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Alkane technology estimates of summer and winter herbage intake of four specialty carpet wool breeds, Romneys and Merinos

S.C. CHAMPION, G.E. ROBARDS, A.R. LINDSAY AND M.A. FRIEND

Department of Wool and Animal Science, University of New South Wales, Sydney NSW 2052.

ABSTRACT

The study involved 128 animals (19 Carpetmasters, 20 Drysdale, 19 Elliottdales, 20 Merinos, 23 Romneys and 27 Tukidales) maintained on improved pastures at Oberon, on the central tablelands of NSW. For the intake measurements, animals were stratified on liveweight into five groups within breed, and one animal selected from each group at random for dosing with controlled-release alkane capsules.

The intake of Romneys (1.30 kg OM/day), Merinos (1.20) and Tukidales (1.18) was significantly ($P < 0.05$) higher than that of Carpetmasters (0.98), Drysdale (0.78) and Elliottdales (0.80). There was no significant interaction between breed and season, with all breeds having a lower ($P < 0.01$) intake in July (0.63 kg OM/d) than February (1.43 kg OM/d). When the intakes were expressed in terms of metabolic liveweight, there was again a highly significant difference between the intake in February and July (0.078 and 0.040 kg OM/g/LW^{0.75}, respectively). On a metabolic liveweight basis breed differences also still existed, with Merinos (0.082) having higher ($P < 0.05$) intakes than the other breeds.

Keywords: Alkanes; carpet wool; intake, sheep breeds.

INTRODUCTION

The use of one of various methods to estimate intake of grazing ruminant livestock has generally been applied in experiments where the emphasis is on determining the stocking rate a pasture can sustain or the capacity of the pasture to promote high levels of liveweight gain. There are few reports of studies in which an intake estimation method has been applied to study the relative intake of different strains or breeds of livestock.

The development of a technique using the odd-numbered carbon chain of plant cuticular alkanes and a dosed adjacent even-numbered carbon chain alkane, and its apparent advantages over earlier techniques, provides a means of studying grazing intake differences between breeds with an increased degree of confidence (Dove and Mayes 1991; Dove 1992). Such an opportunity was taken to test the applicability of the alkane technique in a comparison between breeds in two seasons, in a study where the four speciality carpet wool breeds, Merinos and Romneys were grazing the same pasture together for over a year.

MATERIALS AND METHODS

Experimental site: The experiment was conducted on 'Arundel Park', a private property at Oberon on the central tablelands, about 150 km west of Sydney NSW, where the annual rainfall averages 750 mm and environmental conditions are generally conducive to growth of good quality pasture in most seasons of the year.

Experimental animals: The sheep used in this study were a subgroup of an experiment comparing the year-round productivity of Carpetmaster, Drysdale, Elliottdale, Merino, Romney and Tukidale sheep while grazing together in one paddock of improved pasture. Each of the six sub-flocks

contained about 20 sheep, and the five required within each sub-flock for the intake studies reported here were selected by random stratification based on liveweight; that is, a total of 30 sheep were dosed with alkane capsules.

Faeces sampling: The experiment was conducted in both summer and winter with dosing of alkane in slow-release capsules occurring on 7th February and 5th July 1994, and the subsequent faeces sampling occurring on 14th to 17th February and 12th to 15th July 1994, respectively. The capsule standardisation (K. Ellis, personal communication), dosing procedure and faecal sampling were the same as that described by Friend *et al* (1995).

Pasture sampling: The pasture sampling method was the same as that described by Friend *et al* (1995) with one composite sample being prepared for the paddock in which the experimental sheep were constantly grazed.

Laboratory analyses: The pasture and faecal samples were analysed for alkane content as outlined by Mayes *et al* (1986) and Dove (1992) with minor modification as described by Lindsay (1994) and Friend *et al* (1995). This involves extraction of alkanes with n-heptane, separation on a silica gel column and measurement by gas liquid chromatography using tetratriacontane (C₃₄) as an internal standard as this alkane does not appear in plants.

