

Managing crop growth and water use

This trial is funded by the GRDC and conducted in collaboration with Victor Sadras, SARDI, and Glenn McDonald from the University of Adelaide.

Key findings

- The highest yielding treatments were the early high nitrogen rate (2.80t/ha) or the high nitrogen rate (2.91t/ha)
- Treatments imposed to manipulate crop growth were unable to save more soil moisture for grain fill

Why do the trial?

Throughout southern Australia many trials have recently focussed on improving the retention of summer rainfall and have clearly shown that effective and early summer weed control can increase the retention of stored soil moisture. Previous research conducted at the Hart field site in 2009 and 2010 showed that soil cover i.e stubble, provided limited additional benefit.

The research also showed that additional stored moisture was more likely to be used early in the season to increase crop growth, rather than contributing towards grain fill.

The above average rainfall and cool summer conditions of 2011 built up a significant amount of stored soil moisture (40 to 60mm in many areas). This trial aimed to manage the crop canopy and conserve the stored soil moisture so that it might be saved for grain-fill, rather than being used to create early crop growth.

How was it done?

Plot size	1.4m x 10m	Fertiliser	DAP + Zn 2% @ 80kg/ha
Seeding date	30 th May 2012	Varieties	Gladius wheat @ 100kg/ha

The trial was a randomised block design with 10 treatments and 3 replicates (Table 1). The seeding equipment used was a knife-point press wheel system on 22.5cm (9") row spacings. The narrow row treatments were 11cm (4.5") row spacings and were made by sowing twice along the plot and using auto-steer to sow in between the previous sowing rows.

Table 1. Treatments and nitrogen fertiliser rates and timings for managing crop growth and water use at Hart in 2012.

Treatment	Nitrogen fertiliser (kg N/ha) timing			
	Sowing	24 th July (GS31)	23 rd August (GS33)	Total
Early variety - Axe	14	34	0	48
Mid variety - Mace	14	34	0	48
Late variety - Pugsley	14	34	0	48
Reduced seeding rate - 20% lower	14	34	0	48
Narrow row spacing	14	34	0	48
Growth regulant at GS30	14	34	0	48
Early high N	94	34	0	128
Split N	14	34	23	71
High N rate	14	80	46	140

42kg N/ha was applied to all treatments at 1st node (GS31) and 1 L/ha of chlormequat with 200ml/ha Moddus Evo plant growth regulator was applied at the beginning of stem elongation (GS30) to the growth regulant treatment.

Plant counts and head counts were conducted during the season and all plots were assessed for grain yield, protein, wheat screenings with a 2.0mm screen and barley screenings with a 2.2mm screen and retention with a 2.5mm screen.

Pre-sowing plant available soil moisture was 44mm to a depth of 90cm and soil nitrogen was 65kg N/ha.

Results

Plant numbers were 114 plants per square metre, with little difference between the treatments. The reduced seeding rate treatment had 100 plants per square metre. There was also no difference between treatments for head number, with the trial average being 253 heads per square metre.

The highest yielding treatments were the early high nitrogen rate (2.80t/ha) or the high nitrogen rate (2.91t/ha) (Table 2). Other treatments which performed well included Mace wheat (2.77t/ha) and the narrow row spacing treatment (2.76t/ha). The later maturing variety Pugsley was the lowest yielding variety (2.28t/ha), which is understandable given the quick finish to the season.

Grain protein was variable and generally lower with higher grain yields and later applications of nitrogen. There was little difference between treatments for test weight and screenings.

The wet 2011 harvest and 2012 summer provided an opportunity to reduce early crop growth and to conserve moisture for grain fill. None of the treatments used to manipulate the crop canopy positively influenced crop growth or grain yield.

Table 2. Grain yield and quality and resultant heads per square metre for canopy management treatments at Hart in 2012.

Treatment	Grain yield (t/ha)	Protein (%)	Test weight (kg/hL)	Screenings (%)	Head number (heads per sq m)
Early variety - Axe	2.39	13.1	78.7	0.4	243
Mid variety - Mace	2.77	11.0	79.4	0.7	298
Late variety - Puglsey	2.37	12.7	79.3	0.6	280
Reduced seed rate	2.62	10.9	80.1	0.7	224
Narrow row spacing	2.76	12.1	79.0	0.9	277
Growth regulant at GS30	2.58	11.1	79.4	0.6	247
Early high N	2.80	12.1	79.8	0.8	200
Split N	2.65	11.7	79.4	0.7	252
Late high N	2.72	10.9	79.7	0.6	243
High N rate	2.91	11.8	79.3	0.7	265
LSD (0.05)	0.14	0.86	0.35	ns	ns