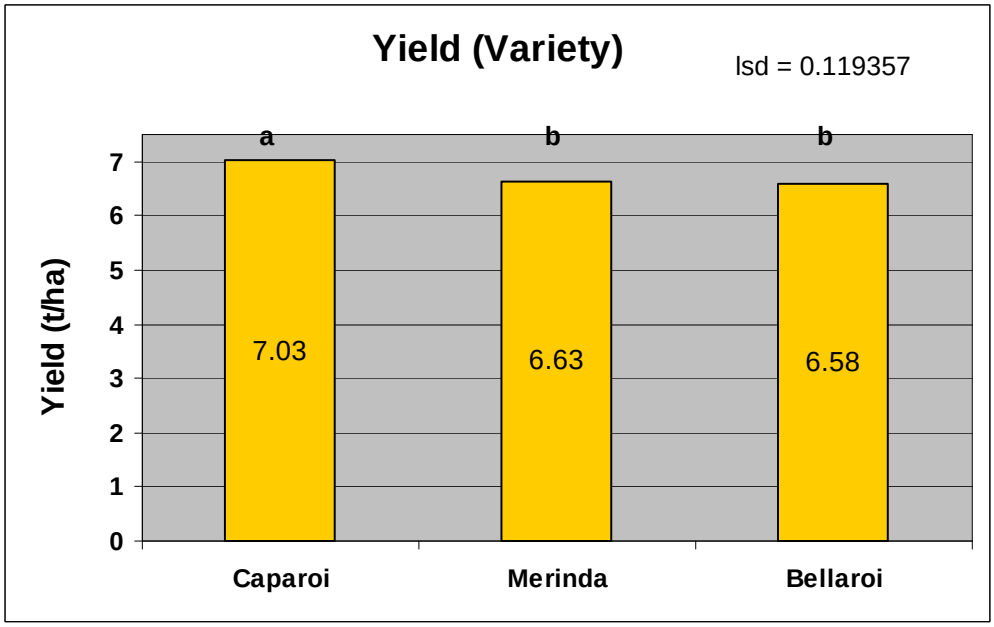
The 2011 cropping season was characterised by a number of factors.

- Large rainfall events in February 2011 (just over 160mm) and December 2010 (just over 80mm). Much of the region therefore started on a full profile of moisture, which negated the need in **most** cases of pre-irrigating.
- For 2011 the growing season rainfall for Griffith was 194mm, compared to the long term average of 239.7mm. After a promising start in early April, rainfall through late April and early-mid May was patchy. The 30 plus mm of rain that fell towards the end of May was a welcome relief. It strengthened the potential of crops already sown and enabled any remaining area to be sown. The season was then followed by a dry winter making establishment difficult as after emergence the season turned dry.
- Lastly mice caused significant damage at crop establishment. Many crops were baited at least once at sowing. Sodsown wheat crops were the worst affected, with multiple baiting often occurring.

Trial Results (note: in each of the graphs below the differing letters indicate that one treatment is significantly different to another)

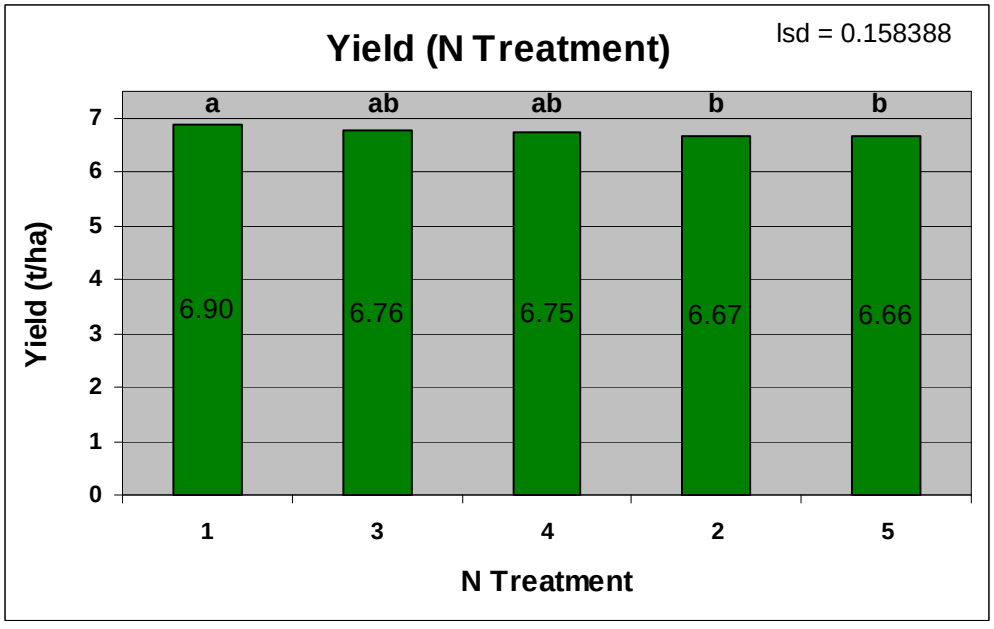
Yield and nitrogen treatment:

