Direct effects of bioactive forages in sheep infected with *Trichostrongylus colubriformis*.

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Introduction Parasitised sheep that consumed bioactive forages, i.e. forages that contain anthelmintic compounds, showed a lower level of parasitism than sheep grazing on grass/clover pastures (Marley *et al*, 2003). This may be due to direct anthelmintic effects of the bioactive forages or indirect nutritional effects, e.g. mediated through an increase in protein availability. Extra protein could improve the host's ability to mount an effective response towards gastrointestinal parasites (Coop and Kyriazakis, 1999). The aim of this experiment was to investigate whether a two-week consumption of forages that contain potential anthelmintic compounds, have a direct anthelmintic effect towards i) an established *Trichostrongylus colubriformis* population and/or ii) incoming *T.colubriformis* larvae.

Materials and Methods Sixty Texel x Grayface parasite naive sheep were infected with 8,000 *T.colubriformis* infective larvae on day 1 of the experiment. Up to day 28, sheep were grazing on a parasite clean grass/clover pasture. On day 28, they were allocated to 10 groups (n=6) based on their faecal egg counts (FEC) and liveweight, and were moved to the experimental plots for two weeks. The experimental plots (10 plots, two replicates for each forage species) consisted of five forage species: *Lotus pedunculatus* (lotus), *Onobrychis viciifolia* (sainfoin), *Chicorium intybus* (chicory), *Hedysarum coronarium* (sulla) and *Lolium perenne/Trifolium repens* (grass/clover). On day 35 of the experiment, sheep were dosed with a second dose of 8,000 *T.colubriformis* infected larvae, to investigate the effects of bioactive forages on incoming larvae, and were killed on day 42. FEC were monitored throughout and were analysed with ANOVA for repeated measurements, with forage species and plot replicates as factors. Adult and immature nematodes recovered from the gastrointestinal tract of sheep and liveweight gain of sheep were analysed by ANOVA, with the same factors as the FEC. FEC and worm counts were log (x+1) transformed prior to analysis.

Results All measurements obtained from the replicates of the same forage species were similar. Figure 1 shows that sheep grazing on lotus had lower FEC compared to sheep grazing on grass/clover between days 31-42 ($P<0.01$). Sheep grazing on lotus and grass/clover grew 320 (se: 26.5) g per day, whereas sheep grazing on chicory had the lowest liveweight gain, at 170 (se: 27.1) g per day (sed: 55, $P<0.05$). The growth of sheep grazing on sainfoin and sulla was 220 (se: 25.6) and 260 (se: 22.7) g per day respectively. Although immature and adult parasite burdens were lower in sheep grazing chicory than any other forage, the difference observed was not significant (Figure 2).

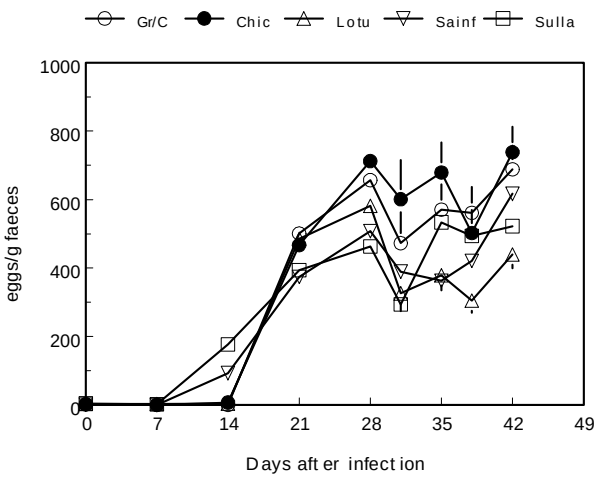

Figure 1 Backtransformed FEC of sheep grazing on five different forages, with 95% confidence intervals.

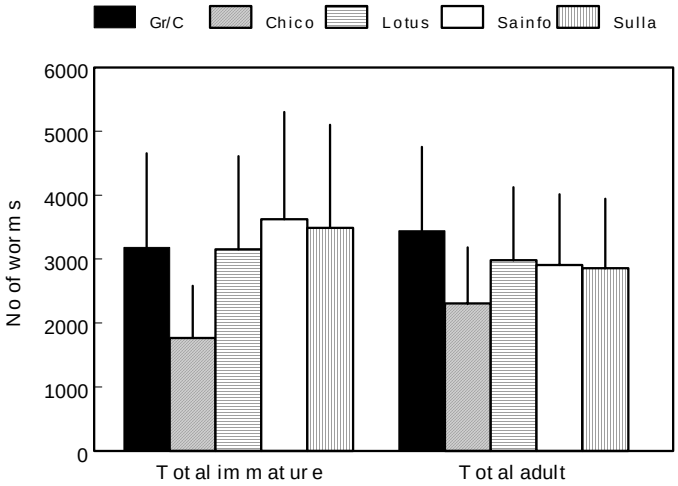

Figure 2 Backtransformed immature and adult worm burdens of sheep grazing on five different forages, with the upper limits of 95% confidence intervals

Conclusion Grazing on bioactive forages for a period of only two weeks did not directly affect the viability of adult and the establishment of infective *T.colubriformis* worms. The number of eggs excreted per g faeces was lower in sheep grazing lotus compared to those grazing grass/clover, which implies a possible direct anthelmintic effect of lotus on the fecundity of female nematodes. It is possible that a longer grazing period on the bioactive forages could benefit sheep parasitised with *T.colubriformis* either through a long-term direct anthelmintic effect or an indirect nutritional effect.

References

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Marley, C.L, Cook, R., Keatinge, R., Barrett J., and Lampkin, N.H. (2003) The effects of birdsfoot trefoil (*Lotus corniculatus*) and chicory (*Cichorium intybus*) on parasite intensities and performance of lambs naturally infected with helminth parasites. *Veterinary Parasitology* **112**: 147-155.