NUTRITIONAL VALUE OF SOME EXOTIC AND INDIGENOUS PLANTS BROWSED BY GOATS IN SOUTHERN AUSTRALIA

B. A. McGREGOR

Victorian Dept of Food and Agriculture, Institute of Animal Science, Werribee, Victoria, 3030.

SUMMARY

The digestible dry matter, determined *in vitro,* and the levels of nitrogen, acid detergent fibre and ash were measured on leaves and stems of 20 species of indigenous and introduced trees, shrubs and pasture weeds known to be eaten by goats. Blackberry *(Rosa fruticosus)* leaves and stems were measured every month during summer. Introduced weeds (blackberries, briar, horehound, thistles) had high DDM (all ≥70%), N(> 2.3%) and ash levels (> 5%). Australian natives had leaves with DDM <60%, and ash < *3.9%* While goats ate leaves and bark of some species e.g. *Pinus radiata, the* nutritional values were about maintenance level. The introduced weeds studied had high nutritional values suitable for livestock of all physiological states and for wide use in goat production enterprises but indigenous plants studied were of limited use in production systems.
Keywords.. nutrition, weed control, biological control.

INTRODUCTION

The use of goats in grazing systems for production of specialist fibres and for the control of annual and perennial weeds is receiving wider attention (Holst 1980). Goats being more flexible, adaptable and selective feeders, and having a greater ability to browse, can utilize a wider range of herbage than sheep (Dernment and Longhurst 1987). Goats have been used successfully to control and assist to eliminate a range of exotic weeds in Australia including gorse (*Ulex europaeus)* (Harradine and Jones 1987), blackberries (*Rubus spp*), briar *(Rosa rubiginosa)* (Holst 1980) and various thistles (McGregor *et al.* 1990) and to assist management of *Pinus radiata* agroforests (Browne 1986). Goats also stop regeneration of indigenous Australian plants such as *Acacia sp* (McGregor and Couchman 1988). The role of goats in some of the semi-arid plant communities of Australia has been investigated but often with the focus on control of indigenous woody weeds following pasture damage caused by sheep (Holst 1980).

Goat producers have been advised or believe that goats should be offered browse and that goats can control certain weeds common in wetter environments of southern Australia. From a nutritional management point of view, advisors and managers need to know if these weedy plants should be offered to goats, what the likely performance of goats grazed on these plants will be and when grazing of these plants should be terminated. Published reports on nutritional value of indigenous plants are mainly for species from Queensland and semi-arid regions (McLeod 1973; Wilson 1977) and few exist for species eaten by goats in southern Australia (AFIC 1987). This report provides details of dry matter digestibility, nitrogen, ash and fibre contents of leaves and other plant parts for a range of trees, shrubs and weeds eaten by goats in southern Australia.

MATERIALS AND METHODS

Plant material from species eaten by goats was collected by the author from 3 sources.

1. The following parts from 10 blackberry (*Rubus spp.)* plants were sampled monthly over summer 1985-86 from a site adjacent to the Werribee River [144°40'E, 37°55'S]: (i) young leaves; usually the 4 still expanding leaves within 20 cm of growing tip ≤ 2 weeks of age, no petioles (ii) old leaves; fully developed leaves about 6 weeks old no petioles (iii) young stems; the last 20 cms of growing stems from which young leaves were harvested (iv) old stems; the piece of stem from which old leaves were harvested, no shoots or petioles (v) old dead stems; previous years dead stems (vi) flowers in full bloom (vii) ripe fruit. The age of old leaves was determined for successive harvests by tying a ribbon on unpruned shoots at a point between fully grown leaves and still expanding leaves.

2. During research projects at Seymour, Werribee, and Horsham, plant parts eaten by goats were collected in the season when plants were eaten (late winter to late Spring).

3. On property visits to goat farmers material similar to that eaten by goats was harvested at Balliang, Beaufort, Omeo, Sale, Strezelecki and Yass (NSW), (Autumn and Spring).

Healthy and clean material (no dust, bird droppings or disease) was collected from 5 to 10 plants and bulked. In some cases uneaten stems were collected. Samples were frozen, freeze dried and ground through a 0.5 mm screen and analysed (duplicates) for nitrogen (micro Kjeldahl using dryblock

procedure), acid-detergent fibre (Goering and Van Soest 1970), in vitro digestibility (DDM) using pepsin–cellulase technique with known standards (Clarke *et al.* 1982) and ash. Duplicates for digestibility were within ± 3% and for other values ± 2%.

