THE EFFECT OF FEED ON OFFER DURING SPRING ON LIVEWEIGHT CHANGE IN MERINO WETHERS OF DIFFERENT AGES

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SUMMARY

Merino wethers, aged 1 or 3 years old, were grazed on annual pastures maintained at different amounts of feed on offer (FOO) (800, 1200, 1600, 2000, 2400 and 2800 kg DM/ha) during spring. Over the first 42 days, liveweight decreased ($P < 0.05$) as FOO decreased for both ages of sheep. At low FOO, weaners lost less ($P < 0.05$) weight than adults (-183 vs -268 g/day at 800 kg DM/ha) during this period. However, for the next 70 days, the effects of FOO on liveweight change were not significant within classes of sheep, although weaners gained more ($P < 0.05$) weight than adults. Less ($P < 0.05$) greasy wool was produced on low FOO plots for both weaner (4.44 vs 5.61 kg for 800 kg DM/ha vs average of other FOO treatments) and adult (5.38 vs 6.41 kg) sheep.
Keywords: spring pastures, sheep, age, liveweight.

INTRODUCTION

In Western Australia about 50% of the annual wool growth occurs in the 4 months of August to November when sheep graze annual pastures (Purser and Southey 1984). The growth rate and fibre diameter of wool at this time are greater than those in the summer-autumn and winter periods. Thompson *et al.* (1994) used stocking rate during spring to reduce wool production by adult sheep in this period. However, because of differences in pasture growth rate during spring in any year, and between spring of different years, any selected stocking rate will have varying effects on wool production during that season.

Feed intake is the major determinant of liveweight change (LWC) and wool growth rate in sheep grazing green pasture and is the product of bite size, rate of biting and grazing time. Intake is also affected by sward characteristics and feed on offer (FOO). Allden and Whittaker (1970) showed a marked decline in intake when FOO decreased from 3000 to 500 kg DM/ha. As FOO declined, sheep partially compensated by increasing grazing time.

The higher maintenance energy requirements per unit metabolic liveweight of young compared to adult animals may drive them to eat more feed per unit metabolic liveweight by prolonging the grazing period. However, adult sheep require more energy *per* se to maintain liveweight; therefore, low FOO may have a greater affect on LWC and wool growth in adult animals.

This experiment examined the effect of FOO in spring on LWC and wool production in young and adult sheep, because the responses are likely to be different due to differences in eating behaviour and energy requirements.

MATERIALS AND METHODS

The experiment was conducted at Mount Barker Research Station (34°38'S, 117°32'E) during 1991. The climate is characteristically Mediterranean with a 24-year average rainfall of 669 mm, the *majority* (75%) of which falls between May and November.

In 1990, the site had been used in a grazing experiment (Thompson *et al.* 1994) and was described in that report. The pasture was fertilized with 120 kg/ha of superphosphate (9.1% phosphorus, 10.5% sulfur) in autumn 1991.

A randomised complete block design was used, with 2 replicates of 6 amounts of FOO, and 2 age groups of sheep. One block was on low stocking rate plots (8 and 16 adult wethers/ha) from 1990, but the 1.0 ha plots were subdivided to 0.5 ha for the current experiment. The second block involved areas grazed at 24, 32, 40 or 48 adult wethers/ha in 1990. Grazing treatments were allocated at random to the plots within blocks.

Over the 5 weeks before the start of the experiment (5 August 1991; day 1), non-experimental sheep (hereafter termed mouths) were used to achieve the target FOO (800, 1200, 1600, 2000, 2400 and 2800 kg DM/ha) for each plot. These mouths were used throughout the experiment to adjust sheep numbers in each plot to maintain FOO. Adjustments were based on weekly FOO measurements and anticipated pasture growth rates for the following week. Treatments ceased on day 112 when a dry spell of 14 days indicated pastures would stop growing.

