**Title**: The effect of sward type and targeted selective treatment on lamb performance and anthelmintic usage

**Application:** This work sought to investigate the effect that multispecies sward grazing and targeted selective treatments (TST) have on anthelmintic usage and performance of finishing lambs compared to perennial ryegrass grazing. Individually, multispecies swards and TST have been found in other studies to be effective in improving performance and reducing anthelmintic usage respectively. In this study, grazing multispecies swards reduced the number of anthelmintic treatments administered to lambs compared to lambs grazing perennial ryegrass. The implementation of this strategy represents a viable approach to maintain refugia of susceptible parasites and prevent the rapid onset of anthelmintic resistance.

**Introduction:** Anthelmintic resistance creates challenges for sustainable livestock farming and limits sheep productivity due to reduced anthelmintic efficacy against parasites. Instead of treating all animals in a group, which is commonly practiced, TST is a method of gastrointestinal nematode (GIN) control that treats only a proportion of the flock based on consideration of indicators such as faecal egg count (FEC), DLWG or dag score. When TST is utilised, there have been reports of reduced number of anthelmintic treatments administered while not compromising productivity of animals (Busin et al., 2014). This helps maintain a population of untreated, susceptible nematodes in refugia. Multispecies swards can reduce the need for anthelmintic treatment as they contain plant secondary metabolites that have been reported to have anthelmintic properties (Marley et al., 2002). Although the effect of TST on GINs and performance of sheep has been evaluated (Busin et al., 2014), there is a lack of research on the effects of combining TST with rotationally grazing multispecies swards on lamb performance and parasite FEC.

**Materials and methods:** Weaned lambs were allocated to three grazing sward groups: (i) Perennial ryegrass with white clover (PRG/WC), (ii) a multispecies sward consisting of perennial ryegrass, timothy, white clover, red clover, ribwort plantain and chicory (MSS) or (iii) alternating between perennial ryegrass and multispecies sward (50:50) from July to October 2023 (n=85, 91, 92). Ram lambs were slaughtered as they reached target slaughter weight (47 kg) and ewe lambs were removed from the study for breeding on 30/08/2023 when average age of ewe lambs for PRG/WC, MSS and 50:50 were 152.2, 148.4 and 150.8 days old respectively (P=0.26). Liveweight and application of any anthelmintic treatments were recorded at 14-day intervals during the grazing season. At this point, nematode FEC were also conducted. Dag scores were recorded at four time points and pasture larval counts (PLC) (Molento et al.,2016) were conducted at three time points. This selective treatment was applied based on DLWG and dag score. Dag score was recorded based on a 0 to 5 scale in which 0 indicated no faecal soiling and 5 indicated heavy faecal soiling (Bath and van Wyk, 2009). The threshold for treatment was a DLWG of less than 150g/day and/or a dag score over 3. The non-parametric Kruskal-Wallis test with Dunn’s *post-hoc* test were used to compare means of the egg counts, dag scores, treatments and PLC between the groups. The one-way ANOVA with Tukey’s HSD *post-hoc* tests were used to compare means of the liveweights and DLWG.

**Results**: No significant differences were observed between the three groups in PLC, dag score, final liveweights or average proportion of the flock treated (P>0.05). Egg counts, however, were significantly different between the groups at two timepoints. The PRG/WC group had significantly higher egg counts than MSS and 50:50 on 01/08/23 (P=0.031, 0.026) and MSS had significantly higher egg counts than PRG/WC and 50:50 on 18/08/2023 (P=0.039, 0.049). Average treatment per lamb was significantly greater for PRG/WC than the MSS group (P=0.001). Liveweight gain was significantly higher for MSS compared to PRG/WC and 50:50 for ram lambs but no differences were observed for ewe lambs (see table 1).

Table 1: The mean, standard error of the mean (SEM) and p- value of start age, start liveweight, DLWG, FEC, proportion of flock treated, treatment per lamb and dag score of the three groups of lambs

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | PRG/WC | SEM | MSS | SEM | 50:50 | SEM | p-value |
| Mean start age (days) | 111a | 0.529 | 108ab | 0.972 | 110b | 0.635 | 0.0230 |
| Mean start liveweight (kg) | 36.5 | 0.551 | 34.9 | 0.553 | 35.9 | 0.580 | 0.140 |
| Mean DLWG of ram lambs (kg/day)  | 0.166a  | 0.00592  | 0.220b  | 0.00629  | 0.180a  | 0.00837  | 0.0200  |
| Mean DLWG of ewe lambs (kg/day) | 0.114 | 0.00807 | 0.114 | 0.00734 | 0.0988 | 0.00750 | 0.270 |
| Mean FEC (eggs per gram) | 349 | 53.8 | 364 | 44.5 | 224 | 22.8 | 0.0940 |
| Mean proportion of flock treated (%) | 28.8 | 13.1 | 26.8 | 13.9 | 23.6 | 13.5 | 0.850 |
| Mean anthelmintic treatment per lamb | 1.21a | 0.0529 | 1.02b | 0.0265 | 1.11ab | 0.0321 | 0.00160 |
| Mean dag score | 1.77 | 0.0972 | 1.87 | 0.0836 | 2.02 | 0.0907 | 0.130 |
| Mean age of slaughter (days) | 158 | 2.35 | 163 | 2.50 | 163 | 3.16 | 0.160 |

**Conclusions:** Lambs that grazed multispecies swards continuously had reduced anthelmintic treatments per lamb when compared with PRG/WC. Ram lambs that grazed multispecies swards continuously had higher DLWG than PRG/WC and 50:50, although there were no differences for ewe lambs; This disparity in DLWG between rams and ewes could be attributed to the early withdrawal of ewe lambs from the study. Egg counts were higher for MSS later in the season however average FEC over the entire study did not significantly differ between the groups. This suggests that implementing TST alongside rotational grazing on multispecies swards can reduce the number of treatments issued thereby reducing anthelmintic use which helps to maintain refugia and **reduce the selection pressure for anthelmintic resistance**. Furthermore, it can also provide benefits for performance of lambs. This may indicate that multispecies swards provide nutritional benefits but not necessarily anthelmintic effects.

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