

VARIATION BETWEEN SHEEP AND OVER TIME IN THE INTAKE OF LUPIN OR OAT SUPPLEMENTS

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SUMMARY

The intake of lupin or oat grain fed twice weekly at (air dry) 100 or 120 g/sheep.day respectively, was measured in weaner and adult sheep at 3 times during summer-autumn using lithium chloride as a marker. The feeding rates for each grain provided similar amounts of digestible dry matter (DDM). In December, adult sheep consumed more grain than weaners due largely to poor acceptance of oats by the weaner sheep early in summer. The standard deviation of intake of DDM from grain was used as a measure of variability in supplement intake. It did not change between measurement times (December, February, March), was not different for weaner and adult sheep for the February and March measurements, but was lower for oats than for lupins over these last 2 measurement times. The large variation in intake between individuals within a flock has important implications for feeding strategies designed to improve wool characteristics, such as staple strength.

Keywords: intake, lupins, oats, weaners, adults.

INTRODUCTION

In summer-autumn in south-west Western Australia, sheep are offered grain supplements to compensate for the low quality and quantity of the dry pastures they graze. However, intake of grain supplements varies markedly between sheep within a flock (Lobato *et al.* 1980; Holst *et al.* 1994). Despite this, grain supplements are used effectively for survival of sheep through this period when nutrient supply from pastures can be limiting.

Staple strength (SS) is emerging as an important price determinant of fleece wool, and it varies markedly between sheep within a flock. For spring shorn sheep in medium to high rainfall environments, it may be necessary to commence feeding small amounts of grain from the time of permanent clover wilting to maintain SS above 30 N/ktex (Thompson and Curtis 1990). It is currently recommended that sheep shorn in spring be supplemented to maintain wool-free liveweight through summer-autumn (Doyle *et al.* 1994). Under these circumstances, variability in intake between individuals may affect the effectiveness of supplementation programs to improve SS.

We measured intake of lupin or oat grain supplements by weaner and adult Merino wethers at 3 times during summer-autumn to examine whether the variability in grain intake varied with time, type of grain or age of sheep.

MATERIALS AND METHODS

The experiment was conducted at the Manurup annex, Mount Barker Research Station (34°34'S., 117°31'E.) over summer-autumn in 1991/92. The treatments were: lupins (air dry) at 100 g/sheep.day and oats (air dry) at 120 g/sheep.day fed in troughs (1.85 x 0.24 m). Supplements were given twice weekly and residues were collected and weighed when they occurred. All treatments were replicated 3 times with weaner sheep and twice with adult sheep in a completely randomised design. Plots were 1 ha in size and were stocked with 12 weaner or 10 adult sheep.

Merino wether weaners, average starting liveweight about 27 kg and born in July-August, and adult wethers weighing about 66 kg were used. They were stratified on the basis of liveweight and then allocated to plots at random from within liveweight strata. Two summer drenches were given in accordance with recommendations for the area and additional drenches were given as necessary based on faecal egg counts.

Supplementary feeding commenced (day 0) on 19 November 1991 and continued for 213 days. Water was available from a trough in each plot. The average nutritive characteristics of the grains were: lupins, dry matter digestibility (DMD) 92%, nitrogen (N, g/kg DM) 60.5 and sulfur (S, g/kg DM) 2.5; oats, DMD 76%, N 18.4 and S 1.5. Digestible dry matter (DDM) provided in supplements was calculated as dry weight of supplement x DMD. Dry weight was 90% of air dry weight.

Supplement intake and DDM intake from supplements was measured 3 times; day 28 (17 December) when pasture on offer was over 4500 kg DM/ha, day 84 (11 February) with 3000 kg DM/ha and day 133 (31 March) with 2300 kg DM/ha and some green pick (about 50 kg DM/ha). The lupins and oats were

labelled with lithium (Li) chloride using the method described for ytterbium acetate labelling by Curtis *et al.* (1994). Blood samples were collected about 18 hours after feeding and Li concentration in the serum was used to calculate intake of supplement by each sheep as described by Suharyono *et al.* (1991). Supplement not consumed within 90 minutes of feeding was removed and weighed.

Differences between sheep age, supplement type and time of measurement were examined by split plot analysis of variance of the DDM intake from grain. The standard deviation in intake within each plot was used to test whether variability in intake was affected by time or grain type, for adult sheep over the 3 measurement times, or for both ages of sheep over the February and March measurements when there were no refusals by the weaner sheep.

RESULTS

For weaner sheep, residues occurred in December, but not at the other measurement times. At this time, there were significant differences in DDM intake between lupins and oats (228 vs. 103 g, $P < 0.001$) and between weaner and adult sheep (97 vs. 289 g, $P < 0.001$). The feed type \times sheep age interaction was significant ($P < 0.05$), because weaner sheep (all 3 plots) consumed no oats, but 193 g DDM from lupins (Table 1).