Graph1: Yield by Variety.



Graph 1 shows the average yield of the 2 durum varieties and Merinda, the hard wheat variety, in the trial. The variety Caparoi (7.03t/ha) yielded significantly better than both Merinda and Bellaroi, while Merinda (6.63t/ha) and Bellaroi (6.58t/ha) were not significantly different from each other.

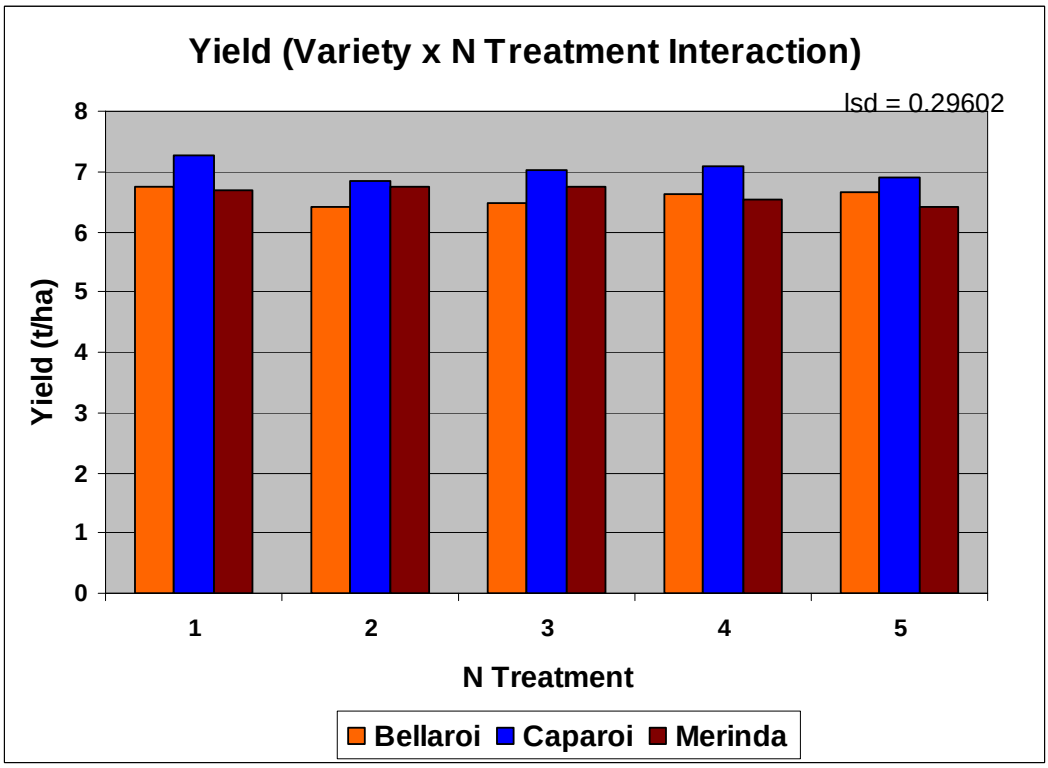
Graph 2: Yield by Nitrogen Treatment.



