



FERTBIO 2016

16-20 October 2016

Convention Center Goiânia –
GO, Brazil

INTERNATIONAL
POTASH INSTITUTE
SINCE 1952



CALCIUM AND MAGNESIUM MOVEMENT IN SOIL PROFILE WITH POLYHALITE AS POTASSIUM FERTILIZER FOR SOYBEAN CROP

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INTRODUCTION

Limestone is applied to reduce the soil acidity. Although its application increases calcium (Ca) and magnesium (Mg) concentrations in soils, these nutrients are concentrated in the superficial soil layers, according to the depth where the corrective was incorporated.

In no tillage system, where limestone is applied in broadcast and without incorporation, Ca and Mg are concentrated in the top of the soil. This restricts the deepening of the roots, leaving the plants more susceptible to the reduction of yield when there is a rain deficit during its development.

OBJECTIVE

To evaluate the application of a new potassium source that also contains Ca and Mg in its composition (associated with sulphate), applied on the soil surface, and the effects on the concentration of these nutrients in the soil profile.

MATERIALS AND METHODS

Place: A field trial was conducted in Sapezal, Mato Grosso state, Brazil

Soil: Oxisol. 143 g kg⁻¹ of clay, 72 g kg⁻¹ of silt, 785 g kg⁻¹ of sand.

Table 1. Chemical characteristics of soil before sowing

OM	pH	PMeh	K	Ca	Mg	Al	H+Al
g dm ⁻³	CaCl ₂	mg dm ⁻³	cmolc dm ⁻³				
7.8	5.8	7.8	0.1	1.7	0.6	0.0	2.9

BS	CEC	V	S	B	Cu	Fe	Mn	Zn
cmolc dm ⁻³		%	mg dm ⁻³					
2.3	5.2	0.4	10.7	0.35	0.50	110	2.15	1.75

BS: sum of basis = K+Ca+Mg; V: basis saturation or amount of basis in CEC, V=(BS/CEC)*100. MO (sodium dichromate 4N and H₂SO₄ 10N); P, K, Cu, Fe, Mn, Zn (Mehlich I); Ca, Mg and Al (KCl 0.1 M); H+Al (calcium acetate 0.5 M pH 7); S (calcium phosphate 0.2M); B (hot water).

Design: Completely randomized, with two treatments:

- (1) KCl in broadcast fertilization (60% K₂O);
- (2) Granular polyhalite, new natural fertilizer - K₂Ca₂Mg(SO₄)₄·2(H₂O), composition 14% K₂O, 12% Ca, 3.6% Mg, 19.2% S.

Before sowing: 2.5 Mg ha⁻¹ of dolomitic limestone, incorporated using heavy harrow.

Fertilization of soybean: 300 kg ha⁻¹ 4-27-8 + 5.8% S, in the furrow.

Treatments: in top soil, broadcast, without incorporation, 140 kg K₂O ha⁻¹, split (50% in V1 and 50% in V6 stages).

Soil sampling: after harvest, soil samples were taken (depths 0-5, 5-10, 10-15, 15-20, 20-30 and 30-40 cm), and were analyzed for K, Ca, Mg and S.

RESULTS

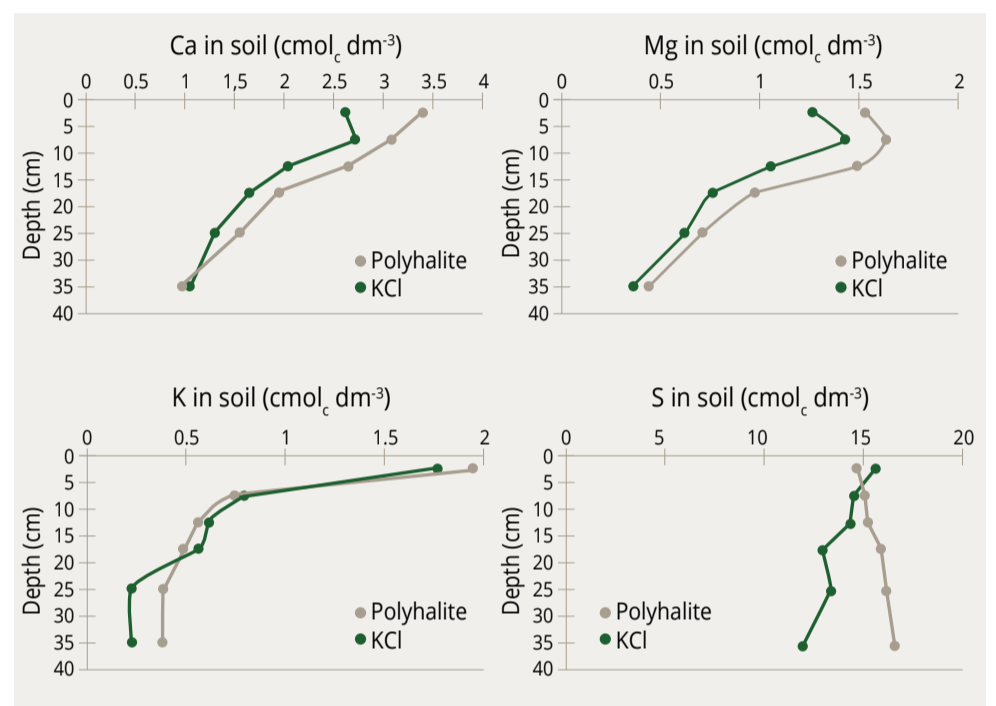


Figure 1. Movement of Ca, Mg, K and S in soil profile in the two fertilization treatments (KCl and Polyhalite as potassium source) to soybean in Oxisol

CONCLUSIONS

- Limestone application increased Ca and Mg contents only in the 0-10 cm layer, proportional to its mechanical incorporation.
- The application of polyhalite increased Ca and Mg contents throughout the profile, increasing Ca in 23% and 8%, respectively in the layers 0-20 and 20-40 cm.
- For Mg the increment was 25% and 17% for the same layers.
- The movement of Ca and Mg followed the movement of the sulphate, being observed the increase of the content of S in the profile, especially in the layer 20-40 cm.

ACKNOWLEDGMENT



ICL Brasil Ltda.