Table 1. Average intake of grain (g DDM/sheep) for weaner or adult sheep offered lupins or oats in December

	Weaners	Adults
Lupins	193	290
Oats	0	287

There were no significant effects of grain type or sheep age on average intakes in February and March as all the supplement was consumed in every plot. Across time, there were significant ($P < 0.001$) differences due to the refusals by weaner sheep in December (Figure 1).

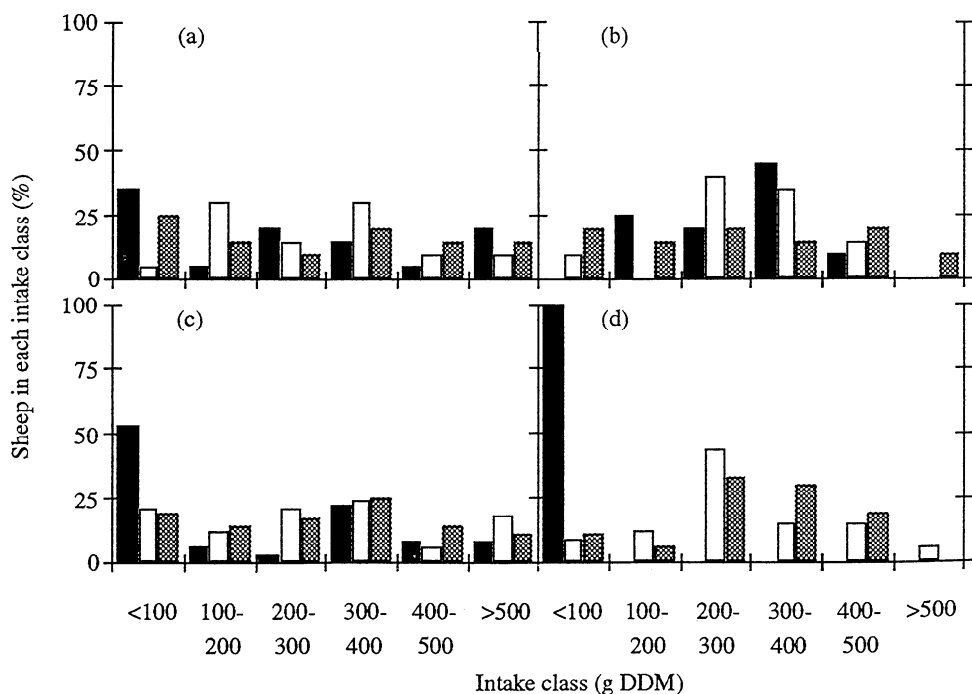


Figure 1. Percent sheep in each supplement intake class for December (filled bars), February (open bars) and March (shaded bars). (a) adults, lupins; (b) adults, oats; (c) weaners, lupins; and (d) weaners, oats.

The average standard deviation in DDM intake by adult sheep was not significantly affected by time, but was lower ($P < 0.001$) for oats than lupins (130 vs. 218 g).

For February and March measurements, the average standard deviation of intake of DDM in supplement was lower ($P < 0.01$) for oats than lupins (138 vs. 194 g), but there was no significant ($P > 0.05$) effect of time (154 vs. 178 g for February and March, respectively) or sheep age (172 vs. 160 g for weaner and adult sheep, respectively).

DISCUSSION

Prior exposure to grain supplements is known to increase acceptance by sheep (Lynch *et al.* 1983; Green *et al.* 1984; Lynch and Bell 1987). The adult sheep used in this experiment had all been exposed to grain supplements in previous years, while the weaner sheep had no prior exposure. This may explain the differences in intake of supplement at the December measurement.

The advantages of prior learning may be transient (Juwari *et al.* 1981) and the variation in supplement intake between individuals in both age groups was expected to decline over time. However, this was not the case with adult sheep between December and March or for weaner sheep between February and March. The availability of dry paddock feed did not decline below 2000 kg DM/ha in this experiment and it may be that at lower availabilities the variability in 'intake between individuals would decline. It indicates that any feeding strategy which is dependent on individual sheep consuming targeted amounts of supplement may be difficult to achieve in practice. Thompson and Curtis (1990) reported that small amounts of lupins or oats increased SS relative to unsupplemented sheep. However, when sheep were given large amounts of lupins once weekly, there were no improvements in SS relative to unsupplemented sheep, presumably due to high consumption of grain by some sheep on the day of feeding and fluctuating nutrient intakes throughout the rest of the weekly feeding cycle.

In a behavioural study, Hutson and van Mourik (1981) found that the preference ranking of oats and lupins was high, but not as high as barley or wheat. They concluded that lupins and oats were not suitable rewards as they were not highly acceptable to all sheep. The high intake variability of lupins in our experiment is consistent with the large variability in liveweight change of sheep group-fed lupins for maintenance by Foot and Hazelwood (1988). If the objective of feeding lupins is to maintain wool-free liveweight of most animals in a flock fed in trails or troughs, it may be necessary to limit the intake of sheep with a high acceptability by the use of feeding devices (Holst and Markham 1988) or intake limiters.

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