BARLEY AND FIELD PEAS FOR LOT-FED LAMBS

D.S. BROOK[A], *B.J. tiOSKING*[BC] *and J.H.G. HOLMES*[B]

[A] Longerenong College, University of Melbourne, RMB 3000, Horsham, Vic. 3401
[B] Parkville Campus, University of Melbourne, Parkville, Vic. 3052
[C] Current address: Better Blend Stockfeeds, Oakey, Qld 4401

SUMMARY

The experiment evaluated barley and barley/field pea mix (60:40), as diets for lot-fed lambs, fed daily, or *ad libitum.* The diets fed were: barley 800 g/hd.day; barley *ad libitum;* barley/field pea mix 800 g/hd.day; and barley/field pea *mix ad libitum.* Pasture hay was available *ad libitum* throughout the trial. The grain was introduced over 14 days, and then fed for a further 56 days. There was no significant difference in lamb growth rate between treatments ($P>0.05$), but barley/field pea *mix ad libitum* tended to produce higher growth rate than the other rations (166 vs 143 - 15 1 g/day). Daily dry matter (DM) intake of barley/field pea *mix ad libitum* was significantly higher than barley *ad libitum* (7 19 vs 622 g/day), but there was no significant difference ($P>0.05$) in DM intake:liveweight (LW) gain ratio. Lambs fed barley/field pea mix *ad libitum* had significantly higher carcase weight (CW) gain (6.3 vs 5.0 kg), dressing percentage (45.5 vs 43.9%), and significantly lower DM intake:CW gain ratio (12.5: 1 vs 14.6: 1) compared to lambs fed barley *ad libitum.*

Keywords: lambs, grain, barley, peas, lot-feeding

INTRODUCTION

Consumption of lamb per person in Australia has decreased from 24.0 kg in 1972 to 12.4 kg per person in 1993 and is forecast to decline even further (ABS 1995). This decline has been attributed to lamb being considered too fat, lamb having a poor image, and the supply of high quality lamb being unreliable. This unreliable supply is mainly due to seasonal variation in environmental conditions (Thatcher and Martin 1995).

Lambs not marketed as suckers are usually shorn and carried through to be finished on summer fodder crops, irrigated pasture, or in the sheep/cropping zone on pulse crop stubbles. The quality of these stubbles varies depending on the amount of grain residue. Lot feeding allows year round finishing of lambs and may help reduce the problem of lamb being labelled as inconsistent in quality, and allow the production of a more reliable supply of large lean lambs.

Lot feeding of lambs in the sheep/cropping zone is seen as a means of value adding to low price or second grade grain and, in some years, the opportunity to take advantage of high lamb prices.

The addition of a pulse grain (lupins) to cereal grain diets for intensively fed lambs has been shown to increase feed intake and improve carcase weight (CW) gain efficiency (Kenney 1986).

This experiment was designed to evaluate field peas, the most widely grown pulse crop in the sheep/cropping zone, and barley as rations for lot-fed lambs. It was conducted at Longerenong College, Horsham, Vic. between April and June 1995.

MATERIALS AND METHOD

Animals and their management

Eighty Border Leicester x Merino lambs (28 castrate males and 52 females) approximately 6 months old, with a mean liveweight (LW) of 27.3 ± 0.2 kg were used.

At the commencement of the trial, lambs were drenched with 7 mL of Valbazen (19 mg/mL Albendazole) and 6 mL of Fasinex 50 (Triclabendazole 50 g/L), injected with 5 in 1 vaccine against Clostridial diseases, and with 1mL of a Vitamin A, D and E preparation.

Lambs were penned in the open in groups of 10, with an area allowance of 5 m^2/hd . Grains were fed in troughs 450 mm above ground located on the fenceline inside the pen. Feeding space allowed was 300 mm/hd for lambs fed daily and 150 mm/hd for lambs fed *ad Zibitum.* Hay was provided in a rack in each pen.

Diets and feeding regimes

Two diets were used, (a) barley + hay, and (b) barley/field pea mix (60:40) + hay. Each diet was fed at 2 levels - (I) *ad Zibitum,* and (ii) restricted grain + hay *ad Zibitum.*

Grains were fed whole with 1% sodium bentonite. A molasses calcium mineral supplement block (calcium 11.4%, salt 60% and molasses 5%) was placed in each pen.

The grain portion of the diet was introduced over 14 days with 50 g/hd being fed on day 1, and with the quantity increasing until 800 g/day was being consumed at day 14. The *ad Zibitum* groups were then fed their grain unrestricted.

