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Grass cultivar evaluation



Key external stakeholders:

Dairy farmers, dairy industry, grass breeders and evaluators, animal nutrition companies and consultants.

Practical implications for stakeholders:

- Grass cultivars re-rank depending on the evaluation protocol to which they are subjected.
- Differentiation of cultivars for grazing or silage use should take place within recommended lists.
- Grass cultivars which had the highest DMD values were also those that were grazed tightest by dairy cows, i.e. had the best 'grazing out score'.

Main results:

- This study clearly showed that there is a re-ranking of individual grass cultivar performance depending on the management protocol that the cultivar is exposed to.
- Grass cultivars which performed well under simulated grazing (SG; 10 cuts per year) did not perform as well under the 2CUT system (two silage cuts plus four other cuts) or AG (animal grazing, 10 rotations) system.
- Differentiation of cultivars for grazing or silage use should take place within recommended lists.
- Highest DM production was achieved on the 2CUT>SG>AG protocol.
- There was a 2,083 kg DM/ha difference between AG (10,055 kg DM/ha) and SG grazing, and a 5,876kg DM/ha between AG and the DAFM protocol.
- Within the animal grazing protocol it was found that some cultivars have a better 'grazing out score' which is linked to the grass digestibility of the cultivar.
- Further research is required to quantify long term grass cultivar persistency.

Opportunity/Benefit:

These results provide data illustrating a clear re-ranking of grass cultivar performance depending on evaluation system. This provides the grassland industry with knowledge that grass cultivars perform differently depending on the management system they are exposed to. The opportunity and benefit of this work has been that Irish grass cultivar evaluation systems have now been redesigned to incorporate both simulated grazing and intensive silage harvest protocols to establish the most appropriate grass cultivars for Irish ruminant grazing systems. This change in grass cultivar evaluation will increase our knowledge of new cultivars and will assist in the development of the grass economic index which is dependant on having a simulated grazing protocol. This work showed that further work and analysis is required to quantify cultivar persistency under different grazing management systems.

Collaborating Institutions:

Department of Agriculture, Food and the Marine (DAFM)
Agri-Food and Biosciences Institute (AFBI) Northern Ireland
French National Institute of Agricultural Research, (INRA) France

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1. Project background:

Ireland's low cost seasonal grass-based ruminant livestock production system has traditionally given producers an advantage over international counterparts. With the selection of modern dairy cow genetics, increased emphasis on product quality and issues associated with Nitrogen leaching, greenhouse-gas emissions and animal welfare, pasture based systems will in the future require higher per-animal productivity. This will necessitate the development of grazing systems that will be underpinned by the selection of grass cultivars that are highly productive yet do not compromise grass quality and ultimately will maximise daily dry matter (DM) intake. Given the importance of Recommended Lists in the selection and use of grass cultivars on farms, it is imperative that they identify the most suitable cultivars for the intended end user – the grassland farmer. Different grass cultivar evaluation protocols are employed throughout Europe, and testing is generally conducted under cutting management practices. The protocols employed can generally be segregated into simulated grazing or conservation based cutting regimes, with some integrating both conservation and simulated grazing. Simulated grazing protocols entails more frequent harvesting and mirrors or 'simulates' typical animal grazing rotations with eight to ten harvests per year. Grass evaluation protocols based on conservation cutting regimes have less frequent harvesting with two to three conservation harvests and five to six harvests in total. The objective of this study was to compare three methods to evaluate perennial ryegrass cultivars, in terms of DM production, herbage digestibility and persistency and to identify which management identified cultivars most suitable for an intensive grazing scenario. The study aimed to identify if the relative performance of cultivars remained the same under actual animal grazing or simulated grazing. Both the animal grazing and simulated grazing managements were compared to a two-cut silage management, which acted as a control as it is the management currently used to evaluate perennial ryegrass cultivars in the Republic of Ireland.

2. Questions addressed by the project:

Do grass cultivars perform differently depending on the grazing management they are exposed to?
Does Ireland need to change the way grass cultivar evaluation is undertaken?
Are grass cultivars grazed preferentially by grazing ruminants?

3. The experimental studies:

An experiment was set up to investigate the effect of cultivar evaluation method on 10 perennial ryegrass cultivars. The study was executed as a randomised block design with each cultivar having three replicates. Three evaluation protocols were put in place as follows: i) Animal Grazing (**AG**); 10 animal grazing rotations from February to November receiving 355 kg N/ha/year; ii) Simulated Grazing (**SG**); 10 mechanical defoliations from February to November receiving 355 kg N/ha/year; iii) Two cut silage management (**2CUT**); 6 mechanical defoliations from March to October with cuts of silage harvested in mid May and late June, receiving 350 kg N/ha/year. Ten cultivars were evaluated under each of the three managements; the cultivars were Abermagic, Aberstar, Astonenergy, Dunluce, Magican, Millennium, Navan, Spelga, Twystar and Tryella. Measurements included seasonal and annual herbage production, DM digestibility (DMD), ground score, tiller density and grazing out score. As part of the study, under the AG treatments, a new measurement 'grazing out score' was established. The grazing out score relates to the preference the animals have for grazing out a cultivar to the lowest post grazing height across the plots in this study.

