Study of Soil Characteristics to Estimate Sulphur Supply for Plant Growth

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Introduction During the last decades, sulphur (S) deficiencies have been observed throughout Europe (Zaoh *et al*., 2002). Accurate estimation of S supply by the soil-atmosphere system is required to give advice for S fertilisers. Soil is an important S source for plants and it is therefore important to evaluate supply by the soil to avoid deficiencies or excessive S fertilisation. The purpose of this preliminary study was to estimate which soil characteristics could be useful for predicting S supply by soil. *Lolium multiflorum* was grown on different soils in a growth chamber and S supply was correlated with soil characteristics.

Materials and methods Twelve soils were sampled at 0-15 cm depth, passed through a 0.5 cm sieve, and air dried at 30° C. Soil DM was determined at 105° C. An equivalent of 1 kg DM was mixed with 250 g of sand, to reduce differences in soil structure; there were 6 replicate pots. Four soils came from permanent grasslands (Pg, soils 1 to 4) and 8 from arable land or temporary grassland (Al, soils 5 to 8). On each pot we sowed 2 g of *Lolium multiflorum* (cv Meroa). Pots were kept at 22°C during the day (16 hours artificial light) and at 16 °C during the night. Each pot received water and all nutrients for optimal growth except S (Lombaert, 1992). Five cuts were harvested and dry matter yields measured. Forages from two replicates were mixed to provide enough sample for analyses. Plant total sulphur content (Leco) and nitrogen content (NIRS) was determined. Soils were analysed for carbon, total S, sulphate content and texture. Plant S yields are the sum of those at each cut.

Results and conclusions Significant differences in S yields were observed between the soils. Soils coming from Pg supplied more S for plants than Al soils (Figure 1) with similar soil characteristics.

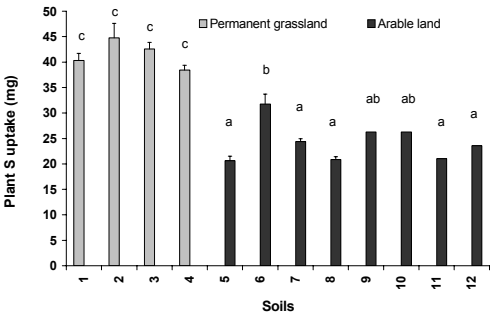

Figure 1 Plant S yields (mean and sd) from soils: different letters indicate a difference at $p<0.05$ (Systat, 1998)

Table 1 Linear relationship between soil characteristics (x) and S supply estimated by plant S yields (y). (y=a*x+ b: R is the correlation coefficient)

Soil charact.	Pg (n=4)			Al (n=8)		
	a	*b*	*R*	*a*	*b*	*R*
C (g/100g soil)	3.94	32.6	0.893	3.48	17.6	0.781*
S (g/kg soil)	24.3	33.0	0.899	27.0	15.7	0.737*
SO_4 (g S/kg soil)	619.6	36.3	0.833	938.4	18.6	0.426
C/S	-0.12	49.4	0.209	0.24	10.3	0.615
Clay (%)	0.30	36.6	0.755	0.24	20.1	0.453
Silt (%)	0.20	37.4	0.690	0.09	20.8	0.506
Sand (%)	-0.13	49.9	0.751	-0.10	28.8	0.603

* Significant correlation ($p<0.05$)

Linear correlations were established between soil characteristics and S supply separately for the two groups (Pg *vs* Al, Table 1). Significant ($p<0.05$) relations were observed for soil C and total S content for Al soils. This relationship was also strong but not significant for Pg, probably because too few soils were studied. For the soil characteristics considered in this study, carbon and total S contents of the soils were the best indicators for estimating S supply by soil.

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