The pastures comprised about 70% subterranean clover and 25% annual grass on day 1, but ranged (low to high FOO, clover: 75-64%; grass 24-35%) by day 91. Green FOO for each plot was assessed weekly from day -35 by visual appraisal (Thompson *et al.* 1994). The calibration cuts were made at ground level using a scalpel, the harvested material was sorted to remove any detached dead material, washed and dried at 60°C. The dry matter digestibility of green FOO ranged from 78% on day 1 to 67% on day 98. These values reflect the quality of material on offer and not of the diet selected.

Experimental weaner (n = 96, l-year-old, liveweight (LW, mean ± sem) 38.3 ± 0.08 kg) and adult (n = 96, 3-years-old, LW 62.0 ± 0.30 kg) wethers were stratified on a LW basis and randomly allocated to plots (n = 8 per plot). For 161 days before the experiment started and for 99 days after the experiment was completed, all experimental sheep grazed together. They were drenched with Ivomec® prior to the experiment, then monitored for internal parasites every 4-6 weeks, and were crutched on day 64.

Experimental sheep were weighed fortnightly during the experiment, commencing around 0900 hours providing the sheep were dry. Two periods (period 1, days l-42; period 2, days 42-112) where the change in LW over time was linear were evident at lower FOO for both weaner and adult sheep. Rate of LW change (including wool) for these periods was calculated by regression analysis. Total weight of greasy wool (TGW; fleece, belly and locks) produced between shearing dates (25 February 1991 to 3 March 1992, 372 days) was measured for individual animals.

Effects of grazing treatment on LW, LWC and TGW were tested by analysis of variance of a block design with main effects of FOO and sheep age. Univariate repeated measures analysis was used to include the effects of time on LW.

RESULTS

Average FOO did not differ significantly from the planned targets in either period (Figure 1).

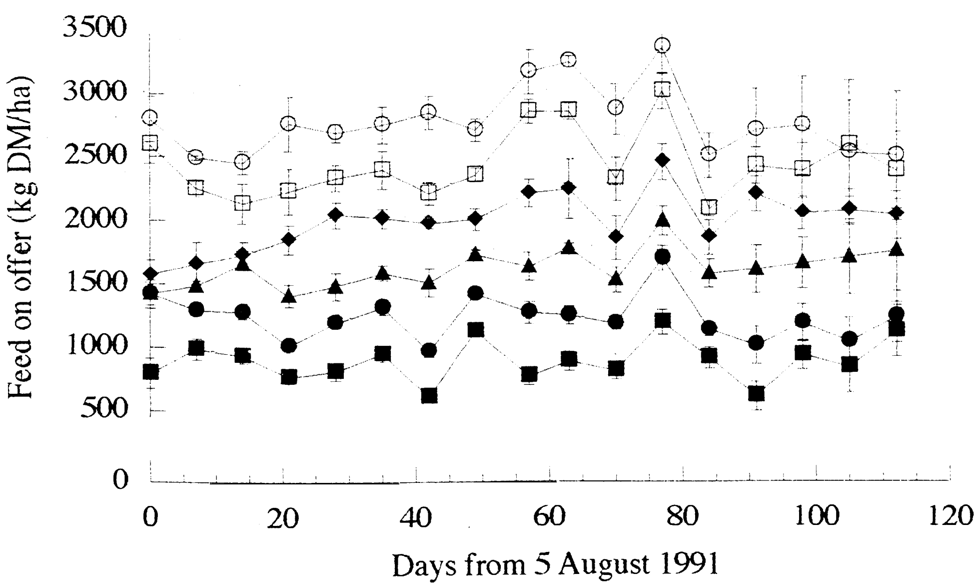

Figure 1. Changes in feed on offer (FOO, kg DM/ha) between days 1 and 112. Bars are the standard error of the mean for the 4 plots grazed to each FOO (800 - closed squares; 1200 - closed circles; 1600 - closed triangles; 2000 - closed diamonds; 2400 - open squares; 2800 - open circles)