Statistical analyses: The data were analysed by the GLM procedure of SAS on a Vax.

RESULTS

In both summer and winter the correlation between alkanes with odd-numbered carbon chains in faeces was very similar to that in the herbage sample ($r^2 = 0.99$ in both seasons), suggesting that the plucked herbage sample was a good representation of pasture the sheep were selecting from the improved pasture at Oberon.

The mean herbage intake over the two periods of Romneys (1.30 kg OM/day), Merinos (1.20) and Tukidales (1.18) was significantly ($P < 0.05$) higher than the intake of Carpetmasters (0.98) (Table 1). In turn Carpetmasters had higher ($P < 0.05$) intakes than the Drysdale (0.78), with the Elliottdales being intermediate (0.80) and non-significantly different from either Carpetmasters or Drysdale. There was no significant interaction between breed and season, with all breeds showing a markedly lower ($P < 0.01$) intake in July (0.63 kg OM/d) than February (1.43 kg OM/d); varying from a reduction of 31% for Carpetmasters to 65% for Elliottdales; an overall intake in July which was 54% lower ($P < 0.01$) than the values estimated with the same sheep in February.

TABLE 1: Liveweight (kg) and intake (kg OM/d) of four speciality carpet wool breeds, Romneys and Merinos grazing improved pasture in two seasons at Oberon, NSW.

Breed	February		July		Overall Intake
	LW	Intake	LW	Intake	
Carpetmaster	53.9	1.16	50.5	0.80	0.98b
Drysdale	54.5	1.03	45.8	0.53	0.78a
Elliottdale	44.1	1.19	36.0	0.42	0.80ab
Merino	37.6	1.60	33.6	0.79	1.20c
Romney	52.7	1.89	45.1	0.70	1.30c
Tukidale	53.8	1.68	47.0	0.68	1.18c
Average	49.3	1.41	43.0	0.65	1.04

Because liveweight had declined significantly from February to July the estimated intakes were expressed in terms of metabolic liveweight (kg OM/day/kg LW^{0.75}, where LW was fleece-free liveweight in kilograms). When this was done there was still a highly significant difference between the intake in February and July (0.078 and 0.040 kg OM/g LW^{0.75}, respectively). Breed differences also existed, with Merinos (0.082) having higher ($P < 0.05$) intakes per unit metabolic liveweight than Tukidales (0.061), but neither being different to Romneys (0.069). In turn, Tukidales had higher intakes ($P < 0.05$) than Drysdale (0.041) but not Carpetmasters (0.051) nor Elliottdales (0.050).

There were no significant interactions between breed and season in terms of intake per unit metabolic liveweight, with reductions between February and July for each breed; a decline for Carpetmasters of 25%, Drysdale 41%, Elliottdales 59%, Merinos 43%, Romneys 59%, and Tukidales 55%. This was due to a combination of actual declines in intake, and liveweight declines of 6% for Carpetmasters, 16% for Drysdale, 18% for Elliottdales, 11% for Merinos, 14% for Romneys and 13% for Tukidales between February and July due to decreased pasture availability.

DISCUSSION

The simple technique of plucking pasture samples appears to have given a very representative sample of what the sheep were selecting from the relatively uniform, improved pastures at Oberon, as the proportion of alkanes with varying chain length was very similar in pasture and faeces samples. This is in contrast to the poor relationship observed at Hay (Friend *et al* 1995), where the sample may not have

contained as much native dicotyledonous plants with a high concentration of alkanes (Dove and Mayes 1991), as that selected by the sheep.

