INTAKE OF LUPIN SEED AND PASTURE BY SHEEP FED LUPINS WHILE GRAZING DRY PASTURE

Kimbal M.S. CURTIS* and B. MAVRANTONIS*

SUMMARY

The amount of pasture in the diet of lupin supplemented wethers on dry pastures was determined at Mt. Barker Research Station. Lupin intake was estimated by measuring lupin disappearance from the plot. Pasture intake was estimated from the digestibility of the pasture and lupins and from total faecal weight.

It was concluded that pasture intake of lupin supplemented adult sheep (condition score 3.1) was reduced relative to the intake of unupplemented sheep.

INTRODUCTION

Supplementary feeding is a widespread practice over summer in Western Australia (W.A.). The Grain Pool of W.A. estimates that farm use of lupins in 1987/88 was 362,000 tonnes or 37% of the total grain (oats+barley+lupins) used. It has been shown that feeding lupins increases: ewe milk production, lamb growth rate, weaning weight, live weights, ovulation rate and wool growth (Arnold et al. 1977; Kenney et al. 1980; Butler 1981; Kenney 1985; Rowe et al. 1989).

Foot et al. (1983) reported increases in liveweight change only at their highest feeding rate (350 g/hd/d). They reported no evidence that lupin grain up to 250 g/hd/d reduced herbage intake. Roberts et al. (1979) and Kenney (1981) also found no evidence of substitution at low rates of lupin supplementation. By contrast, Arnold and Wallace (1977) and Rowe and Aitchison (1987) found a linear decline in chaff intake with increasing levels of lupin intake. Lindsay et al. (1980) reported depressed chaff intake with 500 g of lupins/day while Butler (1981) reported that 100 g lupins/d stimulated straw intake.

The aim of this work was to determine, under field conditions, the intake of pasture and lupins for sheep grazing pasture and supplemented with lupins.

MATERIALS AND METHODS

This experiment was conducted at Mt. Barker Research Station in Western Australia in February, 1989. Plots, one hectare in area, were grazed with 15 Merino wethers (20 months old) from late November. Treatments were allocated to the plots at random. The treatments were no supplement, or lupins at rates equivalent to 100, 200, 300, 400 or 500 g/hd/d. The lupins were spread weekly from Pate November with a super spreader. Treatments were not replicated.

Sheep were allocated to treatments at random. Sheep live weights and condition scores were recorded fortnightly on the day the lupin supplement was fed. Live weights for February 21 only (the mid point of faecal collection) are reported here.

The amount of pasture (subterranean clover/ryegrass-based) dry matter on offer was estimated by visual scoring and calibrated against harvested quadrats following the method of Morley et al. (1964). Pasture samples were hand plucked from five random quadrats on each plot on every third day of the experiment. The samples were combined for each treatment and analysed.
...digestibility by pepsin-cellulase digestion (McLeod and Minson 1978) and corrected to in vivo digestibility. Lupin samples were collected from the silo and analysed by the same technique.

A 30 cm square quadrat (60 counts/plot/day) was used to estimate the availability of lupins each day for two consecutive weeks. The difference between availability on successive days was used to estimate average intake per sheep.

Total faecal collection was made using a canvas bag attached to a harness. Harnesses were fitted to five sheep in each plot. The bags were emptied each morning for 14 days, the contents weighed fresh, and a 20% sample dried at 65°C to a constant weight.

RESULTS AND DISCUSSION

Pasture dry matter (DM) on offer ranged from 1.1 to 1.8 t DM/ha and in vitro digestibility (adjusted to in vivo) averaged 48% for the plucked samples. Green dry matter was estimated at 5% and so some selectivity was expected.

Mean live weight during this experiment was 51.7 kg with a significant (P<0.001) positive linear response to feeding rate of 1.9 kg per 100 g of lupins. Average condition score was 3.1 (S.E. = 0.13).

Faecal dry weight for all sheep averaged 6.5 g dry matter per kg live weight with a significant (P<0.01) negative response to lupin feeding of 0.8 g per kg live weight for every 100 g of lupins per day.

The change in availability of the spread lupins over time is presented in Fig. 1 (mean for the two weeks). The pattern observed shows a rapid decline initially (while lupin availability is high) followed by a slower decline until the next feeding. It is worth noting that lupin seeds were still available at the end of each week for all treatments. This suggests that wastage may be a problem when lupins are spread, particularly if new areas are used each week.
Lupin intake was highest during the first day after feeding. On this day there was a significant \((P<0.001)\) linear relationship between lupin intake and lupins on offer \([\text{lupin intake (g/d)} = 34 (\pm 1.5) \times \text{lupins on offer (kg/ha)})\] explaining 94% of the variation in intake per head for the day of feeding. During the remaining 6 days of each feeding cycle, lupin intakes were 37(7.6), 41(8.7), 111(24) and 138(18) g/d for the 100, 200, 300 and 400 g treatments respectively. For the 500 g treatment, intake rate was 796(66) g/d for the first two days and then 178(44) g/d until the next feeding.

Two possible explanations can be proposed to explain the decline in faecal weight with increasing lupin feeding rate, (i) the amount of pasture eaten decreased, or (ii) lupins increased the digestibility of the pasture. The second explanation is unlikely as Roberts et al. (1979), Butler (1981) and Foot et al. (1983) all reported no change in the apparent digestibility of the herbage with lupin supplementation. It is reasonable then to conclude that pasture intake of lupin supplemented sheep was reduced relative to the intake of unsupplemented sheep.

To estimate pasture intake, it was assumed that (i) faeces derived from the supplement can be estimated from its digestibility and this subtracted from the total output to give faeces derived from the pasture, and (ii) supplement did not effect the digestibility of the pasture ingested.

Lupin intake was estimated using the rates presented above. It is accepted that sheep are more selective than hand-plucked samples and so the digestibility of the pasture in the diet may be considerably higher than the 48% recorded for the plucked samples.

Figure 2 shows the calculated intake of pasture and lupins for (a) the measured pasture digestibility and (b) a higher value (65%) representing the superior selectivity of the sheep. If no selectivity is assumed (diet pasture digestibility equals 48%) then the substitution rate is 0.88, while for a diet containing 65% digestible pasture, the substitution rate is 0.59. This later value compares well with pen experiment values of 0.69 (Arnold and Wallace 1977), 0.54 (Lindsay et al. 1980) and 0.53 (Rowe and Aitchison 1987).

![Fig. 2. Estimated intake of lupins and pasture for different lupin feeding rates for a pasture digestibility in the diet of (a) 48% and (b) 65%.](image-url)
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