4. Main results:

- Year had a significant effect on total and seasonal DM production. Total DM yield was 2,090 kg DM/ha greater ($P < 0.001$) in Year 1 compared with Year 2.
- Management influenced total DM yield ($P < 0.001$), the highest total DM yield was recorded under the 2CUT management (15,931 kg DM/ha) which yielded 3,793 and 5,876 kg DM/ha greater than the SG and AG managements, respectively.
- Cultivar had a significant impact ($P < 0.001$) on total DM yield, with a range of 1,862 kg DM/ha recorded between the highest and lowest yielding cultivars.

- There was an interaction ($P < 0.001$) between cultivar and management for DM yield as the relative performance of cultivars changed between managements. Astonenergy ranked 3rd under SG; whereas it ranked bottom when under the AG management. Navan ranked 2nd under the 2CUT management, while ranking 8th under the SG management.
- Grass quality varied across the three protocols, DMD was 803 g/kg DM for AG, 796 g/kg DM for SG and 805 g/kg DM for the 2CUT protocol. The largest difference in DMD took place in spring - 813 g/kg DM for AG, 771 g/kg DM for SG and 841 g/kg DM for 2CUT. There were management ($P < 0.001$), year and cultivar effects on DMD.
- Sward tiller density and ground scores were different between cultivars and managements. Tiller density was 5762 tillers/m² for AG, 4425 tillers/m² for SG and 7058 tillers/m² for 2CUT protocols.
- Astonenergy and Magician achieved the highest grazing out scores (lowest post grazing sward height) while Abermagic and Aberstar were consistently the lowest (highest post grazing sward height). While the magnitude of the difference in post grazing height was 0.13 cm, which is low, the consistency of results across years illustrates that some cultivars are difficult to utilise in an intensive grazing situation.
- Grass cultivars with the best grazing out score also had the highest DMD.
- Further work is required to examine persistency over time.

5. Opportunity/Benefit:

These results provide data illustrating a clear re-ranking of grass cultivar performance depending on evaluation system. This provides the grassland industry with knowledge that grass cultivars perform differently depending on what management system they're exposed to. The opportunity and benefit of this work has been that Irish grass cultivar evaluation systems have now been redesigned to incorporate both simulated grazing and intensive silage harvest protocols to establish the most appropriate grass cultivars for Irish ruminant grazing systems.

6. Dissemination:

The primary stakeholders for this research are Irish dairy farmers, grassland companies, grass evaluators and grass breeders. The results of this project have been disseminated through the popular press and at the Teagasc Moorepark Open Days, a major international grassland conference in 2010 ('Grasses for the Future') hosted by Teagasc, a PhD thesis, presentations at scientific conferences and in scientific peer-reviewed publications.

Main publications:

O'Donovan, M., Lewis, E., O'Kiely, P. 2011. Requirements of future grass-based ruminant production systems in Ireland. *Irish Journal of Agricultural and Food Research*, 50: 1-21.
McEvoy, M., O'Donovan M. and Shalloo, L. Development and application of an economic ranking index for perennial ryegrass cultivars. *Journal of Dairy Science* (2011) 94 1627-1639.
McEvoy, M., O'Donovan M. and Shalloo, L. Capturing the economic benefit of Lolium Perenne performance. *Irish journal of Agricultural and Food Research*, 50; 83-98, 2011.

Popular publications:

McEvoy, M and O'Donovan, M. Evaluation of perennial ryegrass cultivars (2011). Moorepark open day proceedings, p68-69.
Wims, C., McEvoy, M., T Boland and O'Donovan M. A comparison between cut and intensively grazed swards on DM yield of perennial ryegrass. Proceedings of the British Society of Animal Science and the Agricultural Research Forum (2010). P326.
McEvoy, M., O'Donovan M., Wims, C. and Kennedy E. The effect of evaluation protocol on the dry matter yield performance of Lolium Perenne varieties. Proceedings of Grassland Science in Europe, Vol. 15 (2010). P314.
Wims, C., McEvoy, M., T. Boland and O'Donovan, M. A comparison between cut and intensively grazed swards on DM yield of perennial ryegrass. Proceedings of Grassland Science in Europe, Vol. 15 (2010). P578.

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