

Plantain (*Plantago lanceolata*) in herb and legume pastures increases lamb growth relative to perennial ryegrass and white clover pasture

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Keywords: Sheep, forbs, lamb finishing, chicory, red clover.

Introduction

Increased use of plantain (*Plantago lanceolata*) by New Zealand farmers has created a demand for a more complete understanding of the performance and management of plantain by itself and in various combinations with chicory (*Cichorium intybus*) and legumes such as white clover (*Trifolium repens*) and red clover (*T. pratense*). The objective of this study was to evaluate lamb finishing on plantain by itself and combined with chicory, white and red clover as part of a research programme to develop a temperate perennial pasture superior in animal performance to perennial ryegrass and white clover pasture for sheep production systems (Kemp *et al.* 2010).

Methods

Three field experiments on lamb finishing were undertaken at Massey University, Palmerston North, New Zealand (40°23'19.11"S; 175°36'46.22"E). The pasture species used were plantain cv. 'Ceres Tonic', chicory cv. 'Puna II', red clover cv. 'Sensation', white clover cv. 'Bounty' and perennial ryegrass cv. 'One50 AR1'. There were three randomised replicates of each treatment with three to six paddocks per treatment plot (0.25 ha/plot) depending on pasture growth rates. Lambs (initial live weight 30 – 35 kg) were stratified on weight before allocation to treatments. Lambs were rotationally grazed using the stocking rates and pasture heights in Table 1 with the objective of *ad libitum* feeding. In Experiment 1, two grazing heights of plantain were compared; in Experiment 2, plantain at two grazing heights was compared with a mixture of ryegrass and clover; and in Experiment 3, three mixed pastures were compared over a 12-month period. In experiment 3, four batches of lambs were finished on the herb pastures and five on the ryegrass pasture. All lambs were killed in a commercial abattoir at completion of each experiment.

Results

In summer Experiment 1, a high lamb weight gain was achieved by grazing laxly but not when the plantain was grazed for higher utilisation (Table 1). In summer Experiment 2, the ADG of lambs on ryegrass/white clover was higher than that for the lambs on plantain at the two stocking rates. Plantain stocked at 24 lambs/ha

produced more net carcass weight than the other two treatments. In Experiment 3 the addition of clovers or clovers plus chicory increased the ADG of lambs relative to ryegrass/white clover pasture to the extent that the net carcass weight of lamb produced in a year was 80 and 66% greater from plantain/clovers and plantain/chicory/clovers pastures, respectively, than from ryegrass/white clover pasture.

Discussion

The results indicate that plantain has a higher feeding value when it is combined with clovers than when grazed as a monoculture. The weight gain of lambs on the herb plus legume pastures demonstrated that these pastures were superior to a perennial ryegrass and white clover pasture for lamb finishing. The mix of plantain, chicory, red clover and white clover has also been shown to increase ewe milk production and lamb weight during lambing (Hutton *et al.* 2011). The results presented here lend support to a high-performance production system with ewes lambing on herb and legume pasture followed by finishing lambs on the pasture, or grazing ewe hoggets so they attain a weight suitable for mating (Kemp *et al.* 2010).

The grazing management of plantain requires further refinement but the results in Table 1 suggest that a post-grazing height of 5 cm for plantain limits intake by lambs, consistent with the findings of Moorhead *et al.* (2002) who observed a post-grazing herbage mass of 1200 – 1400 kg DM/ha, equivalent to 5 cm high, limited lamb growth. A post-grazing height of 8.5 cm in the current study maximised lamb intake but was observed to increase the proportion of old un-grazed leaves and give poor utilization of the pasture. The pre- and post-grazing heights used in Experiment 3 produced lamb weight gains equivalent to the better live weight gains reported in other studies for (Kemp *et al.* 2010), which supports these heights as being effective for management of the herb and legume pasture. The interval between grazing in all three experiments varied with pasture growth rates but the aim was three to four weeks. When shorter intervals were used the pasture was later spelled for up to four weeks to ensure the three tap-rooted species (plantain, chicory and red clover) recovered their root reserves.

Table 1. Lamb average daily live weight gain (ADG) and net carcass weight produced during the experiment (net cwt) for three experiments. Summer experiments 1 and 2 had monocultures of plantain and the 12 months experiment had plantain combined with white clover and red clover, or with chicory and the two clovers.

Pasture	Grazing heights (cm)	Stocking rate (/ha)	Grazing days	ADG g/lamb/day	Net cwt kg/ha
Summer experiment 1					
Plantain	13.4 - 8.5	45	30	219	296
Plantain	7.8 - 4.9	50	30	121	182
SEM				10	9
Summer experiment 2					
Plantain	7.0 - 5.1	18	35	205	129
Plantain	6.4 - 4.8	24	35	188	157
Ryegrass/white clover	5.7 - 4.4	18	35	231	145
SEM				13	9
Experiment 3					
Plantain/clovers	> 12 - 7	32 - 40	159	223 - 336	717
Plantain/chicory/clovers	> 12 - 7	30 - 40	159	210 - 360	664
Ryegrass/white clover	> 10 - 5	25 - 40	215	152 - 322	401
significance					$P < 0.05$

Conclusions

Plantain when combined with clovers was superior to a perennial ryegrass and white clover pasture for finishing lambs. Plantain as a monoculture provided similar lamb weight gains to ryegrass/white clover when grazed lightly. It is recommended that plantain is combined with clovers for lamb finishing.

Acknowledgements

Mark Osborne, Tayah Johnstone, Hannah Appleton, Hamish Best, Bill Pomroy, Peter Hutton, Sarah Pain, Simon Orsborn, Dean Burnham, Geoff Purchas provided technical assistance and advice with pasture and animal measurements. International Sheep Research Centre, Massey University; C.

Alma Baker Trust and Gravida NZ provided research funding.

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