

Trial 2: Durum Variety and N strategies to achieve DR1 specification

The aim of the trial is to examine various treatments that may assist in ensuring high protein, high yielding durum wheat from irrigation.

The key to successful durum production is grain quality – DR1 requires greater than 13% protein as well as meeting grain colour and vitreous kernel specifications.

The trial examined several aspects of durum agronomy based on previous trial experience that may impact yield and grain quality and was supported by GRDC in 2017 and 2018.

This trial focussed on the durum varieties DBA Aurora and DBA Vittaroi, and their response to N management, plant growth regulators and sowing rates.

The trial was sown on May 8th following pre-irrigation (1.5 Ml/ha) in April with 120 kg DAP/ha.

Variety seed size and sowing rates are summarised in the table below:

Treatment	g/1000 seeds	Target Population	kg/ha
Aurora	61.6	160	141
Aurora Low Rate		125	110
Aurora High Rate		220	194
Vittaroi	56.3	160	129
Vittaroi LR		125	101
Vittaroi HR		220	177

As Vittaroi is a shorter variety and claims a greater lodging resistance than Aurora, a plant growth regulator (trinexapac ethyl) was applied to all treatments except “no pgr” at GS31. A “late pgr” treatment at GS39 at half rate was also included.

N management was based on the assumption that DR1 would require 50 kg N/t and mineralisation of N would be low in-crop.

Nitrogen budget for the standard (control) treatment:

Yield Target	8.5	t/ha
N Required/t	50	kg N/t
N Required/ha	425	kg N/ha
Soil N (fallow)	187	kg N/ha
Starter fertiliser	20	kg N/ha
Mineralised N*	40	kg N/ha
Topdressing required	178	kg N/ha

The N topdressings are summarised below. Other treatments such as sowing rate and plant growth regulators were applied to plots that were treated similar to the control.

N Treatments	Stage	ToS1	Control	Late N	High N
Topdress 1	<30	4-Jul	60	60	60
Topdress 2	32	17-Aug	60	50	100
Topdress 3	37	14-Sep	60		100
Topdress 4	55	14-Sep		80	
Total N Topdressed			180	190	260

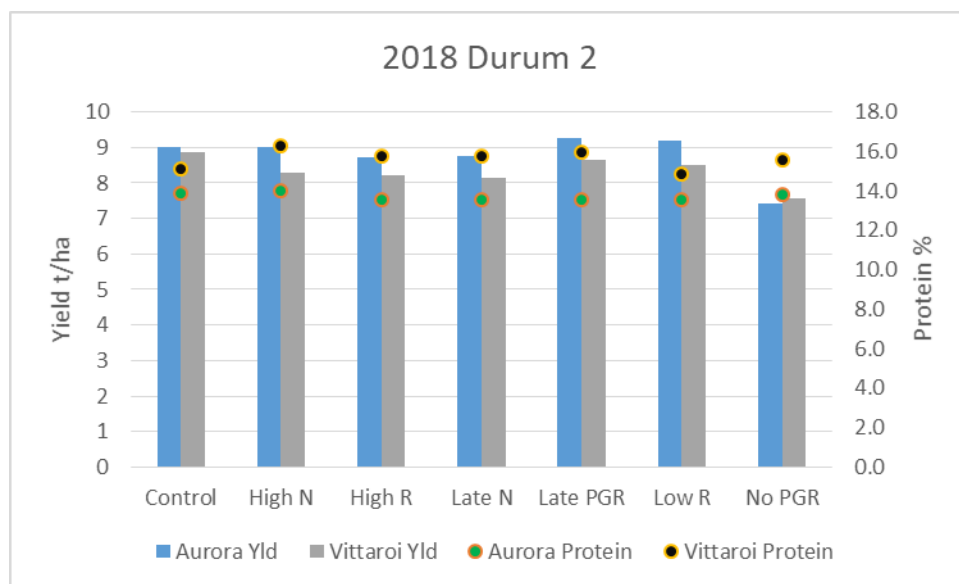
Some topdressings planned for a certain growth stage had to be amalgamated due to the lack of rainfall for topdressing to be effective.

The trial was irrigated three times in spring: August 28th, September 19th and October 9th. Total spring irrigation was 2.8 Ml/ha.

In an effort to better understand the yield potential of the durum wheats, small samples were taken from the sowing rate plots and grain weight per head was calculated.

The trial was harvested on December 11th.

Results



All treatments met DR1 specification.

Yield

Aurora averaged 8.86 t/ha and Vittaroi 8.31 t/ha. This was statistically significant ($p = 0.002$, $lsd = 0.27$, $cv\% = 4.9$). All treatments had similar yields except the “No PGR”. Aurora and Vittaroi both lodged when grown without a PGR application. This resulted in

a yield penalty, which was statistically significant in Aurora but not Vittaroi. Overall Vittaroi was more resistant to lodging (see Appendix).

Protein

Vittaroi grain protein averaged nearly 2% higher than Aurora (15.6% compared with 13.7%). The difference was statistically significant across all treatments ($p < 0.001$, $lsd = 0.34$, $cv\% = 3.6$).

All Aurora treatments were not statistically different from the control, and only the “High N” treatment in Vittaroi was of higher protein than the control.

Grain per head averaged over 2g/head or 2.0t/ha per 100 heads. Aurora averaged 2.2 g/head and Vittaroi 2.1 g/head, with sowing rate having no effect. This grain weight per head is that is much higher than that of the bread wheats. A recent survey of irrigated wheat crops that the ICC conducted on behalf of GRDC saw an average of 1.33 g/head or 1.33 t/ha from 100 heads/m², with the range from 1.0 to 1.9 g/head.

The significance of this grain weight per head is in predicting crop yield late in the season. Judging a durum crop by eye based on experience with the bread wheats may result in underestimating the yield. By counting shoots/heads late in the season, an accurate yield prediction can be made and N managed accordingly.

What does it mean?

Durum wheat can be grown under irrigation, but the N requirement is quite high. A Nitrogen budget is essential, but a weakness is in the yield forecasting where underestimation can result in not attaining the required grain protein. Data from this trial gives some guidelines in estimating yield and matching N supply.

Applying N “late” at head emergence or post-flowering can increase grain protein and could be used as insurance to maximise grain protein from N topdressing.

DBA Vittaroi may have a slightly lower yield potential than DBA Aurora, but its ability to be more efficient in converting N to protein may see the profitability of Vittaroi exceed Aurora if N inputs can be reduced.



Appendix

	Yield (t/ha)		Protein (%)		Screenings (%)		Test Wt (kg/hl)		Lodging	
Treatment	Aurora	Vittaroi	Aurora	Vittaroi	Aurora	Vittaroi	Aurora	Vittaroi	Aurora	Vittaroi
High N	9.02	8.283	14.0	16.3	1.2	0.5	82.1	80.77	2	1
High Sowing Rate	8.723	8.203	13.6	15.7	1.3	0.4	81.3	81.57	2	1
Late N	8.747	8.153	13.6	15.8	1.1	0.4	81.77	81.37	2	0
Late PGR	9.267	8.64	13.5	15.9	1.1	0.5	82.5	80.93	1	0
Low Sowing Rate	9.19	8.493	13.5	14.8	1.2	0.8	82.63	81.6	2	0
No PGR	7.437	7.547	13.8	15.6	1.7	0.7	80.77	80.67	5	5
Control	9.02	8.86	13.9	15.1	1.6	0.4	82	81.4	2	0
p	0.002		<0.001		<0.001		0.018			
lsd	0.7067		0.8875		0.5904		1.4680			
cv%	4.9		3.6		38.2		1.1			