**Grazing multispecies swards alters enteric methane emissions by ewes and lambs**

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***Application:*** Grazing swards containing a mixture of grass, legumes and herbs can enhance the sustainability of pasture-based sheep meat production by reducing daily enteric methane output produced by sheep.

***Introduction:*** The production of enteric methane during the rumen fermentation process serves as a source of energy loss from ruminants which could otherwise be utilised for meat, milk or wool production and also contributes to environmental damage through the release of this potent greenhouse gas. Previous studies reported lambs grazing swards containing more than one plant species resulted in earlier achievement of target slaughter (Grace *et al.,* 2019; McGrane *et al.,* 2023) and potentially, reduced total lifetime emissions. There is a paucity of information relating to the impact of multispecies swards on enteric methane emissions, therefore this study measured daily methane output by sheep grazing a perennial ryegrass or a multispecies sward.

***Materials and methods:*** Two flocks were offered one of two forage treatments for the entire grazing season in 2023; A perennial ryegrass (PRG; *Lolium perenne* L.) sward receiving 163kg N/ha/year or a five species multispecies sward (MSS) composed of PRG, red clover (*Trifolium pratense* L. white clover (*Trifolium* repens L.), chicory (*Cichorium intybus* L.) and plantain (*Plantago lanceolata* L.) receiving 90kg N/ha/year. Daily methane output from sixty ewes was assessed using Portable accumulation chambers (PAC; O’Connor *et al.* 2021) on two occasions; during lactation (May), and during the dry (non-lactating) period (July) and from 60 weaned lambs on one occasion (July). Animals were fasted for one hour prior to entering the PAC to prevent capturing false highs of CH4 measurements that can occur in the first hour after feeding (Brask *et al.,* 2015). During this hour, animals were weighed before entering the PAC for 50 minutes. Data were analysed using a linear mixed model in PROC HPMIXED (SAS Inst. Inc., Cary, NC) with CH4 (expressed as grams per day) as the dependant variable; measurement date, measurement group (time of day), sward type, breed and liveweight included as fixed effects; individual animal was included as a random effect for all analysis. Age was also included as a fixed effect in ewe methane production analysis and gender was included in lamb methane production analysis.

**Table 1**

Daily methane output and methane intensity of ewes and lambs grazing a perennial ryegrass or a multispecies sward (Least Square Means ± SEM).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *PRG1* | *MSS2* | *SEM* | *P* |
| Methane production | | | | |
| Lactating ewe (g/day) | 37.97 | 40.25 | 1.522 | 0.1322 |
| Dry, non-lactating ewe (g/day) | 24.43a | 14.87b | 1.049 | <.0001 |
| Lambs (g/day) | 17.76a | 14.85b | 0.457 | <.0001 |
| Methane intensity | | | | |
| Lactating ewe (g/kg LW3) | 0.508 | 0.537 | 0.0203 | 0.1588 |
| Dry, non-lactating ewe (g/kg LW) | 0.345a | 0.206b | 0.0153 | <.0001 |
| Lambs (g/kg LW) | 0.430a | 0.384b | 0.0124 | <0.05 |
| Lambs (g/g ADG4) | 0.139 | 0.082 | 0.0212 | 0.0624 |

1PRG= Perennial ryegrass, 2MSS= Multispecies sward, 3LW= Liveweight, 4ADG= Average daily gain, a, b Means within a row with different superscript differ (P < 0.05)

***Results:*** No difference was observed between forage types for daily methane output or methane intensity of lactating ewes (P >0.05). However, forage type significantly reduced daily methane output (P <0.001) and methane intensity (P <0.001) of dry, non-lactating ewes with ewes grazing the MSS producing less daily methane in comparison to ewes grazing the PRG sward. Lambs grazing the MSS sward produced significantly less daily methane (P <0.001) and had a significantly lower methane intensity (g/kg LW) (P <0.001) than lambs grazing the PRG sward. There was a tendency for lambs grazing the multispecies sward to have a lower methane intensity (g/g ADG) than lambs grazing the perennial ryegrass (P =0.0624) (Table 1).

***Conclusion:*** Grazing multispecies swards reduced daily methane output in ewes when dry, but not during lactation. Multispecies swards also reduced daily methane output by lambs which can potentially contribute to an overall reduction of total greenhouse gas emissions over the lifetime of animals grazing multispecies swards.

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