The effect of six herbages on liveweight gain, wool growth and faecal egg count of parasitised ewe lambs

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ABSTRACT

The effect of grazing parasitised ewe lambs on herbages with and without condensed tannins (CT's) was evaluated in terms of liveweight gain (LWG), wool growth, faecal egg count (FEC) and worm burden in a six week grazing trial. Six herbages were compared; Maku lotus, *Lotus corniculatus*, and sulla (all containing CT's); plantain, lucerne and ryegrass/white clover.

One hundred and sixty previously undrenched ewe lambs were randomised into 6 treatments (n=25) on the basis of liveweight (mean 29kg; SD 4.4kg) and FEC (mean 1403epg; SD 1356epg). Ten lambs within each treatment were drenched fortnightly, 15 were not. Lambs were weighed, faecal sampled and given a new break of feed every seven days. An additional 10 lambs were slaughtered at the start to provide measurements of initial worm burdens.

Drenched lambs grazing lucerne had the highest LWG (243g/day) and plantain the lowest LWG (51.2g/day). Undrenched lambs had lower LWG's than the drenched lambs, ranging from 175g/day when grazing sulla, to a small loss of 2g/day while grazing plantain. Wool growth followed a broadly similar pattern. FEC's were lowest in lambs grazing sulla and highest in lambs grazing plantain. Total worm burdens were lowest in the lambs grazing sulla and highest in lambs grazing maku. Undrenched lambs grazing maku had much lower dry dag weights than those on the other herbages, with those on ryegrass/white clover having the highest.

The high production level obtained in lambs grazing sulla and maku, despite the high worm burdens indicates that these herbages could be used within farm grazing rotations to reduce anthelmintic usage. The marked reduction in dag weights on maku may also be of economic benefit by reducing the need for crutching and the risk of flystrike.

Keywords: lambs; internal parasites; specialist crops; production.

INTRODUCTION

One method to reduce anthelmintic drench usage, while limiting the losses due to internal parasites, may be to include plants which contain condensed tannins (CT's) into a grazing rotation.

Previous studies have shown increased liveweight gains, wool growth and reduced dagginess in parasitised lambs grazing sulla (*Hedysarum coronarium*), which contains CT's, compared with lucerne (*Medicago sativa*), which does not (Niezen *et al.*, 1995). Niezen *et al.*, (1994) also reported significantly higher liveweight gain of lambs trickle dosed with larvae, while grazing *Lotus pedunculatus* (cv Grasslands Maku) compared with 6 other herbages.

This paper reports a 6 week grazing trial comparing the effects of 6 herbages on liveweight gain, wool growth, dags, faecal egg counts (FEC's) and worm burdens in lambs with a high, naturally acquired worm burden. This trial was designed to compare lamb preformance when grazing herbages with no nematode larvae contamination, so as to try and eliminate the effect of different herbages on larvae dynamics.

MATERIALS AND METHODS

Herbages

Herbages compared in this trial were; *Lotus pedunculatus* (cv Grasslands Maku); plantain (*Plantago lanceolata* cv Grasslands Lancelot); sulla (*Hedysarum coronarium* cv Aokau); lucerne (*Medicago sativa* cv Otaio); ryegrass/white clover (*Lolium perenne* cv Grasslands Nui/*Trifolium repens* cv Grasslands Huia) and *Lotus corniculatus* (cv Grasslands Goldie). Herbages were sown in early November, 1993 and were ungrazed by sheep, to avoid contamination by nematode larvae, until the trial began in March 1994. Excess herbage was either grazed by cattle or removed as hay.

Animals

One hundred and sixty Romney ewe lambs with a naturally acquired high gastrointestinal nematode burden were used in a 6 week grazing trial. Lambs were restrictively randomised on the basis of FEC (mean 1403epg; SD 1356epg) and liveweight (mean 29kg; SD 4.4kg), into 6 herbage treatment groups (n=25/herbage). Each of group of 25 comprised 10 drenched lambs and 15 undrenched lambs. The drenched lambs were given a combination anthelmintic (ARREST ®, Ancare Distributers LTD) at 14 day intervals. An additional 10 lambs were held indoors for 21 days to ensure the parasite burden was mature, slaughtered and the initial worm burden counted (FEC at slaughter was 5445epg).

Lambs were given a fresh break of feed every seven days and backfencing prevented access to previously grazed herbage thus preventing any further infection from nematode larvae. Lambs were weighed every seven days and faecal

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samples taken to determine FEC and to estimate faecal consistency on a scale of 1 (liquid) to 5 (hard pellets). FEC's were undertaken using a modified McMaster technique, with 1 egg counted corresponding to 50 eggs/gram fresh faeces.

