7.7 Effect of Fodder Cuts on Grain Yield of Early Sown Wheat and Triticale – Perth Tasmania

Location: "Oakdene", Perth, Tasmania

Researchers: Geoff Dean SFS
Simon Munford DPIW
Brett Davey SFS

Acknowledgments: Bill Chilvers, Rob Bradley

Growing season rainfall (April-Nov): 385 mm including 120 mm irrigation

Summary:
Responses to cutting treatments in Mackellar wheat and Breakwell triticale were examined in an early sowing (March). Frost damage was severe and both uncut treatments produced significantly lower grain yields being at mid flowering (Breakwell) and late ear emergence (Mackellar) at the time of the frosts. Grain yields did not tend to correlate with the number of ears per m^2 or grain weight. However for both varieties the higher yields of cut treatments related to the number of grains per ear.
The grain yield of the cut Breakwell plots was significantly higher than that of Mackellar –it appeared to be more delayed by early cutting than Mackellar and consequently avoided some of the frost damage. The higher yield was a result of more grains surviving per ear and the potential to produce larger seed.
A fodder harvest of Breakwell and Mackellar sub-plots at the soft dough stage produced 22.9 and 19.4 t/ha of dry matter respectively and there is obvious potential for silage production.

Background:
With early sowing dates in the UK excess vegetative growth is controlled by lower plant population and where necessary, reduced nitrogen inputs early in the life of the crop. In the high rainfall areas of Australia excess growth can be controlled through grazing. There has been little work conducted in Australia to quantify the effects of grazing (cutting) on subsequent grain yield of early sown wheat and triticale. The potential of early sown wheat and triticale for production of silage was also assessed.

Method:
Varieties: Mackellar wheat, Breakwell triticale

Treatments: March sown -uncut and cut

The trial was sown under a centre pivot and there were four replicates in randomised complete blocks with buffer plots to separate the different cereals and cutting treatments. The trial was sown on 14th March 2006 with 9:16:10 fertiliser at 250kg/ha and followed a poppy crop. Initial dry matter cuts were taken on 31st May with a second cut on 31st July. Nitrogen (50kgN) was top-dressed on 31st August and a further 50kgN was applied to uncut plots (22nd September) and cut plots (11th October). Two fungicides were applied (24th August and 21st September) and an aphicide on 13th September.

At soft dough stage, $2.4m^2$ of plot was cut from each of the previously uncut wheat and triticale plots to assess the potential for silage/hay. Edge rows were excluded from the cut to remove edge effects. Prior to grain harvest, samples were hand harvested from all plots to compare yield components. Grain from the rest of each plot was machine harvested on 24th January 2006.

Results and Discussion:
Growth and dry matter: With irrigation and rain in March and April, establishment was good. Despite early growth being reduced by the cold and frosty May-July period, growth over late winter and early spring was reasonably good. Potential disease was controlled with the two fungicide sprays.

The Mackellar and Breakwell plots cut for grazing estimates yielded a total of 2.26 and 2.62 t/ha of dry matter respectively. From past trials, cutting at a height of 50mm, as for wheat, has been too low for triticale, resulting in loss of tillers. Consequently Breakwell plots were cut at 70 mm which is more in line with commercial practice where grazing of triticale has occurred. Total dry matter production would therefore have been higher than indicated for Breakwell.

The silage cuts of Breakwell and Mackellar were impressive with obvious potential for silage production (Table 1). Breakwell produced significantly higher dry matter than Mackellar and this compares favourably with 21.6 t/ha for Breakwell in 2005-06. Due to the extensive frost damage and lack of developing grain it was considered that the silage cuts could be delayed until soft dough stage to increase dry matter without adversely affecting quality. This was not the case for the triticale and the samples tested at FeedTest, Hamilton were low in feed value, particularly crude protein. The time of cutting should therefore not be delayed beyond late milky dough stage for Breakwell even with frost damage. FeedTest values from 2005-06 are also presented in Table 1 for comparison.

Table 1. Dry matter production and feed quality of early sown wheat (Mackellar) and triticale (Breakwell) cut for silage at Perth, 2006-07 (Data in parenthesis is for Breakwell in 2005-06).

Variety	Dry matter production (t/ha)	Crude Protein (%)	Dry matter digestibility (%)	Metabolis-able energy (MJ/kg DM)	Neutral detergent fibre (%)
Mackellar	19.4	7.2	61.7	9.0	46.8
Breakwell	22.9 (21.6)	5.9 (7.2)	60.2 (63.4)	8.7 (9.3)	49.6 (47.2)
l.s.d. (0.05)	*2.72*				
cv%	*5.7*				

The silage DM values appear high compared with what was actually cut from commercial paddocks of Mackellar nearby i.e. a maximum of 12 t/ha. However the trial figures are from March sown plots that were not previously cut or grazed. Further paddock cuts were taken after the commercial hay/silage had been removed to determine the quantity being left after baling. Generally the paddocks were quite bare with only short stems and most of the dry matter remaining had been left in the windrows. This amount was still not high (average around 1.5 - 2 t DM/ha) except where there were windrows in the furrows of raised beds but even here remaining hay was less than 3 t/ha across the paddock.

Grain yield: Grain yield data reflects the degree of frost damage around the time of flowering (Table 2). Uncut treatments of each variety were the most affected being at mid flowering (Breakwell) and late ear emergence (Mackellar). The grain yield of the cut Breakwell plots was significantly higher than that of Mackellar –it appeared to be more delayed by early cutting than Mackellar.

Grain yields did not tend to correlate with the number of ears/m^2 or grain weight. However for both varieties there were significantly higher (around 230%) grains/ear when plots were cut i.e. the greatest effect of the frost damage was in reducing the number of grains

presumably by damaging the reproductive organs in the developing floret. Grain weights were actually relatively high with plants attempting some compensation later in the growing season.

The 1000 grain weight of the uncut Breakwell was significantly lower than for cut plots suggesting that the less developed grains in the uncut plots were more affected by the mid November frost compared with the more advanced uncut treatment. Mackellar tended to show the opposite of this effect but this was not significant. This was possibly due to greater moisture utilisation (more tillers). The lower soil moisture content measured in soil cores from uncut Mackellar plots tended to show this.

Table 2. Effect of cutting of early sown wheat (Mackellar) and triticale (Breakwell) on grain yield and yield components at Perth, 2006-07.

Variety	Cutting treatment	Yield (t/ha)	No. ears/m^2	No. grains /ear	1000 grain wt (g)
Mackellar	uncut	0.65	875	1.83	40.4
	cut	1.14	667	4.10	43.2
Breakwell	uncut	0.67	481	2.88	57.6
	cut	1.62	456	6.64	54.0
l.s.d. (0.05)		*0.375*	*140.7*	*1.573*	*2.99*
cv%		*23.0*	*14.2*	*25.0*	*3.8*

Not surprisingly Mackellar produced significantly more ears/m^2 and Breakwell a higher grain weight. For Breakwell the greater number of surviving grains in each ear may be a function of the larger ears. The higher yield of Breakwell was a result of more grains developing/surviving per ear and the potential for larger seed. Again the significantly higher number of ears in Mackellar plots may have reduced soil moisture to a greater extent.

Obviously the data from the trial is biased by the degree of frost damage and needs to be repeated. There is a reduced chance of frosts occurring in November and with the extensive damage caused by frosts at flowering in October, later flowering varieties are required for early sowing, particularly if grazing is not planned.

Further details: Geoff Dean, SFS, Ph: 03 6336 5233, Geoff.Dean@dpiw.tas.gov.au