***Application***

How does white clover inclusion in perennial ryegrass swards within intensive grazing dairy systems impact pasture and animal performances on a wetland soil type?

***Introduction***

The volatility of both milk prices and farm input costs within modern dairy production systems emphasises the necessity for the development of more resilient, low-input, pasture-based systems (Horan and Roche, 2020). This necessity has been reinforced by intensifying pressures to reduce the impacts of agriculture on the natural environment and meet environmental policy targets within the European Union, including a 20% reduction in Nitrogen (N) fertiliser use by 2030. These pressures have prompted a shift towards legume incorporation, particularly white clover (WC; Trifolium repens L.), within grazed pastures to fix atmospheric N and reduce requirements for chemical N fertiliser. The incorporation of WC in grazing swards can fix up to 220 kg N/ha/year displacing the requirement for chemical N applications (Schils et al., 2005). Although the effects of WC inclusion on milk production performance have proven inconsistent, recent evidence suggests that pasture DM intake is increased within swards containing WC (McClearn et al., 2021) thereby supporting higher production levels per cow and similar levels per hectare compared to grass only swards. Outstanding concerns remain as to the suitability of WC within swards on wetland soil types.

***Material and methods***

This study was conducted on 144 cows, divided into one of two sward system treatments during 2023 and 2024. In 2021, 2022 and 2023, both perennial ryegrass only (PR) and PR white clover (PRWC) sward systems underwent intensive sward renewal through reseeding and oversowing, which resulted in the entire PRWC farmlet area with some clover establishment by the end of 2023. Following establishment, PR only swards received a maximum of 220 kg N/ha of chemical N per year, whereas chemical N application was reduced to a maximum of 125 kg N/ha for PRWC swards, with significant reductions in N fertilisation from May each year based on prevailing sward clover contents. Grazing management was similar for all treatments in terms of pre- and post-grazing sward height, pre-grazing herbage mass and residency time. Total net herbage production, botanical composition and sward chemical composition were measured for the duration of the study and analysed for sward, season and year effects using mixed models (Proc Mixed, SAS Institute, 2006).

***Results***

Grazing characteristics were similar for both sward systems. Average pre- and post-grazing heights and pre-grazing masses were 113.8 and 47.1 mm and 1,584 kg DM/ha, respectively. Annual average WC contents were similar for both years during the study (190 and 180 g/kg for 2023 and 2024, respectively), however a slight increase in WC content was observed from August 2024 (Figure 1). There were no differences in total pasture production between swards (11,930 and 11,770 kg DM/ha for PR and PRWC, respectively). Nonetheless, established PRWC swards resulted in a significant reduction in chemical N fertiliser application from 189 kg for PR to 128 kg for PRWC. Sward nutritive value parameters (Ash, crude protein (CP), neutral detergent fibre (NDF) and acid detergent fibre (ADF)) were significantly (P<0.001) improved with PRWC swards during the 2 year study period. In particular, increased ash and CP content were observed in PRWC compared to PR only swards (101.2 and 187.0 versus 98.8 and 181.1 g/kg DM, respectively). In contrast, PR only swards had higher NDF and ADF contents (406.8 and 224.2 compared to 390.1 and 220.8 g/kg DM, respectively). The increase in sward quality resulted in increased (P<0.05) milk (4,464 and 4,668 kg/cow for PR and PRWC, respectively) and fat plus protein yield (414 and 428 kg/cow for PR and PRWC, respectively) during the study with no significant differences in milk composition (54.6, 37.2 and 47.7 g/kg for milk fat, protein and lactose, respectively) between sward types. There were also no significant differences in individual animal body weight or body condition score observed during the 2 year study period.

***Conclusion***

The results of this study demonstrate that WC incorporation in swards can significantly reduce the requirement for chemical N fertiliser applications, while maintaining pasture performance and increasing animal productivity within a wetland intensive grazing dairy system.

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**Figure 1**. Mean monthly sward white clover (WC) content for the grazing season (February to November) during the experimental period 2023-2024.