Irrigated Durum and Irrigated Pulses Trials

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Take home messages

- High yielding irrigated durum wheat can be achieved but doing so requires high N inputs.
- Following a legume plays an important role in making durum wheat profitable by reducing the risk of disease and supplying "free" nitrogen.
- Alternative pulses such as chickpeas and lentils have the potential to be profitable but waterlogging tolerance and disease resistance under irrigated conditions needs to be established.

Background

Along with the changing irrigation environment comes opportunities to try new crops that have higher returns than the traditional broadacre irrigated crops. Durum wheat and irrigated pulses (chickpeas and lentils) have the potential for greater returns, but also a higher risk from failing due to not meeting market specifications or susceptibility to waterlogging or foliar disease.

Interest in growing durum wheat was spurred by the price offered in 2014 where prices reached $600/t and the new variety DBA Aurora yielded 8 t/ha in the Benerembah NVT trial. However the downside to high yielding irrigated durum is the necessity to reach the 13% protein, which requires significant N inputs. Otherwise low protein durum is only feed quality.

Similarly, growing irrigated chickpeas and lentils has potential financial rewards but their reputation for susceptibility to waterlogging and disease makes them a risky proposition. Advances in irrigation technology and infrastructure may have reduced some of the risk and that is what the ICC is attempting to ascertain with a combination of irrigation technologies, irrigation and fungicide strategies and variety evaluation.

These two new projects are supported by GRDC.

Irrigated Durum Wheat

Based on trial work that the ICC has previously conducted, and information from the Southern Australia Durum Growers Association, 2 trials were sown; one at the ICC's Kerang Trial site and the other at a "Tiquito", 20 km south of Moulamein NSW under a centre pivot. The treatments are based on an assumption of 7.5 t/ha yield target and an N requirement of 50 kg N/t. DBA Aurora was used as the variety for the trial. The trial was sown on faba bean stubble where it is anticipated the stubble will result in 125 kg N/ha being mineralised through the season. The treatments were based on N strategies tested in 2016 with success and includes a biological product to test claims of improved N efficiency.
To compare the gross margin of bread vs durum wheats, Scout was also sown and received appropriate N rates (40 kg N/t).

Trial treatments

1. Standard: N applied throughout the season, starting late tillering, aiming to maximise yield.
2. Late N: A late application at head emergence aiming to increase grain protein.
3. High N: Similar timing to the standard, but at higher rates to ensure an adequate supply of N.
4. Trace elements application: Some thoughts on trace element deficiencies may affect the ability of the plants to translocate protein into the grain
5. Nitroguard: Assessment of the biological product Nitroguard to supply extra N
6. No Additional N: In addition to in season soil sampling, the No N treatment will help determine the amount of N mineralised from the faba bean stubble and the efficiency of N uptake.
7. Additional PGR: Initial variety evaluation showed many of the durum wheats are prone to lodging. This treatment receives an extra PGR application (Moddus Evo) at full flag emergence.
8. Bread Wheat: Scout wheat has been sown to be able to compare the gross margins.

The trial was sown on June 1st, aiming at a population of 175 plants/m^2 or 144 kg/ha following a knockdown (about May 8th, including dicamba) and again on June 1st (2.0 l/ha Glyphosate 540 plus 100 ml/ha Goal).

Nitroguard applied July 16th in front of rain

Achieve (500 g/ha) plus Supercharge applied on July 21st

Vital (trace elements) applied August 31st

Moddus Evo (PGR 400 ml/ha) applied August 31st.

	Yield	kg N/t	kg N/ha required				
Durum	7.5	50	375				
N Supply			kg N/ha				
soil			101				
starter			20				
mineralised			125	Bio	late N	High N	Bread
topdress 1	<GS30	1/08/2017	40	0	40	60	40
topdress 2	GS32	31/08/2017	40	40	40	60	40
topdress 3	GS39		50	50	20	60	
topdress 4	GS55				80		

Table 2: Nitrogen treatments; timing and quantity (kg N/ha) for the ICC 2016 durum agronomy trial.

Figures are kg N/ha	Standard N	Late N	High N
Soil N	40	40	40
Mineralisation	100	100	100
Starter	20	20	20
TD1 19/07/2016	80	80	80
TD2 9/08/2016	80	50	80
TD3 29/08/2016	30	30	80
TD4 20/09/2016		80	
Fertiliser N (St + TD)	210	260	260
Total N	350	400	400

Target yield was 7 t/ha.

The yield and grain quality from the treatments applied to DBA Aurora is summarised in Table 3.

Table 3: Yield and grain quality from the ICC durum agronomy trial 2016

Treatment	Yield t/ha	Protein %	Scr %	Test Wt
Late N	7.59	14.3	0.8	82.5
Aurora Control	7.50	13.5	0.9	82.2
Trace Elements	7.48	13.4	0.8	83.5
High N	7.33	14.3	1.0	82.7
Moddus GS31 &39	6.55	14.5	0.9	82.6
p	0.580	0.026	0.810	0.612
lsd	NS	0.760	NS	NS
cv%	11.6	2.9	22.4	1.3

Conclusion

Durum wheat can be grown under irrigation, but the N requirement is quite high. Growing durum after a legume makes sense due to the N contribution of the stubble and the disease break. Erring on the side of "a bit extra" N is cheap insurance compared to missing out on durum spec and having the grain relegated to feed quality.

If irrigated pulses can be demonstrated to be both successful and profitable, it would give irrigators an alternative to fabas.

Useful resources

Irrigated Cropping Council Trial Results Summaries from the ICC website
www.irrigatedcroppingcouncil.com.au

"Durum wheat production", NSW DPI

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