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Analysis of N₂O emissions and isotopomers to understand nitrogen cycling associated with multispecies grassland swards at a lysimeter scale.

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Introduction

N₂O is a potent GHG associated with N fertiliser inputs and management practices.¹ N₂O isotopomers are useful indicators of N₂O source pathways.^{2,3} Minimising N losses is key to improving the efficiency and sustainability of grassland agriculture systems.⁴ Multispecies swards have been considered as an option to reduce N fertiliser inputs, maintain yields and mitigate N losses.

Materials and Methods

Completely randomised block design. 4 treatments: Perennial ryegrass only (PRG, 250 kg N ha⁻¹ yr⁻¹), PRG + low white clover (PRG+LWC, 90 kg N ha⁻¹ yr⁻¹), PRG + high WC (PRG+HWC, 0 kg N ha⁻¹ yr⁻¹) and PRG + WC + ribwort plantain (PRG+WC+P, 45 kg N ha⁻¹ yr⁻¹).

Results and Conclusions

Nitrogen balances were significantly greater from PRG+LWC and PRG+HWC than PRG only. Both required less annual fertiliser N to sustain DM production. There were no significant differences in cumulative N₂O emissions or total leached N among treatments. No significant difference in the fraction of nitrification (F_N) or denitrification (F_D) was detected between treatments around peak N₂O fluxes linked to fertiliser application.

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