Variety Specific AGRONOMY Packages

Durum Wheat and Barley Canopy Management, Hillston

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Modifying nitrogen application timing from a single up-front to a split (up-front and 1st node) application resulted in no significant variation in in yield or grain protein in this trial.

The three plant growth regulators tested affected time of plant maturity, plant height, lodging and grain yield.

The plant growth regulators applied at first node (DC31) maintained or increased yield compared to the untreated control, while Ethephon (applied at awn peep or DC49) decreased yield.

2007

The trial

The aim was to determine the influence of nitrogen timing and plant growth regulators on grain yield and quality of durum wheat and barley under a high yielding irrigated situation. The ability to manage crop canopy to reduce lodging and achieve grain quality targets was of particular interest.

Site details

Location: 'Wilga Glen' Hillston (irrigated).

Soil types: brown clay loam.

Rainfall: average annual 370 mm, growing season Apr-Oct 220 mm.

Management

The trial was in an irrigated field following corn in 2005/2006. The corn stubble was baled, disced and harrowed prior to sowing on 26 May with seed rate 100 kg/ha and 120 kg/ha Granulock 15.

Weeds were controlled in June with an application of MCPA LVE (800 ml/ha).

The trial was irrigated three times during the season (19 August, 20 September and 11 October) and harvested 29 November.

Treatments

Varieties: Two durum varieties (EGA Bellaroi[(b)], Jandaroi[(b)]) were chosen for their grain quality attributes which make them attractive to grow under high yielding irrigated situations. One barley variety (Schooner) was also added to the trial to highlight the effect on the plant growth regulators as it is very susceptible to lodging.

Nitrogen: A nitrogen budget was calculated to target 8 t/ha, with a single up-front or split application (Table 1).

Table 1 Nitrogen treatments.

Nitrogen treatment	Urea applied (kg/ha)		
	Pre-sowing	1st node	Heading
Up-front	450	130	45
Split	150	430	45

Plant growth regulators: Three plant growth regulators were applied at critical growth stages to observe their effect on plant height and lodging.

Table 2 Trial treatments.

			Plant growth regulator	
	Variety	Nitrogen	SYNEXP	Ethephon 720
1	Jandaroi	Up-front	Nil	Nil
2			Yes	Nil
3			Yes	Yes
4		Split	Nil	Nil
5			Yes	Nil
6			Yes	Yes
7	Bellaroi	Up-front	Nil	Nil
8			Yes	Nil
9			Yes	Yes
10		Split	Nil	Nil
11			Yes	Nil
12			Yes	Yes
13	Schooner	Up-front	Nil	Nil
14			Yes	Nil
15			Yes	Yes
16		Split	Nil	Nil
17			Yes	Nil
18			Yes	Yes

SYNEXP is two trial products applied as a tank mix at DC31
Ethephon 720 (500 ml/ha) at DC49

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Seasonal review

A good early start to the season allowed timely sowing, but unfortunately by August conditions became extremely dry. In total only 96 mm fell between April and October. This trial survived on stored subsoil moisture until the first irrigation, and was irrigated twice more to maintain and acceptable plant available water level (Figure 1).

Results

A number of effects were observed in the trial, as follows.

Impact of plant growth regulators on plant maturity

Maturity was delayed by applying a plant growth regulator at either DC31 or DC49 (Figure 2) by between 5 and 12 days. The delay was greatest in the barley.

Schooner barley with plant growth regulators applied (left) and the untreated control (right).

Bellaroi durum wheat untreated (left) and with plant growth regulator SYNEXP applied at DC31 and Ethephon at DC49 (right).

Impact of plant growth regulators on plant height:

Application of plant growth regulators reduced plant height as expected (Figure 3). The DC31 application reduced plant height quite significantly compared to the untreated control. However the plant 'bounced back' by increasing the peduncle (stem below the head) length, except when it was followed by an application of Ethephon at DC49 in which case plant height was reduced significantly. Barley height was reduced more than the durum wheat.