Mid-side wool patches were shorn at the start and end of the trial to determine wool growth. Wool fibre diameter was measured by counting 1000 fibres/sample using a fibre diameter analyser (FDA200) and wool length by measuring 5 fibres/sample. Lambs were uniformly shorn around the crutch region to remove all wool and adherent faeces (dags), which were dried for 48 hours and weighed. Lambs were free from dags when the trial commenced. All lambs were slaughtered and worm numbers determined in the abomasum and small intestine. Worm burdens were estimated and identified from 5% aliquots.

Statistical Analysis

All data was analysed using General Linear Models (SAS ®). Faecal egg counts were square root transformed and worm counts $\log_{10}$ transformed, to normalise data for analysis.

RESULTS

Drenched lambs grazing lucerne, Maku lotus, sulla and Goldie lotus grew faster than drenched lambs grazing ryegrass/white clover and plantain (Table 1). Liveweight gain of undrenched lambs was significantly higher ($P<0.05$) when fed the Maku lotus and sulla, and significantly lower on plantain, than other herbages; other differences were not significant. Drenched lambs had higher liveweight gains than undrenched lambs with all herbages.

Wool growth (Table 1) from mid-side patches of drenched lambs grazing sulla was not significanltly different ($P<0.05$) from those grazing lucerne and goldie lotus. Undrenched lambs produced less wool when plantain and Maku lotus were grazed than with other herbages ($P<0.05$). Herbage type also affected fibre diameter (Table 1), sulla resulting in coarser fibres than plantain in drenched and undrenched lambs. Drenched lambs grazing plantain and ryegrass/white clover yielded shorter fibres than other herbages. Wool length of undrenched lambs grazing plantain was significantly different to lambs grazing sulla and ryegrass/white clover.

Faecal egg counts (Table 2) averaged over 5 samplings were signficantly higher in lambs grazing plantain, than other herbages, with those in sulla being significantly lower than other groups except ryegrass/white clover. A similar pattern was evident in total worm burdens (Table 2). Lambs grazing sulla had a lower total worm burdens ($P<0.05$), than those which grazed Maku lotus, Goldie lotus, plantain and pre-trial lambs. The abomasal and intestinal worm numbers showed similar trends.

Dry dag weight (Table 3) adjusted for clean wool was signifincantly higher from lambs grazing ryegrass/white

TABLE 1: Arithmetic mean liveweight gains, wool weights, wool diameters and wool lengths of drenched (D) and undrenched (UD) lambs grazing Maku lotus, plantain, lucerne, sulla, Goldie lotus or ryegrass/white clover for six weeks.

Herbage	Liveweight gain (g/day)		Wool Growth (mg/cm2/day)		Wool Fibre Diameter (μm)		Wool Staple Length (cm)	
	D	UD	D	UD	D	UD	D	UD
Maku	232.1^{c}	160.3^{d}	0.65^{a}	0.57^{a}	32.4^{ab}	30.9^{a}	3.15^{b}	2.83^{ac}
Plantain	51.2^{a}	-2.4^{a}	0.62^{a}	0.53^{a}	31.0^{a}	30.8^{a}	2.41^{a}	2.43^{a}
Lucerne	243.4^{c}	121.4^{c}	0.74^{ab}	0.71^{b}	33.2^{ab}	32.4^{ab}	3.11^{b}	2.87^{ac}
Sulla	226.2^{c}	175.4^{d}	0.81^{b}	0.80^{b}	33.5^{b}	33.2^{b}	3.09^{b}	3.36^{c}
Goldie lotus	207.7^{c}	85.7^{b}	0.77^{ab}	0.71^{b}	32.7^{ab}	32.4^{ab}	3.28^{b}	2.73^{ab}
Ryegrass/white clover	165.5^{b}	88.4^{bc}	0.66^{a}	0.69^{b}	33.8^{b}	32.5^{ab}	2.86^{ab}	3.18^{bc}
Pooled SEM	8.23	9.66	0.033	0.03	0.518	0.507	0.11	0.14
Herbage effect	P<0.0001	P<0.0001	P=0.08	P<0.0001	P<0.2	P<0.06	P<0.03	P<0.05

* Superscripts denote differences significant at P<0.05 level within columns.

TABLE 2: Arithmetic means of average abomasal, intestinal, overall total worm burdens and faecal egg count of undrenched lambs grazing Maku lotus, plantain, lucerne, sulla, Goldie lotus or ryegrass/white clover for six weeks. (Worm counts transformed to $\log_{10}$ for Pooled SEM and faecal egg counts square root transformed for Pooled SEM value).

