

INTAKE AND PRODUCTION OF LAMBS FED RATIONS OF OATS WITH VARYING AMOUNTS OF LUPINS

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SUMMARY

At Rutherglen Research Station, seven groups of three lambs were fed *ad lib.* seven rations with different ratios of oats to lupin grain (0:6, 1:5, 2:4, 3:3, 4:2, 5:1 and 6:0) with 10% hay. Liveweight gains, intakes of dry matter (DM) and digestible DM and wool growth were directly related to the percentage of lupins in the grain diet. For the eleven weeks of the experiment the mean feed conversion ratio was low (3.2) and the mean growth rate high (202 g/day).

INTRODUCTION

Oat grain is the grain most commonly used to feed sheep in south-east Australia. The grain from sweet lupins (*Lupinus angustifolius*), a crop recently introduced, is more digestible and higher in protein than oats, and while it is probably too expensive to completely replace oats as a feed for sheep, it could be worthwhile including some lupins in the substantially oat ration.

This experiment looked particularly at the feeding of young weaned lambs, a practice that may be desirable when pasture is poor. The effect of different proportions of lupins in the rations of lambs fed oats and hay was examined.

MATERIALS AND METHODS

Animals

Twenty-six lambs from Border Leicester x Merino ewes and Dorset Horn rams were weaned on August 26 at 6-7 weeks old and 16-19 kg live weight and put in individual pens. Five lambs were culled in the following four weeks because of low intake and one was removed on October 20 because of ill-health.

Design

Twenty-one lambs were divided into three groups of seven on the basis of intake (high, intermediate or low) during the first four weeks in pens. Lambs were allotted at random within each group to seven treatments of different ratios (0:6, 1:5, 2:4, 3:3, 4:2, 5:1 and 6:0) of lupins to oats in the grain portion of the rations. Treatments were imposed from September 23 - October 20 (period 2). Before and after this treatment period i.e. August 26 - September 22 (period 1) and October 21 - November 14 (period 3) all lambs were offered rations containing oats and lupins in the ratio 1:1. From the measurements of intake and wool growth while lambs were on common rations it was possible to calculate the differences caused by treatment. These differences in intake and wool growth are not subject to as large a variation between animals as the absolute measurements and consequently fewer animals were needed in the experiment. Differences for each lamb were calculated by subtracting the mean of the measurements for periods 1 and 3 from the measurements for period 2. The mean for all lambs in both periods 1 and 3 was added to each difference to obtain "adjusted" values. Liveweight gain was not adjusted as there was no advantage in doing so. It was not possible to adjust measurements applying to the whole period.

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Feeds and feeding

Hay was offered throughout at 10% air-dry weight of grain offered. Hay and each grain were fed in separate containers.

Level of feed offered was adjusted daily so the residue of one grain was 15-30% of the amount of that grain offered. When a lamb was fed two grains, the grain of which a higher percentage was left uneaten was used as a basis to adjust total feed offered.

Lambs were dosed daily with a mineral mix and monthly with anthelmintic and vitamin A.

Measurements

Lambs were weighed at the beginning and end of the experiment after a 24-hour fast, and directly from pens on September 30 and October 20. Wool was dye-banded weekly, beginning on August 26, consecutively on four staples on the mid-back of the lambs. The lengths of the fibres in the staples were measured and growth of wool calculated as described by Kenney (1978) for September 9-23, September 30 - October 21 and October 28 - November 13 in periods 1, 2 and 3 respectively. Lambs were slaughtered on November 15 and carcasses weighed cold the following day.

Faeces from lambs from the two groups of highest intake in period 1 were collected daily for nine days in each period. Collections began 18, 11 and 11 days after feeding began in periods 1, 2 and 3 respectively. Faecal output was related to feed intake two days before for calculation of digestibility. Feed and faecal samples were dried for 24 hours at 100°C for dry matter (DM) determination.

Statistical analysis

Means of data for the three lambs in each treatment were examined using the following model in a multiple regression analysis.

$$y = a + bL + cL^2$$

where for period 2, y represented liveweight gain, and adjusted values for intake of DM (DMI) and digestible DM (DDMI) (g/day) and wool growth (µm/day) in separate equations, and L was lupins as a percentage of grain consumed in period 2. This coefficient was retained where significant ($P < 0.05$); it did not occur for the quadratic term.