Graph 2 shows the average yield of the various nutrition strategies used in the trial. The highest yielding treatment was treatment 1 where all the nitrogen (240 kg urea) was applied upfront. This treatment was not significantly different from treatment 3 (all the nitrogen was put on at the first node stage) or treatment 4 (the nitrogen was split three ways). Treatment 1 was significantly different to treatment 2 (the nitrogen was split 2 ways) and treatment 5 (nitrogen and sulphur were applied upfront).

Variety x N Treatment Interaction (Yield):

Graph 3: Variety by Nitrogen Treatment Interaction.



Graph 3 shows how the varieties yielded under each of the 5 treatments.

For treatment 1 (the nitrogen applied upfront), Caparoi (7.26 t/ha) yielded significantly better than both Bellaroi (6.74 t/ha) and Merinda (6.69 t/ha).

Where nitrogen was split upfront and at DC 31 (treatment 2), Caparoi (6.85 t/ha) and Merinda (6.75 t/ha) yielded significantly higher than Bellaroi (6.42 t/ha).

In treatment 3 (all nitrogen applied at DC31), Caparoi (7.04 t/ha) yielded significantly better to Bellaroi (6.48 t/ha) but was not significantly different to Merinda (6.75 t/ha).

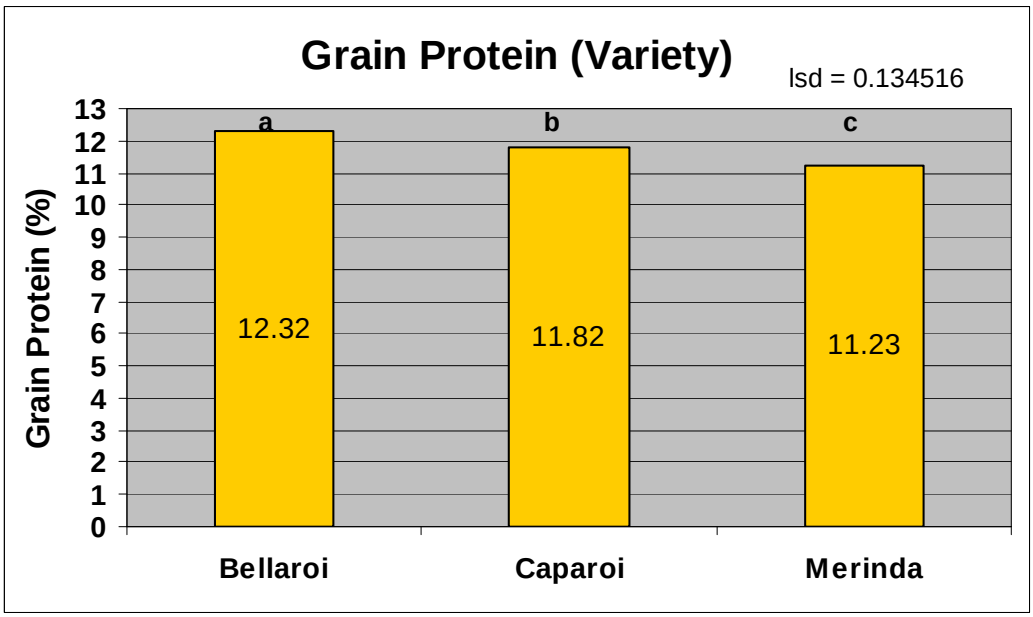
Where nitrogen was split Upfront and at DC31 and DC50 (flowering) (treatment 4), Caparoi (7.08 t/ha) yielded significantly higher than Bellaroi (6.61 t/ha) and Merinda (6.55 t/ha).

For treatment 5 (Nitrogen and Sulphur applied upfront and at DC31), Caparoi (6.89 t/ha) yielded significantly better to Merinda (6.42 t/ha) but not Bellaroi (6.66 t/ha).

When comparing treatments within individual varieties, for Bellaroi treatment 2 is significantly different to treatment 1 but not the other treatments; for Caparoi treatment 1 is significantly different to treatments 5 and 2 but not the other treatments; and for Merinda treatment 5 is significantly different to treatments 2 and 3 but not the other treatments.

