EFFECT OF PRE AND POST-NATAL GRAIN SUPPLEMENTS ON WOOL QUALITY

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SUMMARY

A factorial experiment was conducted using 360 medium woolled Merino ewes to study the effects of three pre and three post-lambing oat and lupin grain supplements on wool quality of autumn lambing ewes in the mediterranean climate of Western Australia. Pre-lambing feed treatments (2-400 g/hd/d oats, 175-344 g/hd/d and ad libitum oat/lupin ([50:50]) had no significant effect on fibre diameter or staple length. The ad libitum oat/lupin increased ($P < 0.05$) staple breaking force. Post-lambing feed treatments of ad libitum oats and oat/lupin (50:50) produced wool which was thicker ($P < 0.05$) and longer ($P < 0.01$) than 400 g/hd/d oats. Ad libitum oats increased ($P < 0.01$) staple breaking force over ad libitum oat/lupin and 400 g/hd/d oats which were not significantly different from one another.

INTRODUCTION

Wool tenderness is a problem in Western Australia with 7 per cent of fleece wool being classed as tender in a normal season. The reduced staple strength of tender wool is a result of a nutritionally induced fibre thinning over summer and autumn (Stewart et al. 1961). This problem is likely to expand because of an increase in the proportion of autumn lambing ewes within the State flock and the poorer pastures resulting from an increased proportion of the farms sown to cereals. In 1984 staple breaking force (SBF) will be included in measurements used to describe wool prior to sale. An objective grading of staple strength will offer farmers a financial incentive to increase late summer/autumn wool growth and thus the SBF of their clips.

Wool growth is largely determined by the nutritional status of the animal and under field conditions it is likely that the intake of metabolizable energy is the main controlling factor (Allden 1978). However if protein passes through the rumen undegraded there are large responses to protein with only small increases due to energy (Black et al. 1973). Lupins may act as a supply of bypass protein with some 35% of the protein passing through the rumen undegraded (Hume 1974). Therefore while supplementation with cereal grain should stimulate wool growth, and thus increase staple strength, the addition of lupins may promote wool growth even further. This paper reports the results from the first year of a three year experiment to investigate the effect of supplementation on the wool production of autumn lambing ewes in the mediterranean climate of Western Australia.

MATERIALS AND METHOD

Experimental

Two replicates of a factorial design (3 x 3; n = 20; N = 360) were used to examine the effects of three pre and three post-lambing supplementary feed treatments. The first two pre-lambing supplements were calculated to give rations of similar metabolizable energy (based on ME values, oats 10.1 MJ/kg, lupins 13.5 MJ/kg); ad libitum treatments were fed out in self feeders.

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Pre-lambing (March 31 to April 27) supplementary feed treatments -
- Supp. oats - 200 g/hd/d for two weeks and then 400 g/hd/d.
- Supp. Oat/lupin (50/50) - 175 g/hd/d for two weeks and then 344 g/hd/d.
- Ad lib. Oat/lupin (50/50) - mean daily consumption of 1250 g/hd.

Post lambing (April 28 to July 13) supplementary feed treatments -
- Supp. Oats - 400 g/hd/d.
- Ad lib. Oats - mean daily consumption of 1500 g/hd.
- Ad lib. Oat/lupin (50/50) - mean daily consumption of 1700 g/hd.

Grazing and supplementation

The experiment was conducted at the Mt Barker Research Station approximately 330 km south west of Perth, Western Australia. Unseasonal rain (151 mm) in January resulted in green feed which persisted on the experimental area until spraying with a herbicide on March 1. The resulting abundant dry matter was heavily stocked with non experimental sheep to produce a more typical end of summer dry pasture residue. Some pasture germination occurred following subsequent rainfall in March, but green feed available to the sheep at the time of stocking the 18 two ha experimental plots on March 30 and through to mid-July was insufficient to maintain ewe live weights.

All ewes were stocked as one mob from mating and received a supplement of 100 g oats/hd/d for the two weeks immediately prior to the experimental supplementary feeding.

Samples of the grains fed had respectively in vitro digestibility and crude protein (N x 6.25) tests of 65 per cent and 10.5 per cent for the oats and 91 per cent and 31.2 per cent for the lupins.

Sheep

The experimental sheep comprised 360 mixed aged (3-S years old) medium woolled Merino ewes selected as pregnant to a 15 day joining of a flock of 1200 ewes. The sheep had been shorn in October the previous year.

The ewes were allocated at random to one of 18 experimental groups from within each age class and period of service (service observations were made on days 8, 12 and 15 following the commencement of joining on November 18).

The mean date of lambing was April 22 (s.d. = 5 days). Overall there were 301 single and 55 twin bearing ewes with no significant difference between treatments in the number of ewes with twins.