Table 1. The crude protein (CP), metabolisable energy (ME) and digestible dry matter (DDM) content of the experimental dietary ingredients

Rations	CP (g/kg DM)	ME (MJ/kg DM)	DDM (%)
Barley	112	12.4	84.7
Barley/field pea mix (60:40)	160	12.6	86.2
Pasture hay	124	9.2	66.1

Experimental design and measurements

A factorial design used 2 grains x 2 feeding regimes; barley fed at 800 g/day and *ad Zibitum,* and barley/field pea mix (60:40) fed at 800 g/day and *ad Zibitum.* Lambs in all treatments were offered hay *ad Zibitum.*

Lambs were stratified on sex and LW, blocked, then randomly allocated to 1 of the 4 treatments. Twenty lambs were allocated to each diet and then divided into 2 pens of 10. There were the same number of each sex in all treatments.

Lambs were weighed weekly 3 hours off feed. The quantity of grain consumed was recorded, and hay consumed was estimated allowing for wastage. Feed residues in daily fed groups were collected and weighed before feeding. Grain was added to -the *ad Zibitum* treatments as required.

At the commencement of the trial the dressing percentage of the lambs was estimated to be 42% by a Level 1 accredited CALM lamb assessor. 'This figure was used to calculate CW gain and CW gain efficiency. At slaughter the carcases were weighed, and fat depth measured at the GR site (100 mm from backbone over the 12th rib).

The crude protein, metabolisable energy and digestible dry matter content of the grains and hay were estimated from data obtained by near infra red spectroscopy by Agriculture Victoria in their FEEDTEST programme (Table 1).

Statistical analysis

The effects of ration and feeding regime were analysed by analysis of variance. Within treatment effects of sex were analysed separately using analysis of variance general linear model (Ryan and Joiner 1994), and differences noted in the text.

RESULTS

Dry matter intake

Lambs had a significantly higher daily DM intake of barley/pea mix *ad Zibitum* than barley *ad Zibitum,* but there was no significant difference in the daily DM intake of hay or in the total daily DM intake (Table 2). There was no significant difference ($P>0.05$) in DM intake:LW gain ratio between treatments.

Growth rate

There was no significant difference in growth rate of lambs between treatments, but lambs fed barley/pea *mix ad Zibitum* tended to achieve higher growth rate than those on the other rations (Table 2). There was no significant difference in growth rates between castrate males and females within treatments.

Carcase weight gain and fat depth

Lambs fed barley/field pea *mix ad Zibitum* had significantly higher CW gain and dressing percentage, and significantly reduced DM intake:CW gain ratio, compared to lambs fed barley *ad Zibitum* (Table 2). There was no significant difference in fat depth between treatments

Table 2. Initial and final liveweights (kg), growth rate (g/day), grain, hay and total DM intake (g/day), DM intake:LW gain ratio, dressing percentage, carcase weight and carcase weight gain (kg), DM intake:CW gain ratio, and fat depth (mm), of lambs fed treatment rations for 70 days

	Barley		Barley/field pea mix (60:40)	
	800 g/hd.day	*Ad libitum*	800 g/hd.day	*Ad libitum*
Initial liveweight	27.5 (0.58)	27.3 (0.45)	27.2 (0.46)	27.3 (0.49)
Final liveweight	37.5 (0.90)	37.5 (0.86)	37.8 (0.89)	38.9 (0.51)
Growth rate	143 (7.7)	146 (9.6)	151 (9.9)	166 (5.1)
Grain DM intake	638 (10.5)^{ab}	622 (29.0)^{a}	648 (0)^{ab}	719 (7.0)^{b}
Hay DM intake	395 (3.0)	418 (2.5)	401 (8.5)	395 (3.0)
Total DM intake	1033 (13.5)	1040 (31.5)	1049 (4.5)	1114 (10.0)
DM intake:LW gain ratio	7.3 (0.45)	7.2 (0.57)	7.0 (0.03)	6.7 (0.24)
Dressing percentage	44.5 (0.36)^{ab}	43.9 (0.30)^{a}	45.6 (0.32)^{b}	45.5 (0.28)^{b}
Carcase weight	16.7 (0.47)^{ab}	16.5 (0.36)^{a}	17.2 (0.39)^{ab}	17.7 (0.26)^{b}
Carcase weight gain	5.2 (0.30)^{a}	5.0 (0.28)^{a}	5.8 (0.30)^{ab}	6.3 (0.19)^{b}
DM intake:CW gain ratio	14.0 (0.57)^{ab}	14.6 (0.49)^{a}	12.7 (0.02)^{ab}	12.5 (0.17)^{b}
Fat depth	11.3 (0.54)	11.6 (0.43)	11.7 (0.48)	12.4 (0.38)

Means in rows with different superscripts are significantly different ($P<0.05$).
Values in parentheses are standard errors of the mean.

