**The impact of incorporating ribwort plantain into perennial ryegrass swards on the performance of high-yielding dairy cows**

**Authors:** Rutherford, N.H., Chesney L., Holohan C., Patterson J.D.

**Application:** Similar levels of cow performance can be achieved when grazing plantain-ryegrass swards and perennial ryegrass swards.

**Introduction**: In an endeavour to reach net zero targets and reduce the environmental impacts of our dairy production systems, there has been growing interest in alternative sward types. Ribwort plantain (*Plantago lanceolata L*.) is one such forage, that could be incorporated into perennial ryegrass swards. Research from New Zealand has shown reductions in nitrogen (N) losses and nitrate leaching (Navarrete et al., 2022) and lower nitrous oxide emissions (Vi et al., 2023) in plantain swards compared to ryegrass-based swards. Recent research conducted at AFBI (unpublished) has produced similar findings. However, the impact of alternative sward types on cow performance, must also be assessed, as this will be a large determinant of the adoption of plantain swards within the dairy industry. The aim of this study was to investigate the impact of plantain inclusion in a perennial ryegrass (PRG) sward on cow performance.

**Materials and methods:** This experiment was conducted at the Agri-Food & Bioscience Institute in Hillsborough, Northern Ireland. A total of 44 spring-calving Holstein-Friesian cows were assigned to one of two sward type treatments in a randomized complete block design, with two replicate groups of 11 cows per treatment. Each replicate was balanced for parity, days in milk, body weight, BCS, milk quality and milk yield. The two sward types were a PRG and a plantain + perennial ryegrass sward (PLN). Swards were initially established in 2021 with additional plantain being stitched into the PLN swards in spring 2024. Cows were paddock grazed (night & day) from May to October 2024 at a stocking rate of 3.8 cows/ha. Cows were turned out in May due to breeding programme commitments and poor weather in March and April. Mean pre-grazing herbage mass was 3203 and 3318 kgDM/ha for PRG and PLN, respectively, likewise mean post-grazing herbage mass was 2010 and 1947 kgDM/ha. Cows received concentrates through the milking parlour at a rate of 4 kgDM/cow/day. Throughout the study, milk yields were monitored twice daily. Milk samples were taken weekly from one successive evening and morning milking for the determination of milk fat, protein, urea and lactose concentrations. Live weight (LW) was recorded daily and body condition score (BCS) was recorded monthly. Pre- and post-grazing herbage mass was determined using a rising platemeter (Jenquip, Fielding, New Zealand), while daily herbage samples were taken for the determination of nutrient composition. Daily sward botanical compositions were completed on both sward types. Statistical analyses were conducted using Genstat (21st Edition) by REML repeated measures.

**Results:** Mean botanical composition over the course of the study showed that plantain content of the PLN sward was 27.9%. The proportion of unsown species within the swards were 2.4% and 6.0%, for PRG and PLN, respectively (*P*<0.001). The remaining proportion in each sward was PRG (*P*<0.001). The results in Table 1 show that there was no difference in cow performance between a PRG sward and a 27.9% PLN sward. These findings are in agreement with that of Nguyen et al. (2024).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 1: The effect of sward type on cow performance** | | | | |
|  | **PRG** | **PLN** | **SED** | **P-value** |
| Milk yield (L/cow/day) | 23.3 | 23.0 | 0.80 | ns |
| Milk solids (kg/cow/day) | 1.97 | 2.02 | 0.048 | ns |
| Milk fat (%) | 4.98 | 5.15 | 0.172 | ns |
| Milk protein (%) | 3.59 | 3.59 | 0.085 | ns |
| Milk urea | 275 | 278 | 8.4 | ns |
| BCS | 2.55 | 2.58 | 0.059 | ns |

**Conclusion:** Results from this study show that similar levels of cow performance can be achieved from both PRG swards and PLN swards with a mean 27.9% plantain inclusion rate over the season.

**Acknowledgements:** The authors acknowledge funding from the Department of Agriculture, Environment and Rural Affairs for Northern Ireland.

**References:** Navarrete S., Rodriguez M., Horne D., Hanly J., Hedley M. and Kemp P. (2022) Nitrogen Excretion by Dairy Cows Grazing Plantain (*Plantago lanceolata*) Based Pastures during the Lactating Season. *Animals* 12, 469.

Nguyen TT, Navarrete S, Horne D, Donaghy D, Kemp P. 2024. Milk production and nitrogen excretion of grazed dairy cows in response to plantain (Plantago lanceolata) content and lactation season. *Anim Biosci.* Feb 23. doi: 10.5713/ab.23.0400. Epub ahead of print. PMID: 38419536.

Vi C., Kemp P.D., Saggar S., Navarrete S. and Horne D.J. (2023) Effective Proportion of Plantain (*Plantago lanceolata* L.) in Mixed Pastures for Botanical Stability and Mitigating Nitrous Oxide Emissions from Cow Urine Patches. *Agronomy* 13(6):1447.