The marked differences in estimated grazing intake at Oberon between February and July appears to be a true reflection of the pasture and climatic circumstances prevailing at the times. In February pasture was abundant and of good quality, the sheep were known to be gaining in weight and laboratory analyses indicated a crude protein percentage of 17.1 and an estimated metabolisable energy value, based on nitrogen and acid detergent fibre analyses (Oddy *et al*, 1983) of 9.7 MJ/kg DM. Thus, an average intake of 1.41 kg OM or about 1.55 kg DM, equivalent to 3.1% of average liveweight, is not surprising. In contrast, although there was a green pick and hence the nutritive value estimates (16.4% CP, 9.5 MJ ME/kg DM) are quite high, pasture was scarce in July, sheep were losing weight and, following the intake estimations, supplementary feeding commenced for six weeks. Even when the intakes were expressed on the basis of metabolic liveweight, the highly significant difference was maintained and the ratio of February to July intake was only reduced from 2.2:1 to 1.95:1.

The intake estimates suggest that Tukidales have higher intakes than the other speciality carpet wool breeds and this difference is not due to a higher liveweight but could be related to breed differences in fleece population (Champion and Robards, 1995). The data also highlights relatively high intakes by Merinos which is emphasised further when their lower liveweights are accounted for by expressing intake on a metabolic liveweight basis. Also, in our study there was a high correlation (0.81) between feed intake and digestibility, with a 1% increase in digestibility being associated with 0.031 kg increase in intake. This is similar to the 20-25 g DM increase in intake per unit increase in digestibility given by SCA (1990).

Estimates of digestibility which can be made using the alkane method indicate differences between the breeds, with Elliottdales digesting the pasture to a lesser extent, but this assumes the breeds were consuming the same pasture species as those represented in the plucked sample, and does not take into account possible differences in selectivity or grazing pattern. Further study under more controlled conditions will be required to determine if there is a difference among speciality carpet wool breeds similar to the breed differences in digestibility of pasture and grazing intake recorded by Langlands (1968) in the studies he conducted using the chromic oxide technique. However, the alkane technique appears to be sensitive enough, particularly under relatively uniform pasture conditions, to detect differences in intake between breed, season and grazing conditions, and undoubtedly deserves further study and application in grazing situations.

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REFERENCES

- Champion, S.C. and Robards, G.E. (1995). The relationship between wool production, liveweight and liveweight change in four specialty carpet wool breeds, Romneys and Merinos. *Proceedings of the New Zealand Society of Animal Production*. **55**: 137-140.
- Dove, H. (1992). Using the n-alkanes of plant cuticular waxes to estimate the species composition of herbage mixtures. *Australian Journal of Agriculture Research* **43**: 1711-24.
- Dove, H. and Mayes, R.W. (1991). The use of plant wax alkanes as marker substances in studies of the nutrition of herbivores: a review. *Australian Journal of Agriculture Research* **42**: 913-52.
- Friend, M.A., Robards, G.E., Lindsay, A.R. and Champion, S.C. (1995). Alkane technology estimates of the relative intake of three Merino strains under different grazing regimes. *Proceedings of the New Zealand Society of Animal Production*.
- Langlands, J.P. (1986). The feed intake of grazing sheep differing in age, breed, previous nutrition and liveweight. *Journal Agriculture Science., Camb.* **71**: 167-72.
- Lindsay, A.R. (1994). An examination of grazing intake by Merino strains and carpet wool breeds using alkane technology. Honours thesis. Department of Wool and Animal Science, UNSW, Sydney. pp 136.
- Mayes, R.W., Lamb, C.S. and Colgrove, P.A. (1986). The use of dosed and herbage n-alkanes as markers for the determination of herbage intake. *Journal Agriculture Science., Camb.* **107**: 161-70.
- Oddy, V.H., Robards, G.E. and Low, S.G. (1983). Prediction of *in vivo* dry matter digestibility from the fibre and nitrogen content of a feed. *In Feed Information and Animal Production*. pp. 395-8. (CAB: Farnham Royal, UK.)
- SCA (1990). Feeding Standards for Australian Livestock: Ruminants. (Ed. J.L. Corbett). (CSIRO: Melbourne.)