WILLOW FODDER BLOCKS FOR GROWTH AND SUSTAINABLE MANAGEMENT OF INTERNAL PARASITES IN GRAZING LAMBS

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Carolina Macarena Diaz Lira

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ABSTRACT

A rotational grazing experiment was conducted for 14 weeks in the summer/autumn of 2004/2005 on the lower eastern North Island, New Zealand, to compare the efficacy of grazing willow fodder blocks containing condensed tannins (CT), for sustainable control of internal parasites in 180 Suffolk x Romney weaned lambs. One third of the lambs grazed control perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pasture only, another third grazed pasture for 3 weeks followed by willow fodder blocks for 1 week (repeating the rotation; restricted access) and the last third of the lambs grazed on willow fodder blocks for the duration of the experiment (full access). All lambs were effectively treated with anthelmintics at the start of the experiment. Each group was divided into undrenched lambs and lambs regularly drenched every 4 weeks. Each of the six groups grazed separate areas at the same dry matter (DM) allowance, using rotational grazing with weekly breaks. Undrenched lambs would be trigger drenched if the faecal egg count (FEC) geometric mean of the group exceeded 1000 eggs/g wet faeces and/or liveweight gain (LWG) was reduced to zero and/or any one individual lamb exceeded 2500 eggs/g wet faeces, which never occurred.

Rectal faecal samples for FEC, larval counts (LC) and visual dag formation (Dag Score; DS) were assessed initially and at two week intervals throughout the experiment. All lambs were slaughtered at the end of the experiment, fatness (GR) and carcass weight (CW) measurements were recorded and representative samples of the abomasum, small intestine and large intestine were collected in the three undrenched treatments to determine total worm burdens.

Primary growth legume content in willow fodder blocks was similar to that of control pasture (20%), but willow fodder blocks secondary growth legume content (30%) was greater than in secondary growth control pasture (22%). Primary growth pre-grazing herbage mass (approximately 4800 kg DM/ha) and post-grazing herbage mass (approximately 3400 kg DM/ha) in willow fodder blocks (full and restricted access) was higher than that of control pasture (4400 and 3000 kg DM/ha respectively). Secondary growth pre and post-grazing herbage mass was similar in willow fodder blocks and control pasture (4200 and 3000 kg DM/ha respectively). Secondary growth mass of fodder trees (775 kg DM/ha) in the willow fodder block full access treatment was higher than primary growth (562 kg DM/ha). Pre-grazing herbage dead matter content was consistently higher in secondary growth (20-40%) than in primary growth (8-10%), for both control pasture and fodder blocks.

Condensed tannin concentration in willow fodder block herbage was 14.5 g/kg DM compared to the CT levels (6.2 g/kg DM) detected in control pasture diet selected. However, CT concentration in willow fodder block trees was particularly high (approximately 45.5 g/kg DM). *In vitro* OMD, DOMD and ME concentrations were higher for selected tree browse in willow fodder blocks (0.71; 0.65 g/kg DM; 10.6 MJ/kg DM respectively) when compared to herbage selected in either willow fodder blocks or control pasture (0.65; 0.60 g/kg DM; 9.7 MJ/kg DM respectively).

Regularly drenched lambs had significantly higher LWG and carcass weight gain (CWG) than undrenched lambs ($p < 0.05$) in all three groups. Lambs in willow fodder block full access had the highest LWG in drenched as well as undrenched lambs of 182 g/day and 154 g/day respectively.

Due to hot and dry summer conditions, growth rates of all treatments declined in the second half of the experiment as herbage nutritive value declined. Undrenched willow fodder block full access had the highest CWG amongst all undrenched treatments. Carcass weight gain reduction of undrenched lambs versus drenched lambs for the full access to willow fodder block group (12 g/day) was half of the reduction between control pasture groups (24 g/day).

Dag score increased with time until Day 70 of the experiment, with no differences between the six treatment groups. From Day 70 until the end of the experiment, dag scores of lambs grazing willow fodder block full access were consistently lower than lambs grazing willow fodder block restricted access or control pasture and were lower for drenched than for undrenched lambs. Drenched groups maintained low FECs throughout the experiment, whereas FECs of undrenched groups progressively increased with time. Both DS and LWG were similar for drenched lambs grazing control pasture and undrenched lambs grazing willow fodder block full access.

The parasites established in greatest numbers in undrenched lambs grazing control pasture were *Teladorsagia trifurcata*, *Nematodirus spathiger*, *Trichostrongylus vitrinus*, *Trichostrongylus colubriformis* followed by *Trichostrongylus axei* and *Teladorsagia circumcincta.* At slaughter, undrenched lambs grazing on willow fodder block full access had significantly lower *Nematodirus spathiger*, *Trichostrongylus vitrinus* and *Trichostrongylus colubriformis* worm burdens when compared to undrenched lambs grazing control pasture ($p < 0.05$), but greater burdens of *Haemonchus contortus* ($p = 0.0299$).

Undrenched lambs grazing willow fodder block with restricted access had significantly lower *Teladorsagia circumcincta*, *Teladorsagia trifurcata*, *Trichostrongylus vitrinus* and *Trichostrongylus colubriformis* worm burdens than undrenched lambs grazing control pasture ($p < 0.05$).

It was concluded that parasitism restricted lamb growth in all three undrenched grazing systems, showing a progressive increase in FEC over time. However, the reduction in carcass weight gain was greatest for undrenched control lambs and least for undrenched lambs with full access to willow fodder blocks. Grazing undrenched lambs on restricted and full access willow fodder blocks showed lower burdens of some parasites at slaughter compared to undrenched lambs grazing control pasture, which could be due firstly to an increased CT present in both willow and in fodder block herbage and their possible effects in increasing protein absorption. Secondly, CT could have interrupted parasite life cycles and/or, thirdly, decreased L_3 larval consumption could have occurred due to taller plant morphology of the trees, hence reducing the reinfection rate. There seemed to be no direct effect on killing established parasites, as if that had happened, there should have been a decrease in FEC in the first half of the experiment, before any effects of reinfection took place.

CT-containing forages could be used in conjunction with live weight gain monitoring and/or body condition score for the control of gastrointestinal nematodes, but it still needs further evaluation and a close collaboration of researchers and farmers.

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ABBREVIATIONS USED

Analysis of variance	ANOVA
Carcass weight	CW
Carcass weight gain	CWG
Condensed tannins	CT
Crude protein	CP
Dag score	DS
Degrees Celsius	°C
Digestible organic matter in dry matter	DOMD
Dry matter	DM
Eggs per gram	epg
Essential amino acids	EAA
Faecal egg count	FEC
Faecal egg counts	FECs
Figure	Fig.
First larval stage	L_1
Fourth larval stage	L_4
Gastrointestinal	GI
General linear model	GLM
Grams	g
Hectare	ha
Kilogram	kg
Larval culture	LC
Live weight	LW

Liveweight gain	LWG
Metabolisable energy	ME
MegaJoules	MJ
Meter	m
Millimetres	mm
Non ammonia nitrogen	NAN
Number	n
Organic matter digestibility	OMD
Post parturient rise	PPR
Second larval stage	L_2
Standard error	S.E.
Statistical Analysis system	SAS
Tannin protein complexes	TPC
Third larval stage	L_3
Tonne	t
Total nitrogen	N
Voluntary feed intake	VFI
Wet weight	W/W

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