

PASTURE SPECIES EFFECTS ON ANIMAL PERFORMANCE

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ABSTRACT

Increasing concerns about food quality have resulted in investigations into the effects of different forage species on animal production and carcass quality. Pure species plots of high-endophyte ryegrass (*Lolium perenne* L.), white clover (*Trifolium repens* L.), chicory (*Cichorium intybus* L.), plantain (*Plantago lanceolata* L.) or lotus (*Lotus corniculatus* L.) were established and lambs grazed the species for 120 days during summer. Pasture species influenced growth rate, hot carcass weight, GR, wool growth, faecal egg counts, adult nematodes at slaughter, and sheep meat odour and flavour. Lambs grazing white clover, lotus or chicory outperformed those grazing ryegrass or plantain, and were also fatter.

KEYWORDS

Carcass weight, chicory, flavour, lotus, nematodes, plantain, ryegrass, white clover

INTRODUCTION

Increasing concerns about food quality have resulted in investigations into the effects of different forage species on animal production and carcass quality. Lambs fed traditional ryegrass/white clover (*Lolium perenne* L./*Trifolium repens* L.) pasture do not perform to their full potential because protein supply is sub-optimal (Hughes et al., 1980). Chicory (*Cichorium intybus* L.) has been found to give high animal growth rates (Fraser et al., 1988) as have Lotus species (Purchas and Keogh, 1984); the presence of tannins in these species enhances animal growth rates by protecting the dietary proteins from breakdown in the rumen. Plantain (*Plantago lanceolata* L.) is also reported to contain tannin, have antibiotic properties, and to be highly palatable to stock (Stewart, 1996). There is conflicting evidence on whether plantain and lotus have anthelmintic properties (Robertson et al., 1995). The effect of pasture species on sheepmeat flavour and odour has been the subject of several investigations (e.g., Cramer et al. 1967; Shorland et al., 1970) with conflicting results.

This trial was established to evaluate the effect of pasture species on animal productivity, carcass quality and sheep meat odour and flavour.

MATERIALS AND METHODS

Three replicates of five pasture species (high-endophyte ryegrass (*Lolium perenne* L. cv. Grasslands Nui), white clover (*Trifolium repens* L.) cv. Grasslands Huia, chicory (*Cichorium intybus* L.) cv. Grasslands Puna, plantain (*Plantago lanceolata* L.) cv. Grasslands Lancelot and *Lotus corniculatus* L. cv. Grasslands Goldie) were established on a Templeton silt loam (Udic ustrochrept) in October 1992. Plot size was 0.5 ha. Irrigation was applied to keep soil moisture above 50 % field capacity. Nitrogen fertiliser (50 kg/ha N as urea) was applied in spring and early summer (total = 100 kg/ha/yr). Soil analysis in year two indicated: pH 6.0, Ca 15, K 27, P 31, Mg 30, S 13 units

The trial was grazed during the summer and early autumn each year from 1993 to 1995. Twenty Coopworth ram lambs (22-23 kg mean 24 h-fasted live weight in both years of the trial) from the same genetic base were weaned, shorn and, after a ten-day adjustment

period, were allocated to each treatment at a herbage allowance of approximately 2.0 kg DM/head/day. Extra non-trial lambs were added when necessary. Lambs were rotationally grazed with no more than 7 days on any break. Excess residual herbage was removed to approximately 5 cm. Regrowth periods were between 28 and 35 days. Grazing started in mid-November in year one and early December in year two; grazing continued for 120 days, immediately after which lambs were slaughtered.

Faecal egg counts were made on samples collected from the rectum each time lambs were moved to a new break; data presented are an average across time. Fasted (24 hour) live weights and carcass weights were obtained at the end of the trial. Animal growth rates were calculated from fasted weights. The weight of greasy wool grown was determined by shearing all lambs at the start of the trial and ten days prior to slaughter.

GR (tissue depth over the 12th rib, 11 cm from the midline of the spine) was measured with a sharpened stainless steel ruler. At slaughter in year two the abomasum and 6 m of intestine were recovered from five lambs per treatment for adult nematode count (Knight et al., 1996) and meat was subjected to sensory analysis (Fraser et al., 1996)

RESULTS AND DISCUSSION

In both years of the trial, lambs grazing chicory, white clover or lotus had higher growth rates, hot carcass weights, GR and wool weights than lambs grazing ryegrass or plantain (Tables 1 and 2). Faecal egg counts were highly variable, but adult intestinal nematodes were significantly fewer in lambs grazing chicory, white clover or lotus than in those grazing ryegrass or plantain (Table 2). Whether this is an anthelmintic effect or a reflection of fast-growing lambs having more resistance requires further investigation.

Lambs fed on white clover had a significantly stronger sheep meat odour than lambs fed on ryegrass or plantain, but pasture type did not influence the intensity of the sheep meat flavour (Table 2). Lambs fed on white clover or lotus also had significantly greater foreign odour and foreign flavours than lambs fed on ryegrass, plantain or chicory. As the possible effect of pH on odour and flavour had been taken into account in the tasting trial design, it can be concluded that although the ultimate pH of lamb meat was significantly affected by pasture type; pasture type had no significant effect on sheepmeat flavour intensity.

CONCLUSIONS

Although species affected growth rate and fat content, there appeared to be an inverse relationship with carcass quality: larger lambs had more fat. Pasture species affected adult nematode numbers and also influenced, sheep meat odour, foreign odours and flavours, but did not affect sheep meat flavour.

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Table 1

The effect of pasture species on animal production and carcass quality in year one

	Chicory	Plantain	White clover	Lotus	Ryegrass
Growth rate (g/hd/day)	181(6.2) ¹	84(4.6)	225(4.4)	175(4.2)	98(4.5)
Hot carcass weight (kg)	20.8(0.58)	14.1(0.38)	23.4(0.33)	19.3(0.31)	14.6(0.26)
GR (mm)	12.4(1.0)	5.6(0.6)	16.4(0.6)	12.0(0.7)	4.7(0.5)
Wool(kg)	2.15(0.06)	1.61(0.05)	2.48(0.07)	2.26(0.05)	1.69(0.04)

¹ Figures in brackets are standard errors

Table 2

The effect of pasture species on animal production and carcass and meat quality in year two.

	Chicory	Plantain	White clover	Lotus	Ryegrass
Growth rate (g/hd/day)	214(6.8)	102(4.4)	233(6.6)	239(9.6)	136(4.9)
Hot carcass weight (kg)	26.0(0.41)	17.1(0.57)	25.1(0.85)	25.9(0.57)	18.4(0.47)
GR (mm)	17.8(1.1)	8.3(0.9)	17.5(0.8)	17.7(1.2)	9.9(0.4)
Wool (kg)	2.54(0.07)	1.79(0.09)	2.69(0.07)	2.86(0.11)	1.69(0.08)
Faecal egg counts ²	35.3a ³	31.7a	36.3a	50.7b	27.6a
Adult nematodes ²	163.4a	294.8b	157.7	176.4a	230.7c
Ultimate pH	5.75ab	5.89bc	5.66a	5.72a	5.97c
Sheepmeat odour	3.9abc	3.5c	4.7a	4.4ab	3.7bc
Sheepmeat flavour	5.1a	5.2a	5.3a	5.4a	5.7a
Foreign odour	0.9b	1.1b	2.2a	2.2a	0.8b
Foreign flavour	1.7b	1.7b	2.8a	2.6a	0.8b

¹ Figures in brackets are standard errors

²Square root transformed

³Means within a row that do not share the same letter are significantly different at the 5 % level.