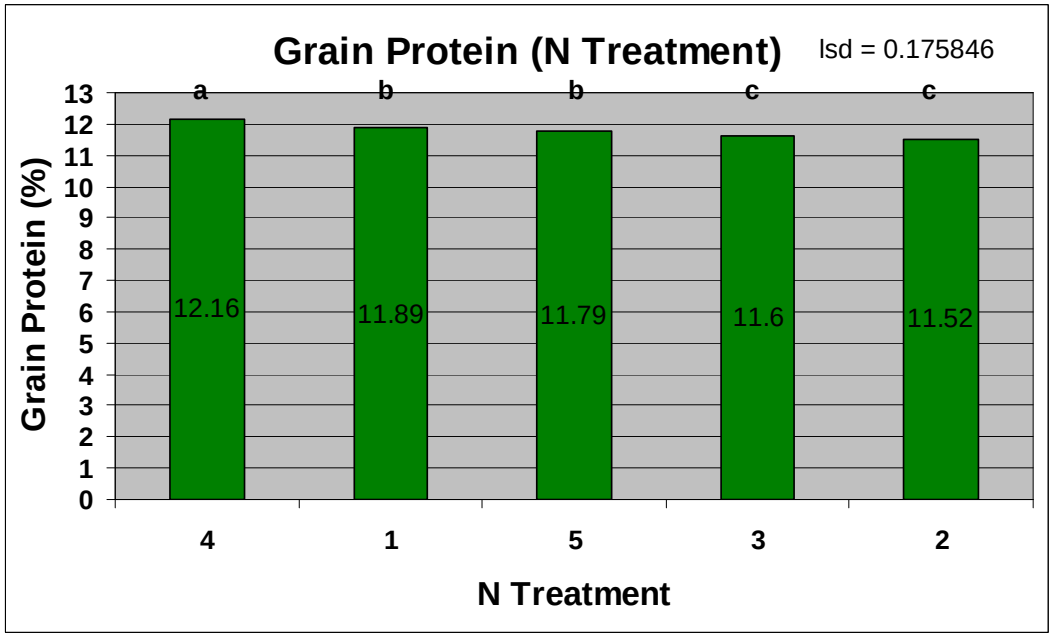
Grain Protein (Variety and N Treatment):

Graph 4: Variety by Grain Protein.



Graph 4 shows that grain protein for each variety was significantly different to the other, with Bellaroi having the highest average grain protein of 12.32%, followed by Caparoi with 11.82% protein and lastly Merinda with 11.23% protein.

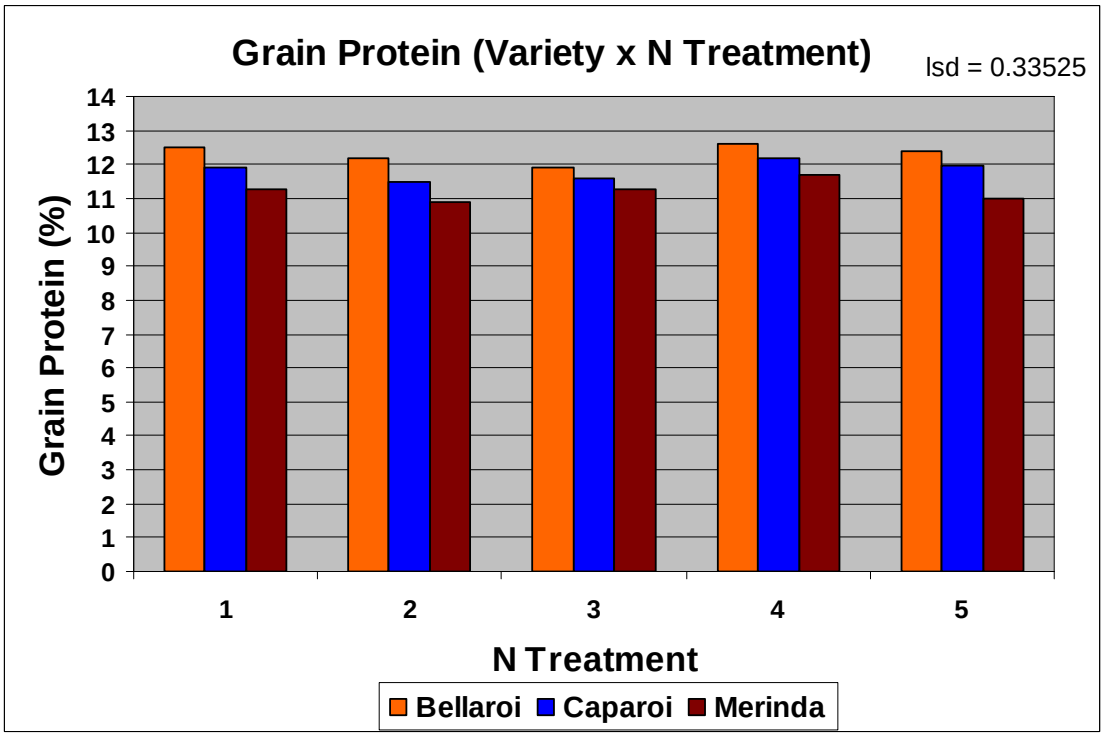
Graph 5: Nitrogen Treatment by Grain Protein.