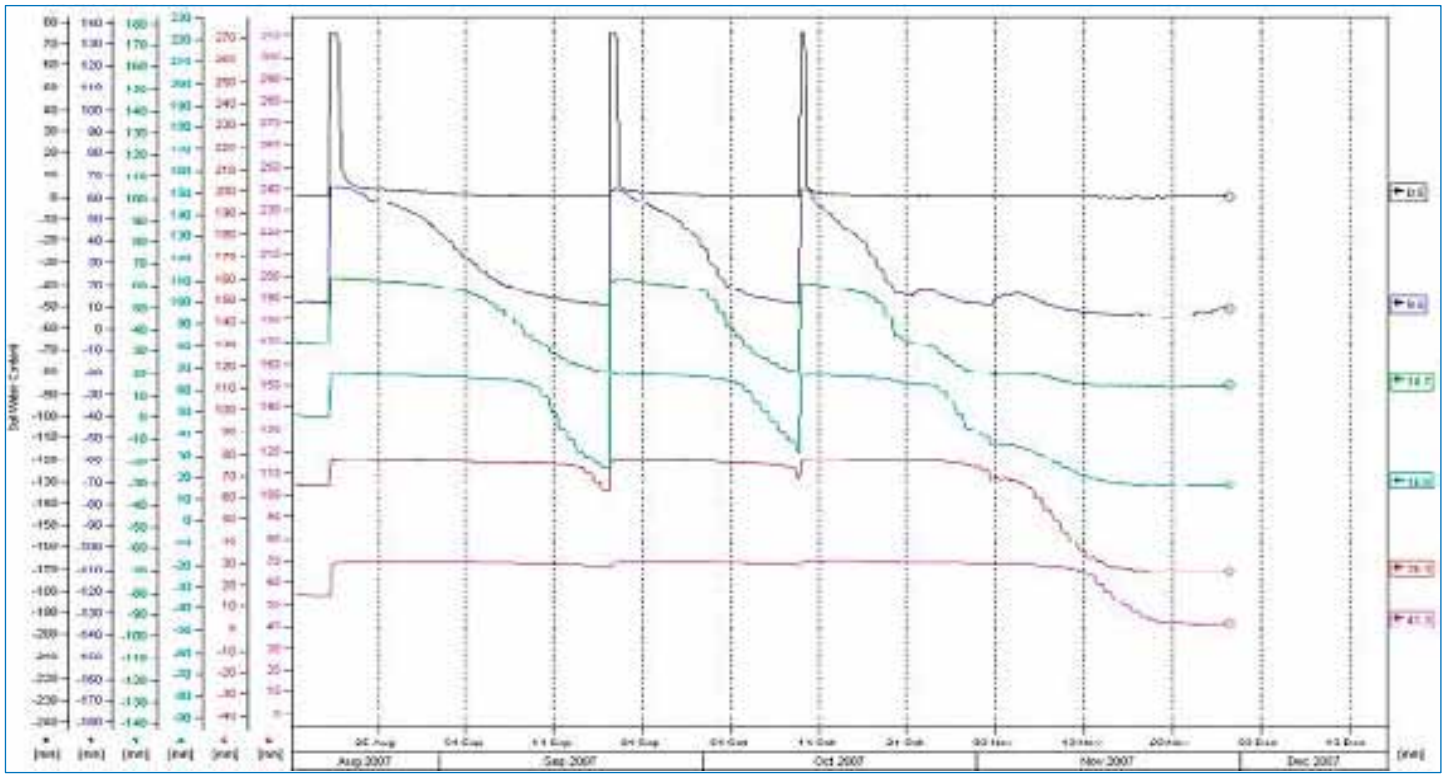

Figure 1 Enviroscan soil moisture readings for the trial paddock from just prior to the first irrigation,

Impact of plant growth regulators at DC 31 on yield: Yield of durum wheat was unaffected by applying SYNEXP at DC31 (Figure 4). This is likely because yield was not compromised by lodging in any of the wheat treatments. In barley however, yield was significantly higher (> 500 kg/ha) in the DC31 treatment compared to the untreated control (Figure 4). The control treatments lodged quite badly in the barley. However when the plant growth regulator was applied at DC31 lodging was reduced, resulting in an increase in yield.

