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## Production, botanical composition and nutrient status of an originally *Lolium perenne*—dominant sward receiving long-term manure applications

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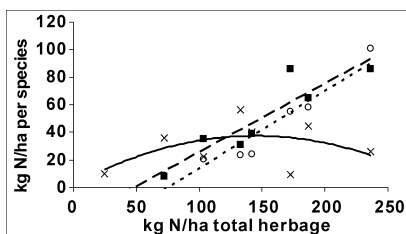
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**Key words :** slurry, nitrogen, phosphorus, *Lolium perenne*, *Agrostis stolonifera*

**Introduction** Long-term slurry applications may alter the botanical composition of herbage (Christie, 1987). Perennial ryegrass (*Lolium perenne* L.) is the most important plant species in intensively managed grassland in the UK. The aim of this study was to investigate the effect of long-term slurry application on production and botanical content of a *Lolium perenne*-dominant sward and to determine the possible role of macronutrients in determining botanical composition.

**Materials and methods** The experiment was established on a sown sward of *Lolium perenne* L. at Hillsborough, Northern Ireland and has been managed as a three-cut silage system since 1970. Eight treatments have been applied to plots of net area 18.75 m<sup>2</sup> in three randomized blocks (each containing two replicates of each treatment) i.e. unfertilized control (UF), fertilized control (FE; 200 kg N, 32 kg P, and 160 kg K ha<sup>-1</sup> y<sup>-1</sup>), pig slurry at 50, 100 and 200 m<sup>3</sup> ha<sup>-1</sup> y<sup>-1</sup> (Pig50, Pig100 and Pig200), and cow slurry at the same three rates (Cow50, Cow100, Cow200). In 2006 the proportions of dominant species in each plot at each harvest and at the first two harvests the concentrations of N and P in *Lolium perenne* (L.p.) and in two other major ingressing species (*Agrostis stolonifera*, A.s.) and *Poa* spp. were determined (except in treatment UF).

**Results** Total annual DM yield varied from 3.1 t ha<sup>-1</sup> (UF) to 18.2 t ha<sup>-1</sup> (Cow200). Perennial ryegrass content declined and *Agrostis* content increased with increasing slurry application rate (Table 1). Nitrogen concentration in either species was only markedly increased by Cow200. Only in perennial ryegrass did P concentration increase with slurry rate. Therefore increasing deficiency in N and P does not explain severe decline in perennial ryegrass at high slurry rates. However, perennial ryegrass was less able to take advantage of the higher availability of N (Figure 1) and P (similar pattern to N) at high rates of slurry application. Among the other macronutrient concentrations determined in perennial ryegrass, Ca suffered the steepest decline with increasing slurry rate, suggesting a possible limitation to perennial ryegrass contribution, although physical factors such as smothering of the herbage by high application rates of slurry may have also been involved.



**Figure 1** Relationship between N uptake by *L.p.* (x, solid line), *A.s.* (■, broken line) and *Poa* (○, dotted line) and total uptake ( $r^2 = 0.27, 0.83$  and  $0.92$ ), respectively.

**Table 1** Proportion in dry matter (3 cuts) and N and P content (mg g<sup>-1</sup>) of *Lolium perenne* (L.p.) and *Agrostis stolonifera* (A.s.) (2 cuts).

	L.p. Prop.	A.s. Prop.	L.p. N	A.s. N	L.p. P	A.s. P
UF	0.31	0	11.9	0	1.81	0
FE	0.23	0.29	14.1	20.2	2.31	2.74
PIG50	0.37	0.18	12.5	17.5	2.36	2.58
PIG100	0.20	0.48	11.5	17.7	2.39	2.82
PIG200	0.03	0.61	12.1	18.4	2.61	2.86
COW50	0.39	0.26	12.3	17.7	2.19	2.68
COW100	0.21	0.47	12.8	19.1	2.27	2.68
COW200	0.09	0.47	19.1	22.3	2.93	2.96
s.e.m.	0.04***	0.049***	0.73***	0.44***	0.09***	0.08ns

**Conclusions** The inability of perennial ryegrass to withstand long-term application of high rates of slurry application cannot be explained by deficiency in N and P induced by competition but limitation in other nutrients may be responsible, perhaps together with physical effects of high slurry application rates on plant growth.

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### Reference

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