The effect of nitrogen fertiliser and season on the *in situ* degradability of Irish perennial ryegrass in cattle

V. Olsson[1,4], J.J Murphy[1], F.P O'Mara[3], K. O'Connell[2], J. Humphreys[1] and F.J. Mulligan[4]
[1]Teagasc, Dairy Production Research Centre, Moorepark, Fermoy, Co Cork, Ireland, Email: volsson@moorepark.teagasc.ie, [2]Teagasc, Johnstown Castle, Co Wexford, Ireland, [3]Department of Animal Science and Production, Faculty of Agri-Food and the Environment, [4]Department of Animal Husbandry and Production, Faculty of Veterinary Medicine, University College Dublin, D4, Ireland

Keywords: perennial ryegrass, rumen degradability, nitrogen, season

Introduction In light of increasing environmental and economic pressure on agriculture to utilise resources more efficiently, protein feeding and its effects are fundamentally important. As grazed grass is the predominant feed in Irish dairy and beef cattle production systems, it is necessary to establish protein values for different grass varieties and cultivars fed. It is also important to investigate the extent of ruminal nitrogen (N) degradability for these grasses since this characteristic greatly influences environmentally damaging urinary N excretion.

Materials and methods Experimental plots of perennial ryegrass (*Lolium perenne*) with different fertiliser application rates (0, 90 or 350 kg N/ha/yr) were grazed to 5 cm throughout the season of 2001, at Moorepark Research Centre. Fertiliser and grazing patterns were: 350 kg N/ha and a 3 week (wk) grazing rotation, 90 kg N/ha and a 4 wk grazing rotation and 0 kg N/ha and a 5 wk grazing rotation. Grass samples were harvested weekly, oven dried at 40ºC for 48 hours (h), milled through a 1 mm screen and pooled by month (April to October). Twelve 2 g samples from each treatment (n=24) were incubated in nylon bags (5×10 cm; 50µm pore size) in each of four Holstein Friesian steers fitted with a ruminal cannula. All samples were incubated together and subsequently two bags per sample were removed at 0, 2, 4, 8, 12, 24 and 48 h. Immediately after removal the samples were immersed in cold water, then frozen and later treated with an *in vitro* buffer (4g NH_3HCO_3 and 35g $NaHCO_3$ per L distilled water) using 5 ml buffer per nylon bag in a Seward Lab Blender. The samples were then washed in a domestic washing machine (3×10 min rinse cycle) and oven dried at 40ºC for 48 h. Nitrogen analysis was carried out using a Leco FP-328 analyser. The animals were offered a diet of 75% grass silage and 25% concentrate fed twice daily.

Results Effective degradability (ED) was calculated according to Ørskov and McDonald (1979) assuming a rumen outflow rate of 6% per hour. Data was analysed by repeated measures analysis using the PROC GLM statement of SAS. The crude protein concentration of the grass averaged 127, 157 and 247 g/kg for 0, 90 and 350 kg of N/ha. The in vitro DMD of the grass samples were 850, 840 and 855 g/kg for 0, 90 and 350 kg of N/ha respectively. There was a significant overall effect (p<0.05) of fertiliser on ED for dry matter (DM) but not for N (p<0.14). Season had a significant effect both on ED for DM and for N. The ED of DM was significantly reduced after each increase in fertiliser application in June (Table 2). In April ED of DM was significantly lower for the 350 kg of N/ha treatment (Table 2).

Table1 Average effective degradability for N

Fertiliser	0	90	350	SEM
April	69.2	67.0	67.7	0.97
May	64.1	63.4	66.2	1.07
June	67.0	68.4	70.3	1.67
July	62.5	64.7	63.7	1.85
August	61.5	63.5	60.8	1.58
September	63.7	63.2	64.0	1.78
October	62.1	64.0	64.4	1.09

Table 2 Average effective degradability for DM

Fertiliser	0	90	350	SEM
April	76.0[a]	74.7[a]	73.2[b]	0.85
May	75.3	72.6	72.3	1.25
June	75.7[a]	68.1[b]	71.5[c]	1.05
July	68.1	70.7	67.6	1.43
August	64.5	65.8	64.4	1.12
September	69.9	69.0	66.9	1.28
October	67.2	66.3	65.9	1.43

[a, b, c] *Means within rows not sharing a superscript differ significantly (p<0.05)*

Conclusion Effective degradability of DM was reduced as fertiliser application rate increased and the grazing rotation length was reduced. The effective degradability of both DM and N was decreased as the grazing season advanced from April to October.

References

Ørskov, E.I., & I. McDonald (1979). The estimation of protein degradability in the rumen from incubation measurements weighted according to rate of passage *Journal of Agricultural Sciences (Cambridge)* 92, 499-503.