DISCUSSION

The inclusion of field peas at 40% with barley fed *ad Zibitum* gave significant increases in grain DM intake and CW gain, and a significant reduction in DM intake:CW gain ratio compared to barley fed *ad Zibitum.* These differences are similar to those shown by Kenney (1986) when lupins were included with barley fed *ad Zibitum.* Lambs fed the barley/field pea mix tended to achieve higher growth rates than those in other treatments, but growth rates in all treatments were less than those in similar trials with cereal grain and protein supplement (Jones *et al.* 1989; Kenney 1986; Orskov and Grubb 1979), and less than that predicted by Bell and Shands (199 1), who suggested that rates in excess of 200 g/day could be achieved using rations of similar energy and protein level. The DM intake:LW gain ratio was considerably higher than the 5: 1 suggested by Easton (1994). Work in the UK suggests that a ratio of between 4: 1 and 5: 1 is possible for lambs lot fed a cereal plus a protein supplement (Jones *et al.* 1989; Orskov and Grubb 1979).

Growth rate between and within treatments was inconsistent throughout the trial with the exception of the lambs fed barley/field pea *mix ad Zibitum.* Both barley groups were observed to go off their feed at times, although there were no observed signs of scouring or digestive upsets in any of the groups. Lambs fed the restricted barley/field pea mix displayed regular feeding behaviour, whereas lambs fed the restricted barley diet were irregular in their eating behaviour, not coming to the trough on some occasions when fed their ration. In observing the feeding behaviour it was noticed that even though there were no shy feeders, on several occasions different lambs on different days did not come to the trough to eat when fed their daily ration. The lambs fed the barley/field pea *mix ad Zibitum* were selective in their eating, often separating out the barley and eating it first and then eating the peas as the trough became emptier.

In this experiment maximum daily DM intake was 3.3% of LW in lambs fed barley/field pea mix *ad Zibitum,* which is less than potential DM intake of 3.5% to 4% of LW as predicted by Bell and Shands (1991) for lambs of similar weight. Intake may have been reduced by offering hay *ad Zibitum* to lambs separate to the grain. Hay formed a high proportion of the lambs' diets (34 to 38%) compared to an inclusion rate of 10% in a similar trial (Kenney 1986) and the recommended inclusion rate of 10-20% (Bell and Shands 1991), and may have contributed to the reduced intake, lower growth rates, poor weight gain efficiency and high variability of growth rates.

Our results suggest a maximum intake of barley where hay is offered ad *Zibitum* of around 800 g/day for lambs around *35* kg LW. The *ad Zibitum* barley group actually consumed slightly less than the group fed daily. Grain may become stale, soiled and less palatable when fed *ad Zibitum.*

At slaughter more than 50% of the livers were found to be necrotic. It was not possible to match the damaged livers to individual lambs, but liver damage may have been a contributing factor to the variable growth rates. Cause of the necrosis was not diagnosed but possible reasons include an earlier liver fluke

infestation, although no fluke were present at slaughter, or possible tissue damage as a result of high grain feeding. Cattle have been shown to suffer liver abscesses following rumenitis which could be the result of fermentation of abnormal amounts of carbohydrate in the rumen (Hungerford 1990).

Barley can be used as a ration for lot fed lambs, but growth rates will not be as high as desired in a feed lot situation. The inclusion of field peas with barley may give higher growth rates, but the economic use of either or both grains will be dependent on grain prices, returns for lambs and the DM intake:LW gain ratio. If possible, hay should hammer-milled and mixed with the grain to enable a calculated and controlled intake. Feeding rations *ad Zibitum* offers an easier management system, whilst possibly achieving higher DM intake and growth rate.

REFERENCES

ABS (1995). "Apparent Consumption of Foodstuffs and Nutrients - Australia 1992-93" (Australian Government Printing Service: Canberra).

BELL, A.K. and SHANDS, C.G. (1991). "Feedlotting Lambs" Agfact A3.5.1 (NSW Agriculture and Fisheries: Sydney).

EASTON, W.L. (1994). "Opportunity Lotfeeding of Lambs" (Agmedia: Melbourne).

HUNGERFORD, T.G. (1990). "Diseases of Livestock", 9th ed. pp. 444-5 (McGraw-Hill Book Company: Sydney).

JONES, R., KNIGHT, R. and WHITE, A. (1989). *In* "Recent Advances in Animal Nutrition, 1989" (Eds W. Haresign and D. J. A. Cole) pp. 195-208. (Butterworths: London).

KENNEY, P.A. (1986) *Aust. J. Exp. Agric. 26: 279-84.*

ORSKOV, E.R. and GRUBB, D.A. (1979). *Anim. Prod. 29:* 371-7.

RYAN, B.F. and JOINER, B.L. (1994). "MINITAB Handbook", 3rd ed. (Duxbury Press: California).

THATCHER, L. and MARTIN, G. (1995). "Securing a brighter future for lamb" (L.P. Thatcher & Associates: Rutherglen).