Production, Botanical Composition and Nutrient Status of an Originally *Lolium perenne*–Dominant Sward Receiving Long-Term Manure Applications

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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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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^2 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 $ha^{-1} y^{-1}$) , pig slurry at 50 , 100 and 200 m^3 $ha^{-1} y^{-1}$ (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^{-1} (UF) to 18 .2 t ha^{-1} (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 .

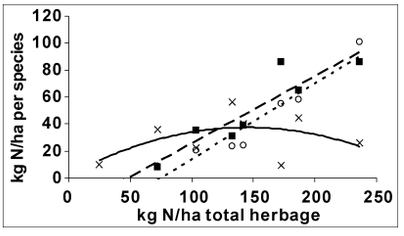

Figure 1 *Relationship between N offtake by L .p . (x , solid line) , A .s . (■ , broken line) and Poa (○ , dotted line) and total offtake (r^2 = 0 . 27 , 0 . 83 and 0 . 92) , respectively .*

Table 1 *Proportion in dry matter (3 cuts) and N and P content (mg g^{-1}) 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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