DIET SELECTION AND WOOL GROWTH OF HIGH AND LOW PRODUCING SHEEP AT PASTURE IN NORTH WEST QUEENSLAND

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SUMMARY

Diet selection and wool growth of high and low wool producing sheep grazing Mitchell grass downs in north west Queensland were measured between March and December. There were no major differences in composition or quality of the diets selected by "highs" and "lows". Highs produced significantly more wool per unit skin area than lows (0.94 v 0.70 mg/cm^2/d) between March and October. Dietary nitrogen level declined from 2.36% in March to 0.85% in December and in vitro digestibility of organic matter from 68% to 56%, resulting in decreases of 41% and 27% in wool growth of highs and lows respectively. Preferential management of high producing sheep may improve economic returns.

(Keywords: high-producers, low-producers, diet selection, Mitchell grass pasture).

INTRODUCTION

Wool production per head is one of the most important factors controlling the profitability of sheep production under extensive grazing conditions. This is particularly relevant in Queensland where reproduction rates are low and income from surplus sheep is minimal (Rose 1978).

Wool production per head in Queensland's pastoral areas is much lower than in southern regions of Australia partly because of environmental constraints (Robards 1979). However, within flocks in these areas, large variation exists between individuals in the amount of wool produced annually. A number of factors can contribute to these differences including feed intake, quality of diet selected and efficiency of utilisation of ingested feed (Williams 1979).

This paper examines the diet selection of high and low wool producing sheep over a 9 month period following summer rain and relates this to the quantity of wool produced.

MATERIALS AND METHODS

The study was conducted at Toorak Research Station located 50 km south of Julia Creek in north west Queensland. Ten high-producing (HP) and ten low-producing (LP) sheep were selected from 200 wethers aged three and one half years which were representative of locally bred Peppin merinos. Selected sheep were of similar live weight and conformation but the two groups exhibited large differences in greasy wool production (4.4 kg v 2.8 kg) over the previous 12 months. These experimental sheep grazed a 256 ha paddock with a commercial flock at the average stocking rate for the district of 1.6 ha/sheep. Rainfall of 452 mm fell in the 10 weeks before the study commenced.

Four HP and four LP sheep were each fitted with an oesophageal fistula and used to assess dietary selection in March, May, July, August, October and

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December. On each occasion, the sheep were introduced to the paddock and allowed 5 days as a settling-in period. On the following four mornings extrusa were collected from each sheep during a 90 minute grazing period. The percentage of broad leaf species (forbs), Mitchell grass (Astrebla spp.) and Flinders grass (Isielema spp.) present in extrusa from each sheep was assessed following hand separation. Subsamples of extrusa were taken daily from each sheep, bulked within sheep and analysed for in vitro digestibility of organic matter (IVDOM) using a modified technique of Tilley and Terry (1963) and dietary nitrogen (%N). Dietary sulphur (%S) was determined on bulked samples for HP and LP sheep at each sampling time.

Wool growth was measured on the unfistulated sheep in May, July, August, October and December using the clipped patch technique. Dry matter yield of the pasture was measured in July, August, October and December by the visual estimation technique of Haydock and Shaw (1975). Botanical composition was estimated by the weighted dry weight rank method of Jones and Hargreaves (1979).

RESULTS

Dry matter yield of pasture in the experimental paddock declined from 2978 kg/ha in July to 2186 kg/ha in December.

Forbs formed the major part of the diet of both HP and LP sheep in March (Table 1). The extent to which these species were selected by both groups of sheep is highlighted by the fact that during July even though the forb component of the pasture was only 3.8% it comprised 13% and 8% of the diets of HP and LP sheep respectively. Flinders grass formed a large part of the diets of both groups at all sampling periods except December while the percentage of Mitchell grass in the diets generally increased as seasonal conditions deteriorated, reaching 100% in December.