The lowest FOO (800 kg DM/ha) caused decreases ($P < 0.05$) in liveweight compared to the 2800 kg DM/ha treatment for both weaner (38.6 kg to 30.9 kg) and adult sheep (61.1 kg to 49.7 kg) during period 1 (Figure 2). For weaners, LW did not change significantly in period 1 at 1200 and 1600 kg DM/ha, while it increased ($P < 0.05$) at 2000, 2400 and 2800 kg DM/ha. During this period, LW in adult sheep decreased ($P < 0.05$) at 1200 kg DM/ha, did not change significantly at 1600, 2000 and 2800 kg DM/ha, and increased ($P < 0.05$) at 2400 kg DM/ha.

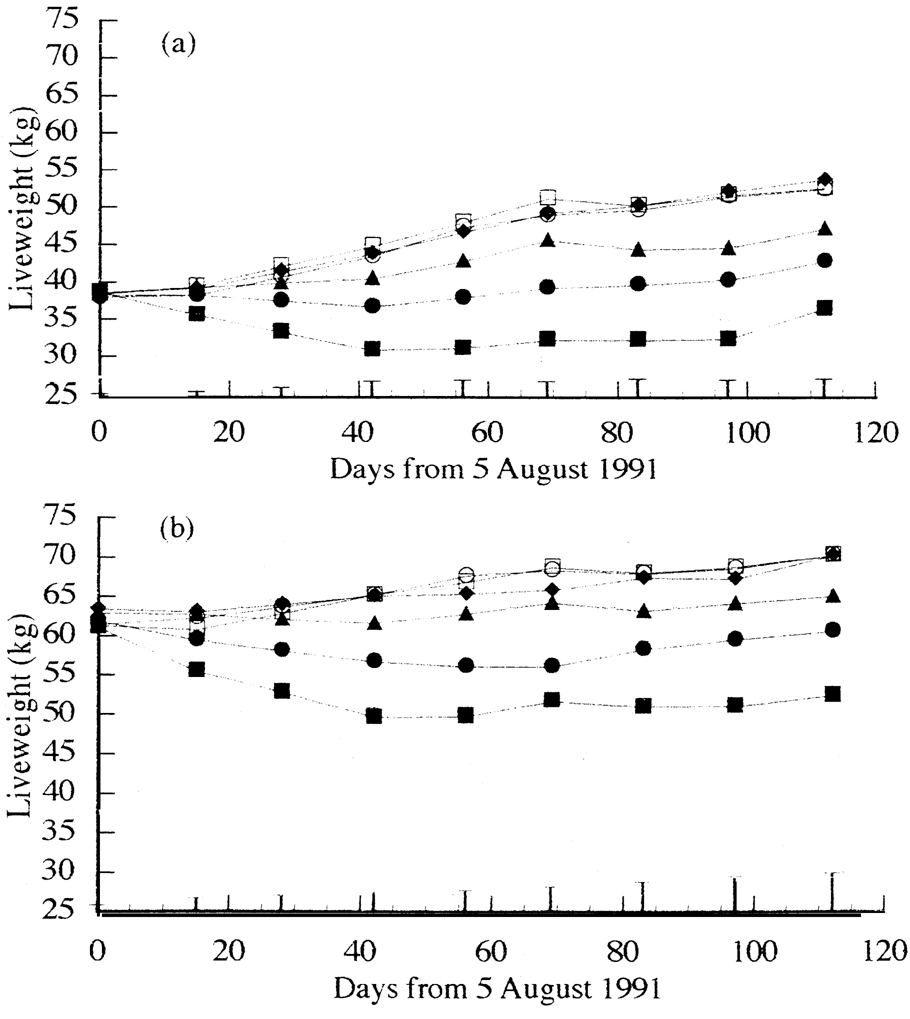

Figure 2. Liveweights of weaner (a) and adult (b) sheep grazing pastures maintained at different amounts of feed on offer (kg DM/ha) (800 - closed squares; 1200 - closed circles; 1600 - closed triangles; 2000 - closed diamonds; 2400 - open squares; 2800 - open circles) during spring

