Digestion of *Medicago truncatula* pasture by sheep

G.D. Denney

NSW Department of Agriculture, Condobolin, 2877, NSW, Australia

J.P. Hogan, J.R. Lindsay and P. Davis

C.S.I.R.O., Division of Animal Production, P.O. Box 239, Blacktown, 2148, NSW, Australia

Reasons for low productivity of sheep grazing barrel medic *(Medicago truncatula)* were investigated based on studies of intake and digestion. Pasture analysis showed that barrel medic represented only 13 to 30% of the diet selected and this was similar to its proportion in the green feed on offer. The selected diets had relatively low ratios of DOM to CP and the high levels of rumen NH_3 and wastage of dietary protein in the stomach were predictable. The amounts of amino acids derived by sheep on these diets were much lower than the CP intake suggested and undoubtedly contributed to the relatively low levels of wool production.

Die rede vir die lae produktiwiteit van skape wat 'barrel medic' *(Medicago truncatula)* bewei, is ondersoek deur na inname en vertering te kyk. Weiveld analise het aangetoon dat *Medicago truncatula* slegs 13 tot 30% van die gekose dieet uitmaak en dit het ooreengestem met die verhouding daarvan in die groenvoer wat aangebied is. Die geselekteerde diëte het relatief lae verhoudings van DOM tot CP gehad en die hoë vlakke van NH_3 in die grootpens en verkwisting van dieetproteïen in die maag was voorspelbaar. Die hoeveelheid aminosure wat die skape uit hierdie rantsoene geput het was heelwat laer as die CP inname wat voorspel is en het ongetwyfeld bygedra tot die relatief lae vlakke van wolproduksie.

Keywords: Intake, digestion, *Medicago truncatula*, grazing, sheep

Introduction

Barrel medic (*Medicago truncatula*) is a legume favoured in the 375 mm rainfall zone in the wheat belt of southern Australia, and dominates pasture growth from seed germination in about March until pasture senescence in late Spring. Although there appears to be ample feed for sheep during this time, wool production is relatively low. The present paper reports an investigation into the reasons for this low productivity based on studies of intake and digestion by grazing sheep of barrel medic during its vegetative growth stages.

Material and Methods

Eighteen medium wool Peppin Merino wethers, including four with oesophageal fistulae and six with rumen and abomasal fistulae, were used. They grazed in a 6 ha paddock selected as representative of medic-dominant pasture. Measurements of pasture composition, selected diet and digestion were made in the winter and spring of 1979 and early spring of 1980, referred to as Periods 1 to 3. Feed intake was estimated from data on the *in vitro* indigestibility of oesophageal extrusa plus faecal organic matter output, the same indigestibility being assumed for all sheep. The salivary content of extrusa was measured by tritiated water dilution (Luick *et al.*, 1959) and flow of digesta from the stomach by reference to chromium and ruthenium markers (Denney *et al.*, 1979) continuously infused into the rumen by portable pumps (Corbett *et al.*, 1976). Amino acid absorption from the small intestine was calculated according to Lindsay *et al.* (1980). Digesta samples were collected at four six-hour intervals during a 96-h period to provide a sample for each hour from 08h00 to 20h00 and for each two hours for the remainder of the twenty four. Wool growth was measured each 28 days by dye-banding (Chapman & Wheeler, 1963).

Results

The pasture was sparse and drought-affected in Period 1, sparse and vegetative in Period 2 and dense and vegetative in Period 3, although the plants were only about 1 cm high. The total green feed on offer (kg dry matter/ha) for the respective periods was 342, 443 and 493 (Table 1). Barrel medic represented only 13 to 30% of the diet selected, but this did not differ greatly from its proportion in the green feed on offer.

Table 1 Pasture on offer and diet selected (minor components omitted) with barrel medic pasture

	Pasture on offer (kg dry matter/ha)			Diet composition (% of DM)				
	Green	Green	Dead	Green grass		Green medic	Dead grass	
Period	grass	medic	forage	Leaf	Stem	leaf	Leaf	Stem
1	190	152	1846[a]	32	3	18	40	3[b]
2	330	113	1483[a]	51	5	13	19	4
3	299	194	384	48	0	30	17	2

[a] Mostly litter
[b] Droughted

Diets in the three periods contained 77%, 73% and 85% water respectively. Saliva contributed 39 to 59% of the water in the oesophageal extrusa but only 3 to 5% of the nitrogen. Forage dry matter contained 13, 14 and 26% ash; the high value for the third period reflecting extensive soil ingestion. The diets contained, on an organic matter basis, 3,07%, 3,9% and 5,23% nitrogen.

The pasture ranged in organic matter digestibility from 71 to 75% (Table 2). Hence the ratios of digestible organic matter to crude protein in the three periods were 3,72, 3,09 and 2,28. Protein digestion was marked by high levels of rumen ammonia, while the amounts of nitrogen leaving the stomach were equivalent to only 56 to 88% of intake. The calculated amount of amino acids absorbed from the small intestines ranged from 59 to 93 g/d. Wool growth (g/d clean dry) measured with the eight non-fistulated wethers for the three periods was 10,5, 10,8 and 12,9. As feed intake in the intact sheep was about 30% higher than in those with fistulae the rate of wool growth was equivalent to about 10,2; 8,9 and 16,8 g/100 g absorbed amino acids.

Table 2 Parameters associated with the digestion of barrel medic pasture

	Period		
	1	2	3
Organic matter (OM) intake (kg/d)	,867	1,039	,592
OM digestibility *(in vitro)*	71,3	75,3	74,4
OM digestion in stomach (% of total)	65,3	70,8	56,9
Dietary crude protein (g/kg OM)	192	244	327
Nitrogen (N) intake (g/d)	26,6	40,5	31,0
Rumen ammonia (mg/l)	239	465	830
Nitrogen leaving stomach (g/kg N intake)	873	673	555
Amino acids absorbed (g/d)	79	93	59

Discussion

Although barrel medic appears to dominate the pasture in winter and early spring, pasture analysis indicates that this may not be so, and medic has a relatively small direct influence on sheep nutrition. The three selected diets had relatively low ratios of digestible organic matter to crude protein and the high levels of rumen ammonia and extensive wastage of dietary protein in the stomach were thus predictable (Hogan, 1981). The amounts of amino acids derived by sheep from these diets were much lower than the crude protein intake might have suggested, and undoubtedly contributed to the relatively low levels of wool production.

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