

2.1.7 Grain yield of early sown wheat without grazing - Longford, Tas

Location:

“Woollen Park”, Longford, Tasmania

Author: Geoff Dean - SFS/TIAR

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Researchers:

Geoff Dean, Brett Davey - SFS/TIAR
Rob Howard - TIAR

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Background/Aim:

In the U.K. planting dates for grain-only wheat crops have progressively shifted back to September. i.e. comparable with March in Australia. This enables development of a vigorous plant root system entering winter and has the added advantage of removing moisture from the soil profile in Tasmania (in the past this was of benefit!).

Leaf disease and lodging are recognised problems with early sown crops. In Tasmania, potential problems with early sowing are reduced through grazing, but given the high grain yields overseas it would be informative to evaluate early sowing of a grain-only wheat crop. This is of particular relevance for early sowing in Tasmania, where the crop can be watered in a dry summer/autumn. The major limiting factors will be excess vegetative growth and greater disease pressure due to the longer growing season.

The objective of this study was to evaluate existing and future wheat varieties for performance when sown early (March) without grazing.

Take home messages:

- A replicated trial was conducted to compare grain yield from four winter wheat varieties: Mackellar, Tennant, Alberic and the soon to be released 95102.1.
- Yields ranged from 7.3 to 10.6 t/ha. Mackellar and Tennant were the lowest yielding varieties and also the most prone to lodging, in particular Mackellar. Mackellar being the earliest to flower also suffered the most frost damage.
- Alberic and 95102.1 yielded the highest and show the greatest potential for early sowing without grazing.

Trial information:

Varieties:

- Mackellar
- Tennant
- Alberic
- 95102.1

Growing season rainfall (Mar-Nov):

606 mm including irrigation

Mackellar is the most commonly grown dual purpose variety in Tasmania largely due to resistance to Barley Yellow Dwarf Virus (BYDV). Tennant is the old standard for winter wheat varieties but is still widely grown as it is later flowering than all other commercial varieties. Alberic is a relatively late flowering French variety as yet unreleased in Australia. It is not as late as Tennant but has a higher yield potential. 95102.1, a CSIRO line, has yielded exceptionally well in yield trials for 5 years and will be released in 2009-10. All varieties sown were winter wheats to avoid early flowering.

There were four replicates in a randomised complete block design. Harvested plot sizes were 8m x 1.5m wide.

The trial was sown under a centre pivot on 11th March with 9:13:17:4 fertiliser at 250kg/ha and followed an onion crop. Nitrogen was applied as a foliar spray (25kgN/ha) on 18th August with additional N topdressed on 29th August (70kgN/ha) and 10th October (70kgN/ha). Three fungicides were applied across the trial (7th August, 18th August and 16th October). The trial was harvested on 6th February 2009.

Results and discussion:

The season: The crop was watered up to assist in establishment. Autumn irrigations are by necessity low input in case water-logging in a wet winter is exacerbated. The risk was higher following of onions, with a reasonable soil moisture profile. With relatively mild conditions over autumn and early winter, growth was rapid and crop development relatively advanced. However with several cold snaps in winter the rate of crop development was reduced considerably. There was a very dry winter and but reasonable rains in September. With a dry October the site was irrigated. A -2.6°C frost occurred on October 23rd.

Table 1: Grain yields (t/ha) from early sown winter wheat trial, Longford, Tasmania, 2008-09.

Variety	Yield (t/ha)	Sig. Diff.	% Mackellar
Alberic	10.62	a	145.1
95102.1	10.57	a	144.5
Tennant	7.56	b	103.3
Mackellar	7.32	b	100.0
F prob	<0.001		
LSD P=0.05	0.939		
CV%	6.2		

Grain yields:

Alberic and 95102.1 were clearly higher yielding than Tennant and Mackellar (Table 1). Frost damage was evident in Mackellar plots with losses of up to 30% in several sections of plots. Although winter wheat requires vernalisation or prolonged exposure to a cold period to flower, early sowing, eg. March, still results in flowering up to 10 days earlier, the exact number of days being seasonal depending on when the cold period requirement is met. Without this vernalisation response flowering would be even earlier. Of the varieties in the trial, Mackellar was the earliest to flower and this was just after the October 23rd frost. Tennant, with a strong vernalisation response (possibly augmented by a day length response) flowered later and thus avoided the frost. Adjacent trial plots of Mackellar that had been cut or grazed also flowered later and showed negligible frost damage.

Alberic being 8 days later flowering than Mackellar only showed very minor effects from the frost, as did 95102.1. 95102.1 only flowers 3 - 4 days later than Mackellar and this difference can result in large variation in frost effects. Interestingly, however, in the dual purpose variety trial at "Oakdene" in 2006-07 most wheat germplasm suffered from frost damage at flowering, the exception being later flowering varieties. As in the current trial 95102.1 was not late flowering and yielded surprisingly high with consistently low scores in frost damage assessments.

Summary:

Both 95102.1 and Alberic have yielded consistently well in previous grain trials. 95102.1 also performs well in dual purpose trials whereas the dry matter production of Alberic is generally significantly lower than other winter wheats. The high yield of 95102.1 at this site is in contrast to the Symmons Plains grain-only site where BYDV was widespread and 95102.1 was above average yielding but not at the top. Lines with BYDV resistance, including Mackellar, were the stand-out lines at Symmons Plains.

95102.1 performed surprisingly well given it was only 3 – 4 days later flowering than Mackellar and may possibly possess some tolerance to frosts at flowering.

In the Trials Results booklet for 2005 it was noted that 95102.1 may have (limited) frost tolerance and the 2008-09 trial appears to add more weight to this idea.

The degree of lodging also influenced grain yields. Lodging in Mackellar commenced as early as July in some plots and steadily worsened. While there was also extensive lodging in Tennant and to a lesser extent 95102.1, this did not commence until much later in the season and so would have had less effect on grain yield. The minor lodging in Alberic suggests that the CSIRO material (and Australian material in general) is not as suited for early sowing as overseas material. This is not surprising given that in trials in Australia the selection pressure for resistance to lodging is generally far less intense than in Europe. While plant growth regulators could have been applied to shorten plant height and strengthen stems, this was in fact a treatment in the adjacent canopy management project. There has not been sufficient time to process and analyse this data. Similarly there has been insufficient time to report on trials examining the effect of timing of cutting on subsequent yields.

With the imminent release of 95102.1 this variety will be used in future early sown trials instead of Mackellar. Alberic has been a consistent high yielder but has tended to be over-shadowed by 95102.1. Tennant has a lower yield potential than the other varieties but its strong vernalisation requirement and late flowering can be a valuable asset with very early sown dual purpose crops (before March).

Future breeding work should target a later flowering variety with similar flowering date to Tennant, improved stem strength and possibly studies to determine whether 95102.1 does possess some cold tolerance at flowering.