RESULTS AND DISCUSSION

The nutritional value of the 20 species sampled are given in Table 1 and the seasonal change in DDM and N of blackberry components in Fig. 1.

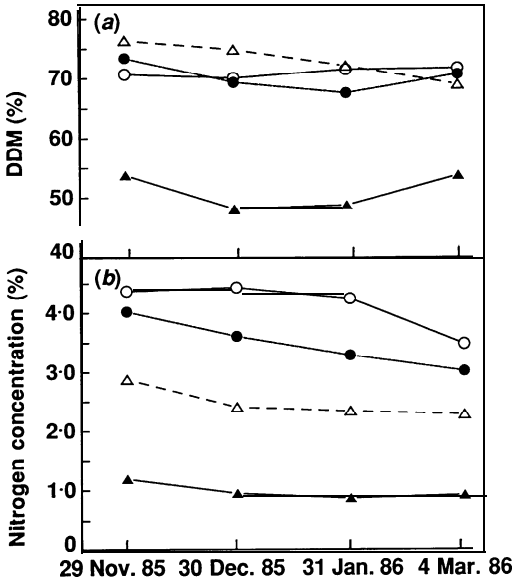

Fig. 1. Seasonal changes in (a) DDM and (b) nitrogen concentration of blackberry leaves (○,●) and stems (△,▲). Open symbols ≤ 2 weeks of age, closed about 6 weeks of age.

Introduced weeds all had leaves with DDM ≥ 70%, N > 2.3% and ash levels > 5%. In many cases young stems were also of high nutritional value. By contrast, Australian natives had leaves with DDM < 60%, and ash < 3.9%. There were large variations in DDM within the *Acacia* and *Leptospermum* genera. The DDM of *Pinus radiata* was only about 51% with relatively low N and ash content. Generally leaves compared to stems and twigs, had higher DDM, N, and ash and lower ADF values and these differences probably explain the selection of leaves by goats in preference to other plant parts. However the consumption of *Grevillea ilicifolia* and *Callistemon micropunctatus* at Horsham, when other more nutritious herbage was available, cannot be explained, although the total quantity of herbage eaten was only small.

Blackberries, thistles and the other introduced weeds all provided excellent quality forage suitable for livestock of all physiological states. The consumption of these plants during summer and autumn when senescent annual pastures have low DDM would be equivalent to providing excellent spring pasture or supplements and would be superior to providing hay as most hays have DDM < 70%. In perennial pastures these weeds may only provide an alternative source of feed. However if briars, blackberries and horehound have been intensively defoliated the nutritional value of the remaining older stems would be low and suitable only for maintenance of mature nonbreeding livestock or for drought feeding. The nutritional value of the Australian and other introduced plants varied from useful f maintenance of adult livestock to below maintenance requirements (plants with DDM < 50%, N < 1.1%). No evaluation has been made for presence of toxic substances or effects of essential oils on DDM or animals, for example *Eucalyptus cladocalyx* has reasonable DDM but in certain circumstances can be poisonous.

Table 1. The digestible dry matter (DDM), nitrogen concentration (N), acid detergent fibre (ADF) and ash content of plant components (dry matter basis) of 20 species of plants grazed by goats in southern Australia