Table 1 Forbs, Mitchell and Flinders grasses available in the pasture and selected by high and low producing sheep

	Mar	May	Jul	Aug	Oct	Dec
Forbs						
Available (%)	++	++	3.8^{a}	0.7^{b}	0.4^{b}	0^{c}
Selected+ (%) - highs	77	14	13	tr	0	0
- lows	62	5	8	tr	0	0
Mitchell grass						
Available (%)	++	++	57^{a}	70^{b}	87^{c}	74^{b}
Selected+ (%) - highs	0	33	65	55	62	100
- lows	0	45	58	20	58	100
Flinders grass						
Available (%)	++	++	37^{a}	27^{b}	11^{c}	24^{b}
Selected+ (%) - highs	23	53	22	45	38	tr
- lows	38	50	34	80	42	tr

Values within rows with different superscripts differ significantly ($P \leq 0.05$)
\+ Each value represents the mean of 12-16 extrusa samples
++ No measurement made tr Trace

Nitrogen content of the diets selected by HP and LP sheep (Table 2) differed significantly ($P \leqslant 0.05$) only during October. Dietary nitrogen decreased from 2.36% in March to 0.85% in December. Dietary sulphur level was similar in HP and LP sheep throughout; however, sulphur declined substantially between March (0.29%) and December (0.13%) as pasture conditions deteriorated. The nitrogen to sulphur ratio (N:S) of the diet selected by HP and LP sheep ranged from 9:1 in May to 5:1 in July.

The HP sheep grew more wool per unit surface area than the LP sheep between March and October (Table 2). Differences in wool growth between the groups were greatest when pasture quality was good and least when it was poor. Rate of wool growth of HP sheep decreased by 41% and of LP sheep by 27% between March and December.

Table 2 Nitrogen content of the diet and wool growth of high and low producing sheep at pasture

		Mar	May	Jul	Aug	Oct	Dec
Nitrogen (%)	- highs	2.33	1.97	1.10	1.03	0.72[a]	0.93
	- lows	2.39	1.77	1.28	0.97	1.25[b]	0.78
Wool Growth	- highs	++	1.11[c]	1.00[c]	0.86[c]	0.79[c]	0.65
($mg/cm^2/d$)	- lows	++	0.81[d]	0.69[d]	0.66[d]	0.66[d]	0.59

Values within columns differ significantly a-b $P \leqslant 0.05$; c-d $P \leqslant 0.01$

Digestibility of diets from all sheep decreased ($P \leqslant 0.01$) from 68% in March to 56% in December with no consistent difference between HP and LP sheep. Dietary nitrogen and IVDOM were correlated ($r = 0.57$, $P \leqslant 0.05$).

DISCUSSION

HP sheep tended to select more forbs (Sida spp., Glycine spp.) in their diets in May and July than LP sheep allthough these differences were small. It is unlikely that these differences contributed to the greater wool growth of HP sheep because nitrogen and sulphur content and the digestibility of diets of both groups were similar. Nevertheless, Lorimer (1978) has highlighted the overall importance of forbs on sheep productivity in this environment and the intensity with which forbs were selected by both groups of sheep in this study support those findings.

HP sheep produced more wool per unit area especially when dietary nitrogen exceeded 1.1% before August. During this period HP sheep grew 42% more wool than LP sheep compared to a difference of only 20% from July to December when dietary quality was considerably lower. Thus, much of the extra wool produced by HP sheep was grown when pasture conditions were favourable. This finding agrees with that of Williams (1964) who found that wool growth differences between HP sheep and LP sheep grazing three different pasture associations in New South Wales were greatest when the quality of green forage on offer was good.

Faecal output measurements suggested that while HP sheep had greater digestible organic matter intakes (approximately 26%) they were also more efficient at converting food to wool. Relative efficiencies of the same sheep were later established in pens when animals were fed to live weight, firstly to maintain weight and secondly to gain weight. At maintenance, relative efficiencies were 120 and 100, while above maintenance values were 123 and 100 for HP and LP sheep respectively (Pritchard, unpublished).

The hypothesis that pasture quality was the major factor limiting wool growth of HP sheep from July to December is supported by pasture measurements which show that dry matter availability was not limiting intake.

The apparent relationship between level of superiority of HP sheep and pasture quality is a characteristic which needs to be exploited. Economic returns from commercial wether flocks could be improved at little extra expense by fleece weighing at second shearing to identify HP sheep. These sheep could be run as a separate flock and given preferential management consistent with their superior wool producing ability. Associated management strategies would include prudent stocking rates and allocation to better paddocks and would aim to extend the period over which high quality material was available for selection. In view of the intensity with which the broad leaf component of the pasture was selected by sheep in this study, grazing selected wethers in paddocks where these species are abundant may offer the best opportunity for improving wool growth of HP sheep.

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