There were significant effects of FOO ($P < 0.05$) on LWC in period 1, but not in period 2 (Table 1). The relationships between FOO (kg DM/ha) and LWC (g/day) in period 1 were described by the equations:

Weaners: $LWC = -730.2 + 0.77\ FOO - 1.68 \times 10^{-4}\ FOO^2$ ($n = 12$, $r = 0.96$, $P < 0.001$, RSD = 41.4).
Adults: $LWC = -702.8 + 0.65\ FOO - 1.32 \times 10^{-4}\ FOO^2$ ($n = 12$, $r = 0.97$, $P < 0.001$, RSD = 36.2).

There were significant effects ($P<0.05$-0.01) of age on LWC, with weaners losing less weight in period 1, and gaining more weight in period 2, than adult sheep at any FOO. The FOO level x age interaction was not significant. There were no significant effects of blocks on LWC in either period.

Total greasy wool was less ($P < 0.05$) at 800 kg DM/ha than f-or other FOO treatments for both classes of sheep (Table 2). For weaners, the only other significant difference was that at 1200 kg DM/ha, TGW was less ($P < 0.05$) than at 2400 kg DM/ha. For adult sheep, TGW from 1600 kg DM/ha and above did not differ significantly. There was no significant block effect on TGW.

Table 1. Average liveweight change (LWC, g/day, uncorrected for wool growth) between days 1-42 (period 1) and days 42-112 (period 2) in weaner and adult sheep on pastures providing different amounts of food on offer (FOO, kg DM/ha)

	Period 1		Period 2	
Target FOO	Weaner	Adult	Weaner	Adult
800	-183	-268	66	38
1200	-32	-122	79	68
1600	47	-34	78	43
2000	133	41	139	70
2400	161	98	101	64
2800	128	91	122	58
s.e.d.	48.2		38.0	

Table 2. Total greasy wool production (kg) for weaner and adult sheep grazed at different feed on offer (FOO) through spring

	FOO (kg DM/ha)						
	800	1200	1600	2000	2400	2800	s.e.d.
Weaner	4.44	5.33	5.72	5.54	5.98	5.60	0.241
Adult	5.35	5.70	6.54	6.68	6.70	6.45	0.313

DISCUSSION

The differences in LWC responses to FOO between periods 1 and 2 of this experiment indicate there may be an adaptation period to pasture availability or that the pasture conditions between the 2 periods differed. Changes in LW over time in period 1 indicate that any adaptation to pasture conditions was quite short (about 2 weeks) at high FOO, but may be up to 6 weeks at low FOO. Alternatively, the pasture conditions in the 2 periods differed. Pasture growth rates, pasture composition and plant density were not significantly different in the 2 periods (Thompson, A.N. unpubl. data), while the quality and amount of feed consumed were not measured.

The energy requirements necessary to maintain the initial LW of the weaner sheep would be lower than those for adults. This is reflected in the fact that weaner LW was maintained at a lower FOO (1200 vs 1600 kg DM/ha) than for adults in period 1. Pasture intake rate decreases when sheep graze short dense compared to tall sparse pastures (Black and Kenney 1984), and are only partially able to compensate by increased grazing time (Allden and Whittaker 1970). The reasons why significant effects of FOO on LWC did not occur in period 2 of our experiment need to be identified.

These results and those of Thompson *et al.* (1994) indicate that restricting the availability of annual pasture during spring may reduce LW gains and wool production. However, relationships between FOO and sheep performance are not simple and will be influenced by pasture growth rate, sward structure or growth habit and differences in quality of the pasture consumed late in spring.

Liveweight changes of young sheep were superior to those of adults in this experiment and the effects on clean wool growth rates during the treatment period are being evaluated.

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