



Use of *Lotus corniculatus* containing condensed tannins to increase summer lamb growth under commercial dryland farming conditions with minimal anthelmintic drench input

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Abstract

A 95-day rotational grazing experiment was conducted in the summer of 2002/2003 under dryland farming conditions to compare effects of grazing *Lotus corniculatus* L. (Birdsfoot trefoil; cv. Grasslands Goldie) and perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pasture on body growth and dynamics of nematode parasite infection in Suffolk × Romney weaned lambs fed ad libitum. Half of the lambs ($n = 30$), grazing either *L. corniculatus* or pasture received oral anthelmintic at the start and at monthly intervals (i.e., regular-drenched groups), whilst the remaining 30 lambs in each treatment only received oral anthelmintic when mean faecal nematode egg counts (FECs) exceeded

Abbreviations: BA, break area; CT, condensed tannins; [¹⁴C]CT, ¹⁴carbon-labelled CT; cv., cultivar; CW, carcass weight; CWG, carcass weight gain; DM, dry matter; DOMD, digestible organic matter in the dry matter (g)/100 g DM; EAA, essential amino acid; FA, feed allowance; FCW, final carcass weight; FECs, faecal nematode egg counts; GR, carcass fatness; HM, herbage mass; LW, live weight; Ltd., limited; LWG, liveweight gain; ME, metabolisable energy; NDF, neutral detergent fibre; OMD, organic matter digestibility; SAS, Statistical Analysis System; VFI, voluntary feed intake; WC, worm counts

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1000 eggs/g wet faeces (i.e., trigger-drenched groups). This only occurred on day 58 for both groups. Trigger and regular-drenched lambs grazed separate areas. Total condensed tannin (CT) concentration in the diet selected was 31–40 g CT/kg DM for *L. corniculatus*, with only trace amounts in pasture. In vitro organic matter (OM) digestibility (OMD), digestible OM in dry matter (DOMD), and metabolisable energy (ME) concentration were higher for *L. corniculatus* versus pasture and declined less under drought conditions versus grass-based pasture. Regular-drenched lambs grazing *L. corniculatus* had higher liveweight gain (LWG; 298 g/day) and carcass weight gain (133 g/day) than all other groups, whilst trigger-drenched lambs grazing *L. corniculatus* had higher LWG (228 g/day) and carcass gain (99 g/day) versus regular-drenched (200; 66 g/day) and trigger-drenched (187; 63 g/day) lambs grazing pasture. Carcass fatness was lower for trigger-drenched lambs versus regular-drenched lambs, when fed either *L. corniculatus* or pasture. Dag score was consistently lower for regular-drenched lambs grazing *L. corniculatus* versus pasture; trigger-drenched lambs showed similar effects up to day 48, with no differences between the groups thereafter. Regular anthelmintic treatment maintained FECs at low values, while parasitised grazed lambs on *L. corniculatus* tended to have higher FECs than pasture fed lambs. Relative to trigger-drenched lambs that grazed pasture, grazing *L. corniculatus* reduced worm burdens at slaughter of *Haemonchus contortus*, *Teladorsagia* spp., *Nematodirus* spp. and *Cooperia* spp., but higher burdens of *Trichostrongylus* spp., *Chabertia ovina*, *Oesophagostomum* spp. and *Trichuris ovis* occurred in *L. corniculatus* fed lambs. Grazing *Lotus corniculatus* L. (Birdsfoot trefoil; cv. Grasslands Goldie) under dryland farming conditions can increase growth of weaned lambs, whilst reducing reliance on anthelmintic drenches to control parasites. These effects are possibly due to increased metabolisable protein supply, from the protein binding action of CT, enabling the lambs to grow faster when carrying a parasite burden, and to *L. corniculatus* better maintaining its high ME value under drought conditions. Mechanisms for the action of CT are discussed.

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1. Introduction

A New Zealand (NZ) sheep industry target is to achieve lamb growth rates of 400 g/day under pastoral conditions in order to meet increased market demands and to maintain their position in the international meat industry (The New Zealand Sheep Council, 2000). Premium prices for lamb could be reached if lamb growth systems could be developed using specialist forages with a higher feeding value than perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pasture, whilst also reducing the internal parasite problems by using low-chemical inputs to prevent anthelmintic drench resistance, improving feed conversion efficiency and decreasing chemical residues in lamb meat purchased by the final consumer.

Condensed tannins (CT) are plant secondary compounds that bind strongly with leaf protein after chewing (Jones and Mangan, 1977), thereby reducing protein degradation in the rumen at pH 6.0–7.0. The CT-protein complex dissociates at pH < 3.5, typical at the abomasum (Jones and Mangan, 1977) thereby increasing essential amino acid (EAA) absorption from the small intestine in sheep fed *L. corniculatus* (Waghorn et al., 1987). Ramírez-Restrepo et al. (2002, 2004) showed that sustainable farming systems can be developed

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