Impact of plant growth regulators at DC49 (Ethephon) on yield: Application of Ethephon at DC49 significantly reduced yield compared to the controls in all barley treatments and in Jandaroi when N was applied at sowing (Figure 4). This highlights the risky impact that plant growth regulators can have on crop growth and yield. Yield loss was most severe in barley and has been well documented in previous trials. It was also observed that Ethephon caused leaf necrosis (death) following application, particularly to the flag leaf. There was no advantage of using Ethephon in this trial at the rate applied.

Impact of nitrogen timing on yield: Nitrogen timing treatments had no significant impact on grain yield or protein (Figure 4). Lodging was minimised in the *split* treatment, particularly in the barley. The high nutritional status of all treatments resulted in a 'very happy' trial, extremely high yield and minimal differences in yield between N treatments.

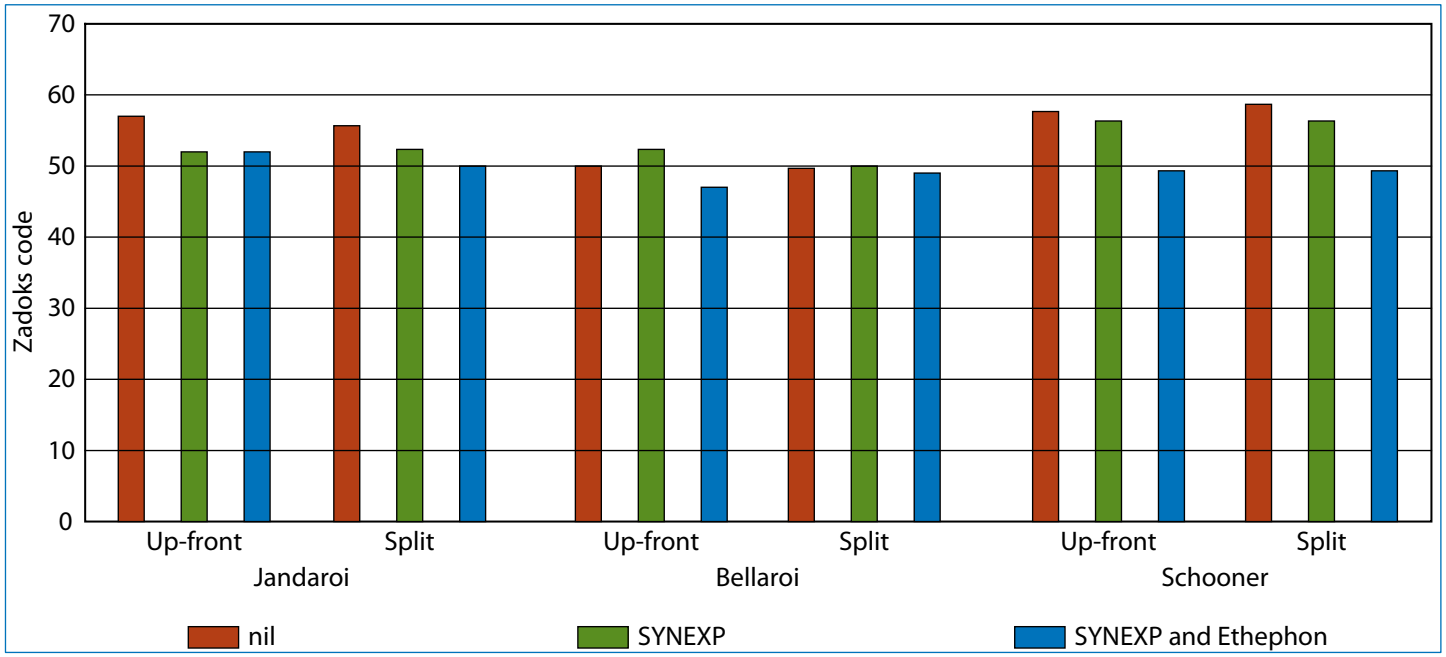

Figure 2 Effect of plant growth regulators on growth stage, 17 September.

