

OVERCOMING SEASONAL DEPRESSION IN WOOL PRODUCTION IN ROMNEY MARSH EWES BY FEED SUPPLEMENTATION

D. J. COTTLE^a and R. R. CARTER^b^aDept of Wool and Animal Science, University of New South Wales, P.O. Box 1, Kensington, N.S.W. 2033.^bBayer Australia Ltd, P.O. Box 903, Pymble, N.S.W. 2073.

SUMMARY

Wool production in Romneys decreases markedly during the winter. Romney ewes were fed a proprietary supplement (S2) with or without a specially formulated supplement (S1) containing 'bypass' protein, methionine hydroxy-analogue and bentonite during the autumn and winter. Liveweight change, fleece characteristics and plasma nutrient levels were measured. Staple strength was increased and winter wool production was increased by feeding S 1 in the autumn rather than during the winter.

Keywords: Romney, photoperiod, protein, methionine, wool.

INTRODUCTION

Kempton (1979) stated that the optimum quantity of protein digested in the small intestine per unit of metabolizable energy in pregnant and lactating Merino ewes for wool growth was 14–15 g/MJ. Pastures generally do not supply sufficient rumen 'bypass' protein and supplements such as cottonseed meal can be fed to overcome this deficiency (Cottle 1988a, 1988b).

Wool protein has a high cyst(e)ine content. DL-methionine can be metabolised to cysteine, but when added to the diet of sheep is readily degraded in the rumen (Cottle and Velle 1989). Protected methionine supplements such as methyl and ethyl esters of methionine hydroxy analogue (MHA, Monsanto, USA) have produced a positive wool growth response in Merinos (Ferguson 1975), while mixed responses have occurred with MHA (Cottle 1988b, 1988c; Reis 1979).

Bogdanovic *et al.* (1990) showed wool growth and staple strength responses to supplementation with a rumen stable methionine when Merino wethers were fed a sub-maintenance ration of pasture hay associated with liveweight loss. Responses in wool growth also occurred in sheep with low basal rates of wool growth when they received 2-hydroxy-4-methylthio-butanoic acid or DL-methionine (Stephenson *et al.* 1990, 1991).

Wool growth in Romneys is affected by photoperiod with the summer:winter growth ratio being about 4:1 (Hawker *et al.* 1984). The aim of this paper was to evaluate whether a supplement containing 'bypass' protein, MHA and bentonite could better overcome the seasonality of wool growth in Romneys when fed during autumn and/or winter in New Zealand, compared to a proprietary mix.

MATERIALS AND METHODS

Two hundred Romney ewes, mated in March-April, were randomly allocated to 4 groups and run on pasture at Selwyn Stud, Canterbury, New Zealand. The groups were run at conservative stocking rates with the aim of reducing pasture intake differences between paddocks. The groups were allocated to 1 of 2 rations in each of 2 periods. The rations were fed in troughs every second day. Period 1 (autumn) was from 28 March-29 May. Period 2 (winter) was from 29 May-28 July.

The specially formulated supplement (S 1, Bayer Aust. Ltd) contained 50% cottonseed meal, 33% sorghum, 8.8% urea, 6% MHA and 2.2% Na Bentonite. Supplement 2 (S2, Integrity Feeds) was a proprietary feed and contained barley, wheat, bran, Pollard, lime, vitamins and minerals. S2 was fed at a level determined as normal commercial practice by the stud manager. From a proximate analysis the estimated N contents of supplements 1 and 2 were 8.1 and 2.2% respectively while the ME contents were 11 and 13 MJ/kg DM respectively. From 28 March-28 April both supplements were fed at 100 g/head.day. From 28 April-27 June, 50 g/head.day of S2 was added to the S1 ration due to liveweight loss in the S1 group and a suspected lower energy intake. From 27 June-28 July a further 50 g/head.day of S2 was added to both rations fed in the previous month, because lambing was approaching.

The ewes were weighed monthly. Dyebands were applied at the start and finish of both periods. Blood samples were taken at the finish of both periods. Sheep were shorn on 15 November. Fleece weights (minus bellies) were recorded and midsides and dyeband samples collected. Clean fleece production in the 2 periods was estimated from yield and dyeband measurements. Staple length, strength and fibre diameter were measured on wool from the combined periods between the first and last dyebands.

The main effects of S1 and S2 rations and their interaction were fitted in a linear model using least squares:

$$y = u + P1 + P2 + P1*P2 + LWT + \text{Error}$$

where y is dependent variable, (e.g. fibre diameter), u is fitted mean, P1 is ration in period 1 (autumn), P2 is ration in period 2 (winter), LWT is liveweight for appropriate period.

Although the S1 ration also contained S2 for half of period 1 and all of period 2, it is referred to as the S1 ration.

RESULTS AND DISCUSSION

In autumn sheep fed the ration formulated to increase the supply of protein and methionine to the intestines (S1) produced the same amount of wool as those fed S2 (see Table 1) but subsequently produced more clean wool in winter (9.3 v. 7.1 g/day, $P < 0.001$). The type of supplement fed in winter did not significantly affect the rate of winter wool growth. The seasonal (autumn:winter) wool growth ratio for sheep fed S1 in autumn and winter was 1.36, when fed S1 in autumn and S2 in winter was 1.29, when fed S2 in autumn and S1 in winter was 1.70, and when fed S2 in autumn and winter was 1.89. Thus seasonality in wool growth was lower in sheep fed the S1 ration in autumn regardless of the ration fed in winter. This was reflected in the staple strength of wool (Table 2) which was higher in sheep fed S1 in autumn (33 v. 25 N/ktex, $P < 0.05$). Sheep fed S1 in winter had a non-significantly higher staple strength (31 v. 26 N/ktex, $P < 0.15$). As the wool from these mated ewes was marginal for tenderness (< 30 N/ktex) the improvement in strength has technical significance.