Liveweight gain, DML, carcass weight, wool growth and feed conversion rate (FCR, feed to liveweight gain) for all the periods of feeding (August 26 - November 14) were examined in a similar manner. In this case L in the equation represented the intake of lupins as a percentage of grain consumed for all the periods of feeding

RESULTS

Liveweight gain and adjusted values for DMI, DDMI and wool growth for period 2 all increased linearly with the increase in percentage of lupins in the grain diet for that period ($P < 0.05$). The four equations were:

Liveweight gain (g/day)	$y = 247 + 0.71L$	$(R^2 = 0.57)^*$
DMI (g/day)	$y = 629 + 3.01L$	$(R^2 = 0.94)^{**}$
DDMI (g/day)	$y = 420 + 3.43L$	$(R^2 = 0.97)^{**}$
Wool growth ($\mu\text{m/day}$)	$y = 461 + 0.84L$	$(R^2 = 0.72)^{**}$
	* $P < 0.05$	** $P < 0.01$

DMI and liveweight gain for the whole period (August 16 to November 14) and carcass weight increased linearly with the mean percentage of lupins in the grain diet for all the periods ($P < 0.05$) but FCR and wool growth did not ($P > 0.05$).

The three equations were:

DMI (g/day)	$y = 363 + 2.86L$	$(R^2 = 0.95)^{**}$
Liveweight gain (g/day)	$y = 139 + 1.19L$	$(R^2 = 0.94)^{**}$
Carcass weight (kg)	$y = 12.0 + 0.05L$	$(R^2 = 0.79)^{**}$

The mean FCR for the whole experiment was 3.2.

At the end of the experiment the 20 lambs slaughtered had carcasses over 12 kg and 18 of these lambs were over 30 kg live weight.

DISCUSSION

The exclusion of 5 out of 26 (19%) of the lambs because of low intake in the early weeks may have reduced variation but may also have hidden a problem which would be encountered in general management. However, lambs which remained in the experiment but had eaten little during the first four weeks increased their intakes quickly and ate amounts similar to the other lambs in the final period. It is probable that the excluded lambs would have behaved similarly.

The results of this experiment show that in rations for lambs fed *ad lib.* the replacement of oats with lupins at any level will improve the performance of the lambs. As FCR in all treatments was low, it is necessary only to increase the percentage of lupins in an oat ration to increase intake and therefore liveweight gain to a level sufficient for young lambs to reach slaughter weight in a reasonable time.

The response in wool growth is probably greater than that shown by the study because of carryover effects of previous nutrition i.e. the decline associated with whole oats or the increase associated with 100% lupin has not fully stabilised in the period 2.

When compared with the results in period 2 the measurements for the whole period were low. This is because they include the period immediately post weaning when lambs offered grain rations eat little. Even so, liveweight gain was generally high and FCR low in comparison with other reported results in Australia (Romberg *et al.* 1970; Gillespie and McLaughlin 1977; Hawthorne and Fromm 1977) but are similar to values reported by overseas workers, e.g. Ørskov *et al.* (1974). In experiments in Australia older lambs and rations with high roughage and low protein have generally been used and these factors may have been responsible for the poor performance of lambs. However, it is not possible to define the importance of these various factors in the results of our experiments.

It is clear that many producers have the basic components of rations on which they can raise young weaned lambs to achieve high liveweight gains and low FCR. However, because of the variation in pasture available, cost of grain and value of lambs, the economics of any such project for feeding lambs must be considered in the appropriate context.

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REFERENCES

- GILLESPIE, D.S. and McLAUGHLIN, J.W. (1977). Aust. J. Exp. Agric. Anim. Husb. 17: 393.
- HAWTHORNE, W.A. and FROMM, G.M. (1977). Aust. J. Exp. Agric. Anim. Husb. 17: 230.
- KENNEY, P.A. (1978). Proc. Aust. Soc. Anim. Prod. 12: 168.
- ØRSKOV, E.R., FRASER, G. and McDONALD, I. (1972). Brit. J. Nutr. 27: 491.
- ROMBERG, BARBARA, PEARCE, G.R. and TRIBE, D.E. (1970). Aust. J. Exp. Agric. Anim. Husb. 10: 145.