Schooner barley showing the difference made by applying Ethephon plant growth regulator at DC49. The application missed the left hand row.

Plant growth regulators

Plant growth regulators are chemicals which are used in various crops to manipulate the production of certain hormones, in particular gibberellic acid (SYNEXP) and ethylene (Ethephon). These hormones are produced by the plant at particular growth stages, hence the timing of application of the two treatments in this trial.

By manipulating the amount of hormone produced by the crop, we can also change the plant height. By decreasing plant height we can reduce the amount of lodging, and also in some cases increase the water use ef ciency of that crop.

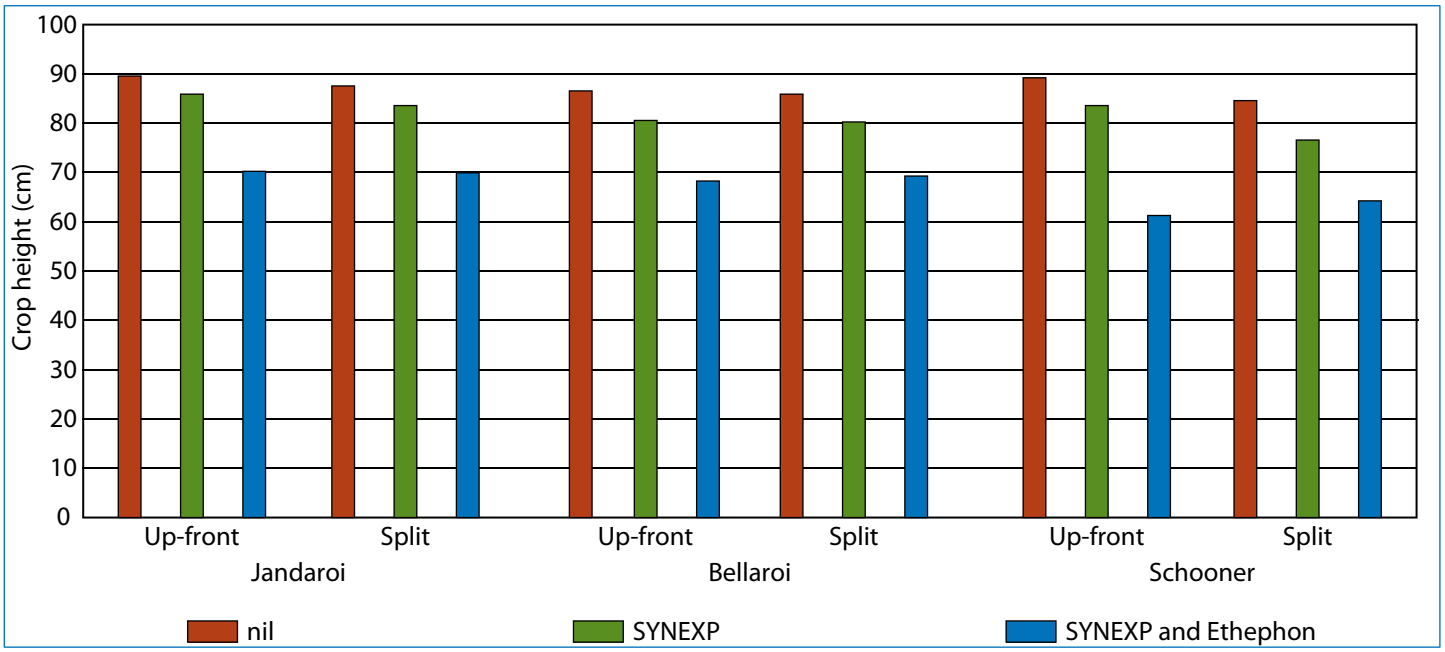

Figure 3 Effect of plant growth regulators on crop height, measured 3 October.

