EFFECT OF LIME AND GYPSUM APPLICATION ON CHEMICAL CHARACTERISTICS OF LEACHING FROM ACID SOIL

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Cation movement in the soils depends, above all, on the amount of water flowing through the topsoil layer (Sanchez, 1976). Under heavy rainfall and irrigation conditions, the soils capacity to retain cations is reduced and they are carried down through the soil to a position beyond the root zone. Sparingly soluble salts. such as gypsum, are quickly removed by the water surplus moving down through the soil layers. However, losses of cations are also influenced by evaporation, by the characteristics of soil, and by the presence or absence of a crop (Prescott, 1950).

Five different treatments of lime (L) and/or gypsum (G) [1 - control (C), 2-lime to get to pH 5.5 (L), 3-gypsum equivalent to the lime to get to pH 5.5 (G), 4-lime to get 20% of Ca saturation (0.2 L), and 5-lime to get 10% of Ca saturation plus gypsum to get 10% of Ca saturation (0.1L + 0.1G)] in four replications were arranged in a randomized block design in factorial combination. Lime, gypsum and fertilizers were mixed with the soils (Haplorthox and Hapludult) and applied 10 cm deep shortly before watering. In both soils 20 kg N; 45 kg P; 0,3 kg B; 4.0 kg Cu; 0,1 kg Mo and 4,0 kg Zn ha^{-1} were added before planting as urea [$CO(NH_2)_2$], potassium phosphate (KH_2PO_4), boric acid (H_3BO_3), copper sulphate ($CuSO_4.5H_2O$), sodium molibdate ($NaMoO_4.2H_2O$) and zinc sulphate ($ZnSO_4.7H_2O$) respectively. Potassium and magnesium were applied in the amounts of 135 and 100 $kg.ha^{-1}$ in the Haplorthx and 76 and 102 $kg.ha^{-1}$ in the Hapludult as potassium sulphate and magnesium sulphate, respectively. Water equivalent to 600 mm of rainfall was applied 10 days before planting of common bean (*Phaseolus vulgaris* L.). Water surplus was collected at the bottom of the pipes to make the chemical analyses.

Lime treatments (L) increased pH, EC values and K, Ca, Mg. concentrations in the leachate from Haplorthox soil. Gypsum treatments (G) increased pH value and K, Ca, Mg, S and Si concentrations in Hapludult soil. Water was efficient to carry the cations down in the non extrutured Haplorthox soil. In the well extrutured Hapludult soil the gypsum was necessary to carry down the same cations (Tables 1 and 2).

References

SANCHES, P.A. 1976. Properties and management of soils in tropics. John Wiley and Sons. New York. 618p.

PRESCOTT, J.A. 1950. A climate index for the leaching factor in soil formation. J. Soil Sci., 1:9-19.

Table 1. Effect of lime and gypsum applications on pH, electrical conductivity. (EC), potassium, calcium, magnesium and sodium concentrations of soil leachate.

Treatment	pH	EC	K	Ca	Mg	Na
Haplorthox (1 soil:5 water)		-$mS.cm^{-1}$	($mol.l^{-1}$)			
Control	5.51	0.070	77.7	451	625	2112.63
Lime (L)	6.66	0.082	97.1	580	836	1814.10
Gypsum (G)	6.43	0.071	92.1	495	700	1834.67
0.2 L	5.89	0.077	88.1	516	681	2077.34
0.1 L + 0.1 G	5.73	0.080	90.6	515	728	2019.20
Hapludult						
Control	3.39	0.022	21.5	31.3	112	480.13
Lime (L)	3,69	0.023	20.5	30.2	115	475.80
Gypsum (G)	3.84	0.024	22.3	60.1	119	445.54
0.2 L	3.37	0.024	19.5	34.2	107	460.46
0.1 L + 0.1 G	3.92	0.027	20.6	67.3	134	519.30

Table 2. Effect of lime and gypsum application under leaching treatment on nitrate, sulphur, manganese, iron, silicon and organic carbon ($mol.l^{-1}$).

Treatment	NO_3	S	Mn	Fe	Si	C
Haplorthox ($mol.l^{-1}$)						
Control	3096.0	332	6.85	<0.17	81.7	939
Lime (L)	3426.0	400	4.57	<0.17	93.4	2186
Gypsum (G)	3492.0	568	5.13	<0.17	96.8	1761
0.2 L	3885.0	434	5.16	<0.17	90.9	1253
0.1 L + 0.1 G	3745.0	445	5.22	<0.17	87.1	794
Hapludult						
Control	1106.0	33.1	1.41	1.80	92.7	473
Lime (L)	1351.0	39.4	1.18	1.15	95.8	353
Gypsum (G)	917.0	166.0	1.32	1.00	98.5	364
0.2 L	985.0	82.0	1.18	1.02	90.4	322
0.1 L + 0.1 G	885.0	111.0	1.29	1.25	88.9	313