LUPIN, PEA AND WHEAT GRAIN AS SUPPLEMENTS FOR YOUNG MERINO SHEEP GRAZING WHEAT STUBBLE

P.W. MORCOMBE and J. FERGUSON***

SUMMARY

Lupin and pea grain, fed as a supplement at 0.1, 0.2, 0.3, 0.4 and 0.5 kg/d to young Merino sheep grazing wheat stubble were used more efficiently than wheat grain during the first five weeks following the introduction of the supplement. The ratio of supplement fed to liveweight gained (kg/kg) in this period was 3.63 for lupins and 5.18 for peas both of which were significantly better than that for wheat, 45.08 ($P<0.05$). During the next six weeks the efficiency of utilization of the lupins and peas declined to 8.24 and 9.41 respectively, while that for wheat improved to 12.00.

INTRODUCTION

Whole grain supplements of cereals or legumes are fed in summer and autumn to young sheep on most farms in the wheat growing areas of Western Australia. Processing of the grain is not required for acceptable levels of digestibility (Orskov 1980), however when first introduced or if fed at infrequent intervals grains with high levels of starch may cause lactacidaemia, scouring and inappetance (Dirksen 1970).

The most appropriate grain to feed to sheep is determined by the efficiency with which it is utilized, its ease of use, freedom from digestive upsets, and cost. Rowe et *al.* (1989) measured changes in young wethers grazing wheat stubbles when fed various levels of barley, oat and lupin grain supplements. In addition to these commonly used supplements, wheat and pea grain are available and in some years lower prices may make them economically attractive to feed to sheep.

This paper reports an experiment measuring the liveweight changes and wool production of young Merino sheep fed six different levels of either pea, lupin or wheat grain under a similar regime as used by Rowe *et al.* (1989).

MATERIALS AND METHOD

One hundred and twenty six 7 to 8 month old Merino sheep were weighed and the weights used to allocate the sheep systematically to 18 groups. The treatments - three types of grain supplement (pea, wheat or lupin) fed at five levels of intake (0.1, 0.2, 0.3, 0.4 *or* 0.5 kg/hd/d) - were randomly allocated to the groups of sheep. The remaining three groups were not fed a supplement until weight declined to 80% of starting weight from which time they were fed 0.3 kg/hd/d of oats.

A wheat crop (cv. Eradu) grown on the Wongan Hills Research Station yielded 1.4 t/ha of grain at harvest prior to being grazed by ewes (7/ha) for six weeks and then fenced into eighteen 0.7 ha plots. Seven experimental sheep grazed on each plot from 20/1/87 for 112 days and then communally on pasture until shearing in October. The grain supplements were trailed out on the ground in daily increments of 50 gm until all groups were being fed their designated level from which time on the grain was fed twice weekly.

Initial and final yields of wheat stubble DM were estimated from 50, 0.25 m^2 quadrats. The in *vitro* digestibility (IVDMD) and nitrogen content of a

* *Department of Agriculture, South Perth, W.A. 6150.*
** *Department of Agriculture, Wongan Hills, W.A.* 6603.

subsample of the stubble material and of each of the grain supplements were determined by standard techniques. The sheep were weighed weekly while grazing the experimental plots and the fleeces were weighed at shearing.

RESULTS

The plant material present *in* the wheat stubble declined from 2.9 t/ha to 1.6 t/ha on 14/5/87. The IVDMD and crude protein content declined from 49.5% and 2.4% to 48.4% and 2.6% respectively. The crude protein content of the lupins, peas and wheat were 30.1%, 26.2% and 11.6% respectively.