Herbage	Total Abomasal worms		Total Intestinal worms		Total Worm		Faecal Egg Count (epg)	
Maku	3286^{ab}	(3.44)	20378^{b}	(4.22)	23665^{b}	(4.32)	2854^{c}	(50.63)
Plantain	3650^{abc}	(3.48)	17402^{b}	(4.15)	21052^{b}	(4.26)	3602^{d}	(57.43)
Lucerne	2984^{ab}	(3.41)	15100^{ab}	(4.08)	18084^{ab}	(4.19)	2199^{b}	(43.84)
Sulla	2278^{a}	(3.29)	10812^{a}	(3.91)	13090^{a}	(4.02)	1538^{a}	(36.23)
Goldie lotus	5256^{c}	(3.60)	17734^{b}	(4.18)	22990^{b}	(4.29)	2571^{bc}	(45.35)
Ryegrass/white clover	3094^{ab}	(3.39)	12712^{ab}	(4.04)	15806^{ab}	(4.14)	2109^{ab}	(40.70)
Pre-Trial	4826^{bc}	(3.57)	17802^{b}	(4.19)	22628^{b}	(4.32)	ND	
Pooled SEM		(0.05)		(0.05)		(0.04)		(3.71)
Herbage Effect	P=0.15		P=0.10		P<0.03		P<0.0001	

ND=not done

* Superscripts denote differences significant at P<0.05 level within columns.

clover than Maku lotus, lucerne and Goldie lotus. Drenched lambs grazing Maku lotus and lucerne also had significantly higher ($P<0.05$) faecal consistency scores, than plantain, sulla and ryegrass/white clover. Undrenched lambs grazing plantain had lower ($P<0.05$) faecal consistency scores than lambs grazing all other herbages except sulla; other differences were not significant. On all herbages, drenched lambs had higher faecal consistency than their undrenched counterparts.

TABLE 3: Faecal consistency, rated on a scale 1 to 5 (1=liquid 5=hard pellets) and dry dag weight adjusted for clean wool weight (g) of drenched (D) and undrenched (UD) lambs grazing Maku lotus, plantain, lucerne, sulla, Goldie Lotus or ryegrass/white clover for six weeks.

Herbage	Faecal Consistency		Dry Dags(g)
	D	UD	UD
Maku	4.03^{d}	3.34^{b}	9.70^{a}
Plantain	3.31^{a}	2.87^{a}	52.51^{ab}
Lucerne	3.94^{cd}	3.22^{b}	25.85^{a}
Sulla	3.29^{a}	2.99^{ab}	47.24^{ab}
Goldie lotus	3.68^{bc}	3.35^{b}	39.08^{a}
Ryegrass/white clover	3.62^{b}	3.16^{b}	90.89^{b}
Pooled SEM	0.13	0.13	13.15
Herbage effect	P<0.0001	P<0.0001	P<0.03

* Superscripts denote differences significant at $P<0.05$ level within columns.

DISCUSSION

The results of this trial show that plants with CT's such as, sulla and Maku lotus could be utilised within a farm grazing rotation to maintain high production levels with minimal anthelmintic usage. Despite having high intial FEC's, which were maintained on Maku lotus, the liveweight gain of parasitised lambs grazing Maku lotus and sulla exceeded 160g/day over the six weeks of the trial.

Lambs grazing plantain had lower liveweight gains and wool growth than those grazing on the other herbages. This appeared to be due to the low palatability of this mature herbage. However, non-parasitised lambs grew 54g/day faster than parasitised lambs. This effect of parasitism was similar to that in lambs grazing sulla and was smaller than production losses of 80-120g/day in lambs grazing other herbages.

Worm burdens of the pre-trial lambs and lambs which grazed Maku lotus, plantain and Goldie lotus were very similar, indicating that these plants had no measurable effect on the established worm burdens. Although, worm burdens in lambs grazing lucerne and ryegrass/white clover were somewhat lower than in other groups, differences were not significant. However, the lambs that grazed sulla had 40% fewer worms at the end of the trial than the pre-trial lambs. This was reflected in substantially lower faecal egg counts, the best undrenched growth rate and the smallest relative benefit of drenching. This result suggests that grazing sulla can affect the persistence of established worm burdens.

The level of dags on lambs grazing sulla was higher in this trial compared to those observed in the previous two seasons (Niezen *et al* 1993; 1995). The dags on the lambs grazing sulla only appeared toward the end of the trial after several frosts which may have changed the chemical composition of the herbage. Prior to the frosts the lambs had no dags. The lambs grazing Maku lotus had no dags throughout the trial, and this is in line with observations of Niezen *et al* (1993) where lambs grazing Maku lotus had higher faecal dry matter than lambs fed ryegrass.

As with other trials (Niezen *et al* 1994; 1995), this trial has demonstrated that two specialist crops, namely Maku lotus and sulla will consistently provide high levels of production in lambs with very heavy worm burdens. Maku lotus, in particular, also limits the build-up of dags on the lambs, which should reduce the need for crutching and the risk of flystrike. While some plants, especially sulla, may have some effect on parasite numbers, this appears less important than reducing the effects of parasitism.

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