Dry matter production of perennial ryegrass swards following varying levels of poaching damage on a free-draining earth soil

G Tuñon[1,2], E Kennedy[1], D Hennessy[1], P Kemp[2], N Lopez Villalobos[2], M O'Donovan[1]
[1]Moorepark Research Centre, Fermoy, Ireland, [2]Massey University, Palmerston North, New Zealand
Email: gonzalo.tunon@teagasc.ie

Introduction Poaching damage is a limiting factor for pasture production and utilisation. Understanding the negative effects of poaching remains crucial since grazing is becoming more important for European farmers. Poaching has been shown to reduce pasture production by 13 to 45 % (Meneer *et al.*, 2001). The objective of this study was to quantify the effects of varying levels of poaching damage on the dry matter (DM) production and tiller density of a perennial ryegrass sward on a free-draining acid brown earth soil.

Materials and methods Twenty four 5 m x 11 m (55 m^2) plots were established in a two-year old sward dominated by perennial ryegrass (*Lolium perenne* L.) at Teagasc Moorepark Dairy Production Centre in the south of Ireland. Four treading damage treatments were applied: i) Control (C), ii) Barely damaged (BR), iii) Intermediately damaged (ID) and iv) Badly damaged (BD). Forty five non-lactating dairy cows (average weight 550 kg) were used to achieve the desired levels of damage. Residency times were 0, 20, 40 and 120 minutes for C, BR, ID and BD, respectively. Half of each plot was rolled four weeks after the poaching treatments had been applied (12 March) thereby creating 48 plots (2.5 m x 5.5 m). Once preceding and five times subsequent to treatments being applied, herbage mass on each treatment plot was estimated by harvesting a strip of 10 m x 1.2 m using a motor Agria mower (Etesia UK Ltd., Warwick, UK). The fresh weight of the harvested material was recorded and a sub-sample (100 g) was dried at 40º C for 48 h, and DM% obtained. Herbage mass (kg DM/ha) was then calculated. Tiller density was assessed once before and on two occasions after the poaching event. Three turves (10 cm x 10 cm) were selected randomly from each plot, cut to a depth of >30 mm and dissected. The species of each tiller were identified and counted. All plots were fertilised with 30 kg nitrogen (N)/ha in the form of calcium ammonium nitrate (CAN) after they were grazed. Hoof depth was measured with a ruler on 20 random hoof marks in each plot. Surface roughness was measured using a 7.57 m chain placed on the soil surface following the contours of the poached soil. The chain length reduction was an estimate of the roughness of the surface. Two measurements per plot were taken and then averaged to calculate the chain reduction. Differences between mean values were tested for significance by ANOVA, with level of poaching and rolling as factors as a randomised complete block design with rolling as split plot.

Results Poaching affected herbage mass on the first harvest post damage but there was no difference in cumulative DM yields. After the imposition of treatments, herbage mass was significantly reduced for the BD treatment (Table 1). Cumulative DM yields to the end of August were not different between treatments and tiller density was not affected by poaching or rolling. Average depth of hoof prints were 3.57, 4.83 and 5.83 cm deep (P<0.001) for BR, ID and BD, respectively. Surface roughness, expressed as a percentage of chain reduction, was 2.52, 6.17, 8.37 and 12.73 % (P<0.001) C, BR, ID and BD, respectively. Surface roughness was greater in areas that had not been rolled (5.89 %) compared to areas that had been rolled (2.97 %; P<0.001).

Table 1 Dry matter yield (kg DM/ha) and perennial ryegrass tiller density (m^2) of the four treatments Control (C), Barely damaged (BR), Intermediately damaged (ID) and Badly damaged (BD), and for the two sub-treatments Rolled (R) and Not rolled (NR).

	Grazing	C	BR	ID	BD	P value	R	NR	P value	SED
DM yield	1	2,304 ^{ab}	2,402 ^{a}	2,095 ^{b}	1,620 ^{c}	<0.001	2,042	2,169	n.s.	153.7
(Kg DM/ha)	2	1,215	1,320	1,369	1,351	n.s.	1,309	1,319	n.s.	56.6
	3	2,192	2,332	2,472	2,509	n.s.	2,361	2,392	n.s.	123.3
	4	1,488 ^{a}	1,558 ^{a}	1,587 ^{ab}	1,706 ^{b}	0.0432	1,564	1,606	n.s.	69.2
	5	2,038	1,983	2,156	2,145	n.s.	2,086	2,075	n.s.	121.1
Tiller density	1	7,985	8,276	8,050	8,106	n.s.	8,126	8,082	n.s.	734.9
(PRG/m^2)	2	7,700	7,498	7,485	7,817	n.s.	7,646	7,604	n.s.	712.4

SED = Standard error of the difference; ^{abc} values in the same row not sharing a common superscript are significantly different; PRG=Perennial rye grass.

Conclusions Previous studies have reported reduced pasture production following a single intensive poaching event (Drewry *et al*., 2008). However, in those studies, the soil type was silt loam or clay. Conversely, in the present study, the soil type was a free-draining, acid brown earth with sandy-to-loam texture. Herbage on this soil may be more resilient to damage than herbage on soils with higher clay content. Hence, the lack of treatment effect in the present study may have been due to soil texture. This study indicates that perennial ryegrass swards on sandy-to-loam soils overcome a single event of substantial treading damage in spring. A similar experiment is being repeated in a heavier textured soil.

References

Drewry, J.J., Cameron, K.C. and Buchan G.D. 2008. Australian Journal of Soil Research 46, 237-256.
Menneer, J.C., Ledgard, S., McLay, C. and Silvester, W. 2001. Proceedings of the New Zealand Grassland Association 63, 63-67.

https://doi.org/10.1017/S2040470010002268 Published online by Cambridge University Press