Graph 5 shows that nitrogen treatment 4 (Nitrogen split Upfront and at DC31 and DC50) was significantly different to all other treatments having the highest average protein of 12.16%. Treatments 2 and 3 had the lowest average proteins of 11.52% and 11.6% respectively, and were not significantly different from each other. Nitrogen treatments 1 (11.89%) and 5 (11.79%) were not significantly different from each other but were significantly different to the other treatments.

Variety x N Treatment Interaction (Grain Protein):

Graph 6: Variety x N Treatment Interaction (Grain Protein).



For Nitrogen treatments 1, 2, 4 and 5, all varieties are significantly different from each other for grain protein. In all these treatments, Bellaroi has the highest grain protein, followed by Caparoi and than Merinda.

Nitrogen treatment 3 is the only treatment that varies with Bellaroi (11.89%) significantly different to Merinda (11.29%) but not Caparoi (11.61%) for grain protein.

Discussion

When growing irrigated wheat, yield is the most important factor for profitable crops, however when you are targeting a high quality durum crop (DR1 classification), grain protein as well as HVK specifications are important and can be hard to achieve. This seemed to be the case in this trial, with the two durum wheats across all nitrogen treatments failing to make the DR1 classification for grain protein because it was less than 13%. Caparoi and Bellaroi will be tested for HVK (an important quality test for durum) later in the year.

Due to the cool finish, 2011 was generally a year that favoured lower protein, high yields and large grain size. The fact crops were watered out, may have contributed to the lower protein. There are also indications that the trial was underdone with nitrogen given the season and following canola. It is also possible that mineralised nitrogen was less than anticipated.

It is not surprising however that the treatment which gave the highest grain protein was treatment 4 (Nitrogen split Upfront; at DC31 and DC50). The late application between head emergence (Z50) and flowering is designed to reduce the potential for lodging and to increase grain protein.

The performance of the durum varieties in terms of yield and protein is consistent with previous work that has been carried out, with Bellaroi having slightly higher protein than Caparoi and Caparoi having slightly higher yield than Bellaroi. It is important to note that the sowing date was on the later side for sowing Bellaroi, which may have also magnified this effect.

It is important to note that the target yield, the topdressing rate, and the spring watering commitment must be best matched to give the targeted result. On irrigation there is potential to achieve high protein and high yields with hard and durum wheats provided you choose the right

paddock, as paddock rotation plays a big part in your overall nitrogen management.

Acknowledgement

The help from the following people with this trial is greatly appreciated: Gary Bond, NSW DPI; Barry Haskins, NSW DPI; Peter Martin, NSW DPI; and Glen Andreazza and Family (trial co operator).

Published by the Department of Primary Industries, a part of the Department of Trade and Investment, Regional Infrastructure and Services.