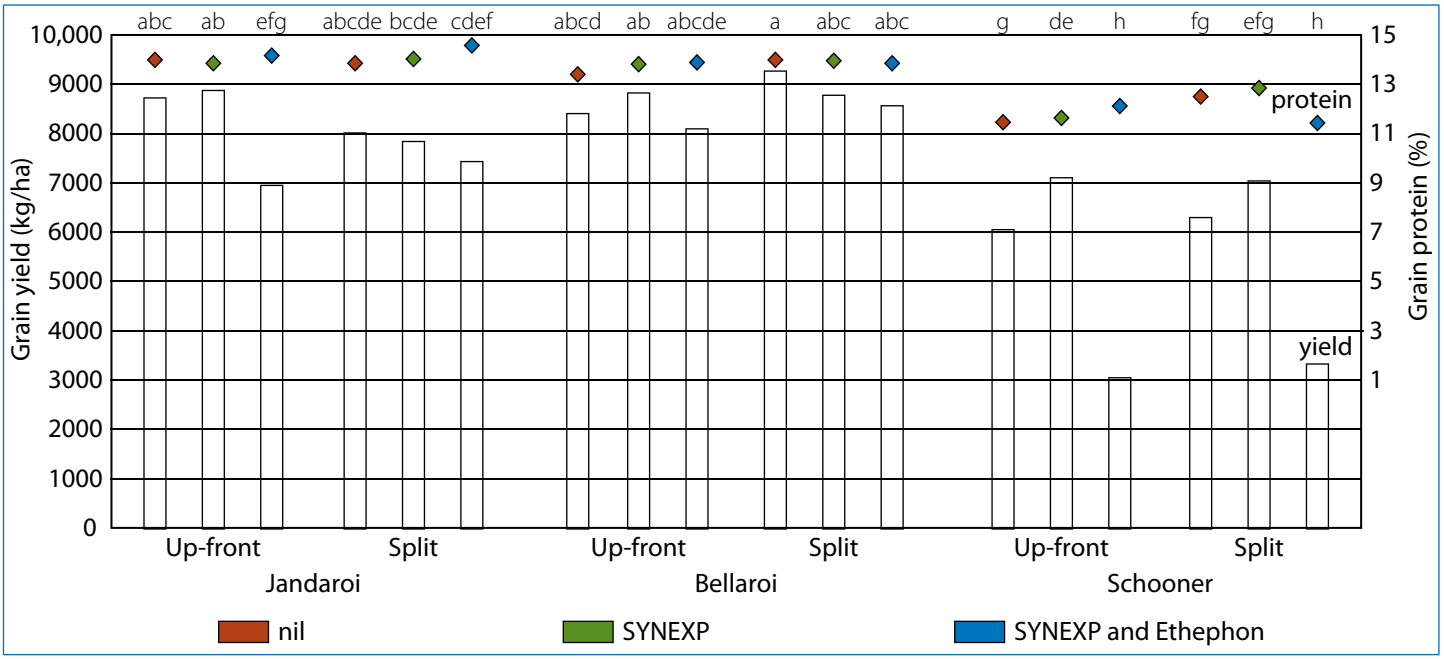

Figure 4 Effect of plant growth regulators and timing of nitrogen application on grain yield (bars) and protein (diamonds).

Letters along the top of the graph represent levels of significant difference in grain yield at 95% confidence. Yield values with the same letter are not significantly different.

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Further information: available from the project team agronomists at NSW DPI Wagga Wagga, Condobolin, Parkes, Hillston, Temora, Cowra and Moulamein.

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