The mean liveweight for the ewes at the commencement of the experiment was 52.5 kg (s.d. = 5.5) with no significant difference between treatments.

Measurements

Ewes were weighed off pasture prior to their introduction to the experimental plots on March 30 and then in the plots on May 5 (post lambing) and June 6 (approx. 6 weeks post lambing).

Ewe lambing records were obtained with lambs being tagged and weighed on day of birth. Fleece weights (plus bellies) were measured for all ewes at shearing on October 1. To measure changes associated with supplementary feeding a skin level band of dye (Williams and Chapman 1966) was laid in the midside wool of each ewe on March 30. This wool was taken from the fleece at shearing and four dye-banded staples from each midside sample were used for the measurement of staple length and strength (Baumann 1981). The remainder of the sample was used for the determination of washing yield (AWTA Automatic Scourer) and mean fibre diameter (Sonic Fineness Meter Model A).

Staple strength in force per unit thickness (Newtons per ktex) was obtained by measuring the staple thickness in the section immediately tip side of the dye-band and holding the staple at the dye-band and butt in the jaws of the Breaking Force Gauge; then breaking the staple.

Statistical analysis

Resulting data were examined by analysis of variance; number of twin and single bearing ewes in each treatment were analysed by the Chi-square test.

RESULTS

The ewe liveweight and wool production results are summarised in Table 1.

Ewe liveweight

Pre-lambing ad libitum oat/lupin increased liveweights on May 5 ($P < 0.001$) and June 2 ($P < 0.01$); there was no difference at other times between oats or oat/lupin supplements.

Post-lambing ad libitum feeding increased liveweight on May 5 ($p < 0.01$) and June 2 ($P < 0.001$); oat/lupin was heavier ($P < 0.05$) than oats on June 2.

The interaction of pre-lambing x post-lambing feeding on ewe liveweight was not significant.

TABLE 1 Effect of pre-lambing (4 weeks) and post-lambing (11 weeks) feed supplements on ewe liveweight and wool production characteristics

	Ewe liveweights 5/5 (kg)	Ewe liveweights 2/6 (kg)	Staple breaking force (N/ktex)	Greasy fleece weight (kg)	Mean fibre diameter (μm)	Staple length (mm)
Pre-lambing (n = 120)						
Supp. Oats	44	44	34	4.5	23.3	45
Supp. Oat/lupin	43	44	31	4.6	23.2	45
Ad lib. Oat/lupin	49	48	38	4.8	23.1	47
Post-lambing (n = 120)						
Supp. Oats	43	40	30	4.3	22.7	42
Ad lib. Oats	46	47	40	4.7	23.5	47
Ad lib. Oat/lupin	47	50	33	4.9	23.5	48
L.S.D. (0.05 level)	2	2	4	0.2	0.7	2

Wool production characteristics

Pre-lambing feeding ad libitum oat/lupin resulted in higher ($P < 0.05$) SBF and greasy fleece weight compared with the Supp. Oats treatment; there was no significant difference between the supplements of oats or oat/lupin. Washing yield, mean fibre diameter and staple length, were not significantly different between pre-lambing treatments.

Post lambing feeding ad libitum oats gave higher ($P < 0.01$) SBF than either 400 g/hd/d oats or ad libitum oat/lupin. The mean greasy fleece weight was greatest ($P < 0.001$) with ad libitum oat/lupin, which in turn was greater ($P < 0.05$) than ad libitum oats. The ad libitum feeding also increased mean fibre diameter ($P < 0.05$) and staple length ($P < 0.01$). There was no difference between treatment mean washing yields.

The interaction of pre-lambing x post-lambing feeding on wool production characteristics was not significant.

DISCUSSION

Post-lambing ad libitum feeding has given a 12% increase in greasy fleece weight over 400 g/hd/d oats. This increase was due principally to staple length rather than fibre diameter which is a definite processing and financial advantage. The addition of lupins to this ad libitum feed has increased wool production and ewe live weight. However the different intakes with the ad libitum feed treatments mean that the effect cannot be differentiated between an energy or protein response. The pre-lambing feed treatments appear to indicate that the response is more to metabolizable energy than protein in that the addition of lupins to the isojoulic supplements showed no benefit in either ewe liveweight or wool production. This may not be the case when feeding is over a longer period or the dry paddock residue is more typical of the annual prolonged dry season experienced in Western Australia.

Taking into account the increase in staple length and fibre diameter there was an unexpected lack of response to post-lambing ad libitum oat/lupin in SBF when compared with 400 g/hd/d oats. While this result is noted and further research is required to determine its reality and possible cause it is not inconsistent with results reported by White et al. (1978) where short term wool growth rate was in some cases negatively correlated with energy intake.

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