Initially some of the sheep fed wheat and peas did not eat all of their ration and two sheep fed wheat had diarrhoea. *Over* the first 14 day period, during which the sheep were gradually introduced to their grain supplements, all sheep lost weight. By 12/3/87 (day 51), the unsupplemented sheep had lost nearly 5 kg of live weight and were subsequently fed 0.3 kg/hd/d of oats. These sheep were not included in further analyses. Four sheep fed wheat were removed from their plots because of excessive weight loss and one of the control sheep died. Replacement sheep were used to maintain the grazing pressure. Rainfall in late April caused a sparse germination during the final three weeks of the grazing period and all sheep, except those fed wheat at 0.4 and 0.5 kg/hd/d, lost weight in this period. This was apparently associated with the consumption of sprouted wheat grain which had been trampled into the ground,

The liveweight changes of the sheep fed 0.3 kg/hd/d and 0.5 kg/hd/d during the period of stubble grazing are presented in Fig. 1. The regression equations describing the relationship between the weight change (Y, g/d) of the sheep within the 35 day period following the introduction of the full grain allowance and the levels of supplementation (X, kg/d) are as follows:

$$\text{Lupins } Y = -45.2 + 388.3\,X;$$
$$\text{Peas } Y = -45.2 + 308.3\,X;$$
$$\text{Wheat } Y = -45.2 + 133.7\,X.$$

Table 1 Ratio of supplement fed to liveweight gain (kg/kg) (for those levels of intake (kg/d) which resulted in a gain) of young sheep grazing wheat stubble measured for different periods of time

Supplement	Level of intake	Feed/liveweight gain
February 5 to March 12		
Lupins	0.2, 0.3, 0.4, 0.5	3.63[a]
Peas	0.1, 0.2, 0.3, 0.4, 0.5	5.18[a]
Wheat	0.2, 0.4, 0.5	45.08[b]
March 12 to April 23		
Lupins	0.3, 0.4, 0.5	8.24[a]
Peas	0.2, 0.3, 0.4, 0.5	9.41[a]
Wheat	0.3, 0.5	12.00[a]
April 23 to May 14		
Lupins		
Peas		
Wheat	0.4, 0.5	7.1

Values with different superscripts within the same period differ significantly ($P<0.05$)

There was a significant difference between the coefficients of liveweight change for each of the grain types ($r = 0.90$, $P<0.01$). This is also evident from an examination of the ratio of grain intake : liveweight gain presented in Table 1. In this period sheep fed lupins and peas gained significantly more weight per unit of supplement than did sheep fed wheat. There was no significant difference between the annual greasy fleece production (Y, kg) of the sheep fed the three grains (X, kg/d). The equation describing this relationship was

