IRRIGATION RESEARCH & EXTENSION COMMITTEE

2006

Grains Research UPDATE GRDC

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Grazing management and the yield of winter wheat in southern NSW – experiments in 2004 and 2005

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Take Home Messages:

- Grazing delays flowering in winter wheat. Other studies have also been completed recently and similar results have been obtained. This has implications for breeders and the conditions under which new cultivars are developed. Likewise there are implications for time of sowing.
- Grazing can be imposed at high stocking rates to increase utilisation considerably over what was traditionally recommended. In cases where high stocking rates combined with a long grazing period (~ 6 weeks) have been imposed, yield has been depressed by 1-2 t/ha. Simple economic analyses show that losses associated with this decrease in grain yield can be outweighed by the income generated from liveweight gain.
- Grazing reduced the number of grains produced per m2 but did not seem to affect the grain size. While this may hold for the two years of experimentation at Cookardinia, it is not a generalisation that could be extended to other environments/seasons. The comparatively wet springs at that site in 2004 and 2005 probably explain the absence of any effect on grain size. In drier environments/seasons it is possible that grazing could defer water use to later in the season compared to ungrazed crops and this could give rise to variation in grain size.

Traditional advice regarding the grazing management of winter wheat has emphasised brief periods of grazing, so as to leave comparatively high residual biomass. Up until recently there has been little data available on the yield response of winter wheat to grazing. However, experimental results from the past two seasons have shown that heavily grazed winter wheat (cultivar EGA Wedgetail, in particular) can achieve acceptable yield while providing valuable feed during July and August. To explore the relationship between yield and the length and intensity of grazing a series of experiments at sites in southern NSW were carried out over 2004 and 2005. The key question being addressed was: what, if any, is the trade-off between grain production and grazing intensity? To impose different levels of grazing “intensity” both the length of grazing period and the stocking rates were varied.

2004 experiment

Location: Cookardinia

Seasonal rainfall: Jan-April: 44 mm; May to November: 304 mm

Sowing: Sown on 25th April with 125kg/ha of MAP using maxi points and press wheels at 30 cm row spacings into partially burnt canola stubble.

Cultivar: EGA Wedgetail

Design: 6 treatments: Ungrazed, or grazed for various lengths of time as in Table 1. Grazing pressure was varied to achieve relatively similar residual biomass for each treatment. Hence, the cumulative stocking rate expressed in DSE.days is also presented in Table 1.

Table 1 Summary of grazing treatments. Grazing commenced on 6th July.

Treatment	Number of grazing days	Grazing intensity (DSE.days/ha)	Dry matter at end of grazing (t/ha)	Sowing to flowering (days)	Anthesis dry matter (t/ha)	Yield (t/ha)
1	0	0	-	170	11.3	5.9
2	15	570	6.6	171	11.1	6.0
3	26	988	6.7	175	9.0	4.9
4	37	1072	5.4	175	9.0	4.8
5	45	1297	6.6	178	8.6	4.7
6	55	1522	4.2	181	7.2	3.9
LSD (5%)			1.7	1.2	0.6	0.3

Although the residual dry matter left after grazing differed significantly between treatments, the differences were comparatively small (Table 1). As a consequence, the results reflect more the effects of the length of the grazing period rather than severity. Overall there were two notable results. Firstly, grazing delayed flowering considerably, by up to 11 days (Table 1) for the treatment with the longest grazing period. The number of developing ears that were consumed was also measured. Only for the longest grazing treatment (6) was ear removal apparent, at a level of 8%. Secondly, there was a negative relationship between the length of grazing period and yield with the ungrazed treatment achieving a yield of 5.9 t/ha. When broken down into components, it is clear that the major effect of grazing was on the number of grains produced (per unit area), not the size of the grain. Late rains in the season at this site probably ensured that the crop was able to fill grains to near potential size with a low percentage of screenings.

2005 Experiments: Cookardinia and Wallendbeen

Two experiments carried out in 2005 on the Wedgetail cultivar were identical in design and but located at different sites (Holbrook and Wallendbeen). The site details including time of sowing, fertiliser use, etc. can be found in Table 2

Table 2. Site and sowing details for Cookardinia and Wallendbeen. The experiments were carried out in paddocks that had been sown by farmers under normal commercial conditions.

	Cookardinia	**Wallendbeen**
Sowing date	April 25	March 17
Sowing Rate (kg/ha)	80	80
Fertiliser (kg/ha)	125 (MAP)	100 (MAP + Impact)
Other sowing info.	30 cm row spacing, direct drill	22 cm row spacing, direct drill
Stock used	Wethers (~ 45 kg)	Weaners (~40 kg)
Rainfall Jan. to sowing (mm)	163	138
In-crop rainfall (mm)	452	529
Soil Type	Red Sodosol	Red Kandosol

The experiment consisted of five grazing treatments each replicated four times. The grazing treatments were: ungrazed and grazed for short periods (3-4 weeks) at high (high/early) or low (low/early) intensity or grazed for a longer period (~ 6 weeks) at a high (high/late) or a low (low/late) intensity. The grazing treatments and some relevant data are presented in Table 3.

Table 3: Details of the grazing experiments and Cookardinia (CK) and Wallendbeen (WB) and key results. Note that grazing commenced on 12 July at Cookardinia and 11 July at Wallendbeen.

Site	Treatment	Grazing duration (days)	Stocking rate (DSE/ha)	DSE.days/ha	DM at end of grazing (kg/ha)	Delay in flowering (days)	Yield (t/ha)
CK	*ungrazed*	0	0	0	-	-	5.8[a]
	low/early	21	17	365	1.6	2	5.8[a]
	high/early	21	29	599	0.7	4	5.8[a]
	low/late	41	17	713	1.2	6	5.4[b]
	high/late	41	29	1169	0.2	13	5.0[c]
WB	*ungrazed*	0	0	0	-	-	3.2[b]
	low/early	28	17	465	2.5	7	3.8[a]
	high/early	28	31	855	1.0	9	3.9[a]
	low/late	43	18	757	2.0	9	3.1[b]
	high/late	43	33	1412	0.72	16	2.3[c]

As with the earlier 2004 experiment, grazing delayed flowering considerably in both experiments (Table 3). Flowering was delayed by 13 and 16 days at Cookardinia and Wallendbeen, respectively in the ***high/late*** grazing treatment. Further analysis showed a negative (linear) relationship between delay in flowering and grazing intensity. Consumption of heads was only apparent in the ***high/late*** treatment at Cookardinia (< 3%) and was not measured at Wallendbeen. At the Cookardinia site, yield declined with longer grazing (more so at high intensity) but was unaffected by the shorter grazing period. At Wallendbeen yields were disappointingly low due to take-all, stripe rust and wheat streak mosaic virus. Nonetheless, yields were highest when the crop was grazed for a brief period and declined markedly when grazed late at either high or low intensity (Table 3).

Further analysis from the Cookardinia site has also shown that there was no significant effect of grazing treatment on grain size, as in 2004. Hence, the component most closely related to yield was grain number (per m^2). This indicated that the decrease in leaf area was translated into lower yield via either fewer grains per ear and/or fewer ears per m^2.

Acknowledgements

We would like to thank our farmer co-operators, Stuart and Phillip Hulme and Ken Jacobs. The work presented here was supported by Grain and Graze (Murrumbidgee), the GRDC project DAV00061 and FarmLink Research.