Species	Common name	Plant part[A]	DDM (%)	N conc. (%)	ADF (%)	ASH (%)
Acacia acinacea	Golddust wattle	OGP	49.56	2.35	37.97	3.11
		OS	37.31	1.09	50.09	1.78
Acacia dealbata	Silver wattle	OGL	56.92	2.36	25.48	2.57
Acacia melanoxylon	Blackwood	OGP	59.07	3.05	45.17	3.45
Acacia pycnantha	Golden wattle	OGP	53.49	2.53	18.41	3.93
Casuarina glauca	Sheoak	OGL	58.23	2.46	37.60	6.75
Callistemon micropunctatus	Bottlebrush	OGL	43.10	1.12	45.44	2.08
Eucalyptus cladocalyx	Sugargrum	OGL	60.36	1.48	30.80	2.63
		VDL	50.68	0.78	56.25	3.27
		VB	47.25	0.29	59.81	1.41
Grevillea ilicifolia	Holly grevillea	OGL	42.13	0.97	39.53	2.25
		OS	37.18	0.34	56.06	1.12
Leptospermum juniperinum	Manuka	VGL	58.79	1.02	32.81	2.47
		VT[B]	47.26	0.59	56.74	2.86
Leptospermum sericatum	Teatree	VGL	45.22	1.36	39.53	2.72
		VT[B]	36.83	0.65	61.62	3.01
Schinus molle	Peppercorn	YL	68.94	3.24	13.76	8.00
Tamarisk parviflora	Tamarisk	YL	60.85	3.23	21.76	9.57
Pinus radiata	Pinetree	YGL	51.29	1.45	34.01	2.30
		VGL	47.27	1.44	35.68	3.04
Carthamus lanatus	Saffron thistle	OGL	81.27	2.31	17.86	12.96
Cynara cardunculus	Artichoke thistle	OGL	77.42	2.36	18.73	7.70
Lycium ferocissimum	Boxthorn	VGL	83.20	4.52	9.45	24.46
		VS[B]	62.22	1.86	55.35	5.39
Marrubium vulgare	Horehound	VGL	73.48	3.72	14.80	9.24
		VS[B]	55.03	1.31	41.30	4.58
Onopordum acanthium	Scotch thistle	YGL	75.69	3.23	19.34	8.03
		YS	63.76	0.63	37.52	7.79
		OS	55.39	0.74	45.58	9.22
Rosa rubiginosa	Sweet briar	OGL	70.51	3.31	16.09	7.72
		VB	51.02	0.67	53.53	2.31
Rubus fruticosus	Blackberry	YGL	70.85	4.13	15.18	5.13
		OGL	70.10	3.48	17.60	5.15
		YS	72.92	2.47	18.05	7.45
		OS[B]	51.01	0.98	54.72	2.78
		VDS[B]	44.50	1.27	65.98	1.49
		YFL	69.85	2.77	18.47	5.38
		YFr	66.93	1.89	28.45	4.03

[A]Plant parts were: B, bark; D, dead; Fl, flower; Fr, fruit; G, green; L, leaf; O, 4–6 weeks of age; P, phyllodes; S, stem; T, woody twig < 0.5 mm; V ≥ 6 months of age; Y, young, ≤ 2 weeks of age.
[B]Plant part not eaten or only limited intake.

Results indicate that many weed species found in southern Australia have high nutritional values suitable for wide use in goat production systems. The long term grazing of the indigenous plants tested is likely to result in animals with poor nutritional status whose welfare may be at risk.

ACKNOWLEDGMENTS

Mrs A. Hofmann and Mr T. Clarke are thanked for chemical analyses. Financial support from Kinross Cashmere Company and the Australian Special Rural Research Fund is gratefully acknowledged.

REFERENCES

AFIC (1987). Australian Feed Composition Tables. (Ed Ostrowski-Meissner.) Australian Feed Information Centre CSIRO.)

BROWNE, J. (1986). Goat Note K3/1. Australian Cashmere Growers Assn. Sydney.

CLARKE, T., FLINN, P. *C., AND* McGOWAN, A. A. (1982). *Grass & Forage Sci. 37:* 147–50.

DEMMENT, M. W. and LONGHURST (1987). Proc. 4th Internat. Conf. on Goats. pp. 989-1004. (Embrapa Brazil).

GOERING, H. K. and VAN SOEST, P. J. (1970). USDA Handbook No. 379. Washington.

HARRADINE, A. R. and JONES, A. L. (1987). *Aust. J. Exp. Agric. 25:* 550–6.

HOLST. P .J. (1980). *Proc. Aust. Soc. Anim. Prod.* **13:** 188-91.

McLEOD, M. N. (1973). *Aust. J. Exp. Agric. Anim. Husb.* **13:** 245–50.

McGREGOR, B. A. and COUCHMAN, R. C. (1988). *Proc. Symp. Weed Sci. Soc. Vic.* pp. 47-8.

McGREGOR, B. A., REID, C. J. and SCOTT, B. J. (1990). *Proc. 9th Aust. Weed Conf.* pp. 497-501.

WILSON, A. D. (1977). *Aust. J. Agric. Res. 28:* 501–8.