$$Y = 3.48 + 1.53\ X\ (r = 0.82,\ P>0.05).$$

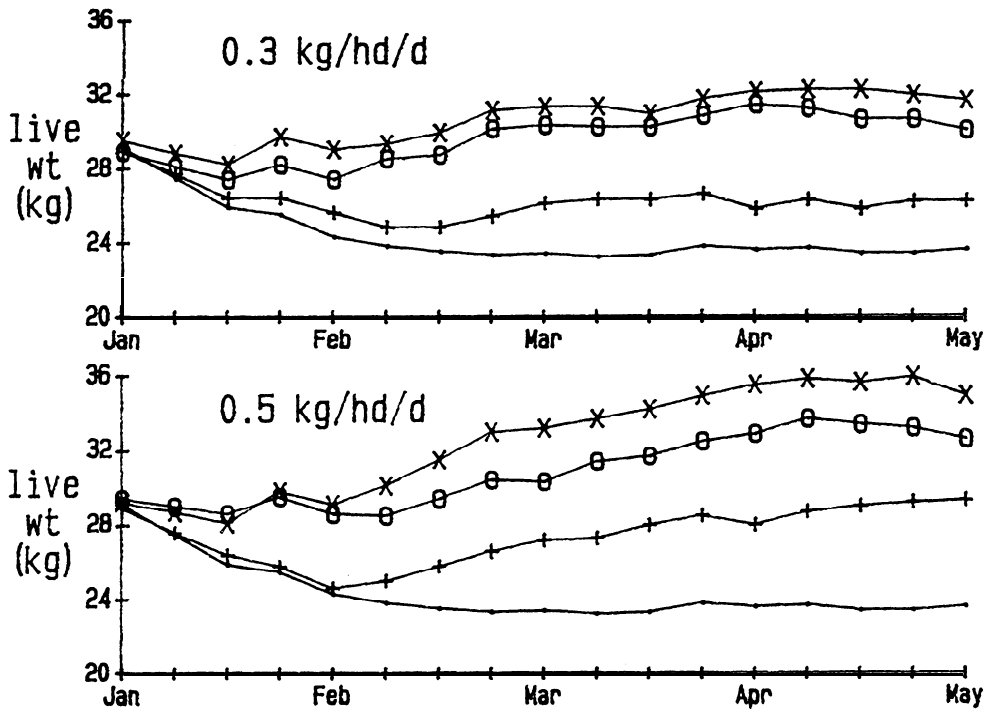

Fig. 1. The mean liveweight change of groups of young sheep fed lupin (x), pea (o), wheat (+) *or no* grain supplement (.) at either a rate of 0.3 kg or 0.5 kg/hd/d while grazing a wheat stubble.

DISCUSSION

Some of the sheep fed wheat grain experienced diarrhoea, a symptom of lactacidaemia resulting from the ingestion of grains with high levels of starch (Dirksen 1970) despite the gradual introduction of the ration. After five weeks the sheep fed wheat *were* not significantly different from those fed the lupins or the peas. Rowe et *al.* 1989 reported a similar finding with barley.

The wheat stubble grazed in this study did not provide an adequate nutritional intake for the control sheep and by day 51 they needed to be fed 0.3 kg/hd/d of oats *to* maintain weight. This contrasts with the wheat stubble of Rowe *et al.* (1989) which maintained the weights of the sheep for 60 days. The IVDMD of

these two stubbles was similar, however, the crude protein content of our stubble, 2.4 g/kg DM, was only half of that reported by Rowe et al. which may have contributed to the poorer performance of our sheep.

The conversion of lupin supplement to live weight during the first five weeks, 3.63, was similar to that reported by Rowe et al. (1979). However, during the next six weeks our sheep required 2.3 times more lupins for the same gain. The poorer utilization of the lupins and peas in this period was most likely due to the sheep substituting supplement for stubble (McClymont 1956). This decline in the efficiency with which the sheep utilize the lupins may be overcome by broadcasting the lupins rather than feeding in a trail (Rowe et al. 1986) and feeding at less frequent intervals (Morcombe et al. 1988).

The lupin and pea supplements were converted by the sheep to live weight more efficiently than was the wheat supplement and at 1990 prices, the lupin is the most cost effective of the three. However, there were no differences in the fleece weights of these sheep when fed equal quantities of the supplements, suggesting that the lupins and peas were not utilized to their full potential for wool growth.

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REFERENCES

DIRKSEN, G. (1970). In "Physiology of Digestion and Metabolism in the Ruminant", p.612, editor A.T. Phillipson. (Oriel Press: Newcastle-upon-Tyne).

McCLYMONT, G.L., (1956). Proc. Aust Soc. Anim. Prod. 1: 63.

MORCOMBE, P.W., RALPH, I.G. and FERGUSON, J. (1988). Proc. Aust. Soc. Anim. Prod. 17: 262.

MULHOLLAND, J.G., COOMBE, J.B., FREER, M. and McMANUS, W.R. (1976). Aust. J. Agric. Res. 27: 881.

ORSKOV, E.R. (1980). Vet. Rec. 106: 399.

ROWE, J.B., BROWN, G., RALPH, I.G., FERGUSON, J and WALLACE, J.F. (1989). Aust. J. Expt. Agric. 29: 29.

ROWE, J.B. and FERGUSON, J. (1986). Proc. Aust. Soc. Anim. Prod. 16: 343.