

Legume Growth as Affected by Lime and Gypsum

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Summary

Soil acidity, aluminum (Al) toxicity and calcium (Ca) deficiency tend to occur together in soils, and it is difficult to isolate the effect of each of these soil conditions on plant growth. This greenhouse experiment was conducted to study the effect of varying the Al/Ca ratio of acid soils, by adding lime or a neutral salt (gypsum), on the establishment and growth of tropical legumes.

Soil pH, Ca, and Al were measured at 4 and 8 weeks after planting. At 8 weeks, plants were harvested and dry matter yield, N concentration, and N uptake were determined.

KEYWORDS: Soil acidity/Al toxicity/forage plants/*Macroptilium atropurpureum* cv. siratro/*Stylosanthes hamata* cv. verano, Rhizobium.

Both legumes grew better in the clay in which the N fertility was not so low as in the sand, even though the extractable Al was higher in the clay. Siratro growth improved with raised pH due to liming, while gypsum had a detrimental effect attributable to a slight decrease in pH. Thus, siratro response to lime seemed evidence of low tolerance to acidity.

Stylo responded to Ca application regardless of Ca source. However, increased pH from liming had a detrimental effect on stylo yields. Stylo response to Ca rather than to pH increase indicates a high tolerance to acidity.

Introduction

Legume growth can be inhibited by low soil pH and toxic levels of some elements such as aluminum and manganese (Mn). When lime is used to combat these problems, it also provides calcium which is essential to the plants. Some tropical legumes have developed a certain tolerance to acidity and Al and Mn toxicity;

TABLE 2. DRY MATTER YIELD OF TROPICAL LEGUMES (SIRATRO AND STYLO) AS INFLUENCED BY Ca SOURCE (LIME AND GYPSUM) AND Ca RATE IN A CLAY SOIL

Added Ca	Al/Ca ratio	Siratro		Stylo	
		Lime	Gypsum	Lime	Gypsum
g pot ⁻¹		Mg pot ⁻¹			
0	1.0	553 ab ¹	443 ab	456 ab	556 a
0.44	0.85	510 a	403 a	563 b	733 a
1.05	0.7	553 ab	460 b	600 b	400 a
2.23	0.5	740 b	436 b	423 ab	430 a
2.75	0.45	540 ab	393 ab	296 a	633 a

¹Means within columns with the same letter are not significantly different by Duncan's Multiple Range Test at P=0.05.

TABLE 3. DRY MATTER YIELD OF TROPICAL LEGUMES (SIRATRO AND STYLO) AS INFLUENCED BY Ca SOURCE (LIME AND GYPSUM) AND Ca RATE IN A SAND SOIL

Added Ca	Al/Ca ratio	Siratro		Stylo	
		Lime	Gypsum	Lime	Gypsum
g pot ⁻¹		Mg pot ⁻¹			
0	1.8	173 a ¹	156 b	233 ab	143 a
0.12	1.4	230 ab	070 a	186 a	190 a
0.35	1.0	366 bc	076 a	290 ab	253 b
0.75	0.7	446 c	080 a	346 b	283 b
1.14	0.5	373 bc	060 a	226 ab	273 b

¹Means within columns with the same letter are not significantly different by Duncan's Multiple Range Test at P=0.05.