The higher cost of feeding S1 during autumn compared to the stud's normal supplementary feeding programme (S2) would not be recovered from the premium for strength and the additional wool grown during the 4 month period (0.2 kg).

Table 1. Least squares means for liveweight change, wool growth and plasma urea, glucose and protein concentrations during autumn and winter in Romney ewes given specially formulated (S1) or conventional (S2) supplements

Means in the same column and period with different letters are significantly different ($P < 0.05$)

Ration		Liveweight change (g/day)	Clean wool (g/day)	Plasma urea (mmol/L)	Plasma glucose (mmol/L)	Plasma protein (g/L)
Autumn	Winter					
<i>Autumn</i>						
S2		-81a	12.8a	8.15a	3.33a	74.4a
S1		-76a	12.3a	6.51b	3.50a	80.7b
<i>Winter</i>						
S2	S2	167a	6.6a	7.43a	2.81a	77.5a
S1	S2	112b	9.8c	7.90a	3.58b	82.0a
S2	S1	89c	7.7ab	9.11b	2.56a	78.8a
S1	S1	96bc	8.8bc	9.66b	2.83a	79.6a

Table 2. Least squares means for the total trial period for liveweight change, wool growth and fleece characteristics of ewes given a specially formulated supplement (S1) or a conventional supplement (S2)

Means in the same column with different letters are significantly different ($P < 0.05$)

Ration		Liveweight change (g/day)	Clean wool (g/day)	Fibre diameter (μ m)	Staple length (mm)	Staple strength (N/ktex)
Autumn	Winter					
S2	S2	38.2a	9.6a	37.9a	130.2a	23.2a
S1	S2	9.8b	11.2b	38.9a	134.9ab	29.7ab
S2	S1	6.3b	10.4ab	38.6a	140.7b	26.2a
S1	S1	15.6b	10.4ab	38.6a	135.6ab	36.0b

Sheep fed S2 throughout the trial had the highest bodyweight gain and the lowest wool growth. In comparison sheep fed S1 in autumn and S2 in winter produced significantly more wool with a lower liveweight gain. Hence the response from S1 was directed towards wool growth rather than body weight. This could not be attributed to any single component in the supplement and so the mechanism of the response was unclear. The plasma urea, protein and glucose levels (Table 1) did not help resolve the underlying mechanisms involved.

Earlier work has suggested that MHA is not an efficient source of bypass methionine for wool growth (Cottle 1988c). However when large quantities of methionine or methionine analogues are fed (6 g MHA/day in this trial), substantial amounts may reach the intestines (Cottle and Velle 1989). The partially protected protein from cottonseed meal would have contributed to the wool growth response as well (Cottle 1988c). Sodium bentonite can also increase wool growth (Fenn and Leng 1989).

The results suggest that the seasonal variation in wool production in Romneys can best be ameliorated by feeding a supplement containing cottonseed meal, MHA and sodium bentonite in autumn rather than winter. This may be due to a 6-8 week lag in wool growth response to nutrients (Hynd 1982) or to a nutritional effect on photoperiod/follicle interactions in autumn.

ACKNOWLEDGMENTS

The authors wish to thank Dr Ken Geenty, Nigel Chamberlaine and Bryan Bradley for assistance with the conduct of the trial. Financial support was received from Vernon Willey Trust Funds, N.Z. and Bayer Australia.

REFERENCES

- BOGDANOVIC, B., HODGE, R. W. and CROWE, D. W. (1990). *Proc. Aust. Soc. Anim. Prod.* **18**: 457.
- COTTLE, D. J. (1988a). *Aust. J. Exp. Agric.* **28**: 699-706.
- COTTLE, D. J. (1988b). *Aust. J. Exp. Agric.* **28**: 707-11.
- COTTLE, D. J. (1988c). *Aust. J. Exp. Agric.* **28**: 713-8.
- COTTLE, D. J. and VELLE, W. (1989). *Br. J. Nutr.* **61**: 397-408.
- FENN, P. D. and LENG, R. A. (1989). *Aust. J. Agric. Res.* **40**: 889-96.
- FERGUSON, K. A. (1975). *In* 'Digestion and Metabolism in the Ruminant'. (Eds I. W. McDonald and A. C. I. Warner.) pp. 448-64. (Univ. New England: Armidale.)
- HAWKER, H., CROSBIE, S. F., THOMPSON, K. F. and McEWAN J. C. (1984). *Proc. Aust. Soc. Anim. Prod.* **15**: 380-3.
- HYND, P. I. (1982). Ph.D. Thesis, University of Adelaide.
- KEMPTON, T. J. (1979). *In* 'Physiological and Environmental Limitations to Wool Growth' (Eds J. L. Black and P. J. Reis.) p. 209. (Univ. New England: Armidale.)
- REIS, P. J. (1979). *In* 'Physiological and Environmental Limitations to Wool Growth'. (Eds J. L. Black and P. J. Reis.) p. 223. (Univ. New England: Armidale.)
- STEPHENSON, R. G. A., SUTER, G. R., PRITCHARD, D. A. and MARTIN, M. D. J. (1990). *Aust. J. Exp. Agric.* **30**: 477-82.
- STEPHENSON, R. G. A., SUTER, G. R. and HOWITT C. J. (1991). *Aust. J. Exp. Agric.* **31**: 471-7.