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# PERFORMANCE OF K SILICATE AGROMINERALS FOR CORN CROP

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## Introduction

In general, Brazilian soils are poor in macro and micronutrients. Brazil has only one producing potash mine so that more than 90% has to be imported, despite its importance as food producer. This very uncomfortable dependence also has a significant impact on the country's trade balance. Due to actual potash market, it is unlikely that any significant new production capacity will be developed in Brazil from the local potash salt deposits.

Since 2011 TERRATIVA MINERAIS screened locations close to agricultural regions from the Cerrado and with favourable geology and logistics, for syenite rock with up to 14.5% potash content and also high content of other macronutrients. This rocks are uncommon, but Terrativa was able to locate them in key areas by using modern geological tools. TERRATIVA is developing five high grade potash mines (with up to 14.5% $K_2O$) and is planning the installation of four rock powder plants close to important agricultural zones from the Cerrado.

A 2 year research program from TERRATIVA with the MIT/USA developed Hydrosyenite, a second generation low cost high efficiency potash fertilizer produced from syenite by hydrotermal process, with controlled accelerated release of potash and also other benefits for agriculture. Embrapa is running laboratory and agronomic efficiency tests to evaluate these K silicate agrominerals.

In this way, the objective of this research was to compare different silicate rocks as K source for maize as indicator plant in pot experiment.

## Methods

The experiment was conduced in greenhouse located at Embrapa Cerrados in Planaltina-DF. The treatments were the control (TE), 6 kind of silicated agrominerals (granulometry <0.15 mm), 2 doses and 3 repetitions. The silicated agrominerals were TA-15 (PRGB-PCER-MCA-RO0011/ 12,5 % de $K_2O$); TA-16 (PRTR-PICO-EBT-RO0013/ 13,4% de $K_2O$); TA-17 (PRRV-PACR-CAL-RO0066/ 9,97 % de $K_2O$); TA-18 (PRRV-PACR-CAL-RO0015/ 4,84 % de $K_2O$); TA-20 (PRTD-PSEA-CAL-RO0011/ 14,9 % de $K_2O$) e BX (biotite schist/ 2,66 % de $K_2O$). The doses were calculated based on the recommended fertilization of K to corn crops (120 kg $ha^{-1}$ of $K_2O$), and another with the double of it (240 kg $ha^{-1}$ of $K_2O$). For this calculation were considered the total K (%) presented in each rock. The treatments were homogenized with 2 kg of soil (Oxisol), packed in 2L pots, and seeded 2 plants of corn each.

Passed 45 days after emergency, the plants were collected and separated shoots and roots. All the material were dried at 60ºC, in the sequence, were weighted to the dry mass evaluation and crushed to the chemical analysis (total extraction). In the same period, the soils were collected, air dried and analysed for available amount of nutrients.

## Results and discussions

In the experiment was observed a increment in the dry mass as a consequence of the increasing dose of all the silicate agrominerals (figure 1). In the low doses (40 and 80 kg $ha^{-1}$) the dry mass addition were not different from the control treatment. The plants in the highest dose (240 kg $ha^{-1}$) some silicate agrominerals showed a potencial in the dry mass increment (figure 1), such as TA-15, TA-18 and TA-20.

In the dose equivalent of 120 kg per ha of $K_2O$ the biotite schist (BX) had the better development compared with the others agrominerals. However there are no difference in the dry mass production of both shoots as rootsif compared the BX with all agrominerals. The BX is the knowed silicate agromineral used as a rock control.

With the application of increasing dose of agromineral, the K available in soil were proportionally higher (figure 2). The available Si in the soil

treated with silicate agrominerals were simiar to the control (figure 2B), indicating no difference between the treatments.

The K amount absorbed by the plants were compatible with the K available in soils treated with the silicate agrominerals (figure 3). In the higher dose (240 kg $ha^{-1}$) plants from all the treatments accumulated more K than in the control. The plants treated with the rocks TA-15, TA-16, TA-17, TA-18 and TA-20, even accumulating lower amount of K than in the BX treatment, showed similarproduction of shoot dry mass.

The accumulation of K in plants treated with biotite schist were higher than in the other treatments. However the tested K silicate agrominerals have higher total K concentration, for this reason the amount of rock necessary to apply the same quantity of K is higher for the biotite schist than for other rocks. For example, to apply the dose of 240 kg $ha^{-1}$ de $K_2O$ is necessary the addition of 9.02 t $ha^{-1}$ of biotite schist, and for the other rocks are 1.92; 1.79; 2.40; 4.90; and 1.61 t $ha^{-1}$, respectively for TA-15; TA-16; TA-17; TA-18; and TA-20.

## Conclusions

The silicate agrominerals TA-15, TA-18 e TA-20 were the promising rocks for the agricultural use, in the aspects of development, dry mass production of corn plants and for the K availability in soil. The TA-15 is from Bahia state (TERRATIVA Ceraíma Project – Silveira Braga *et al.*, 2014), and the TA-20 is from Goiás state (TERRATIVA Serra das Araras Project – Oliveira *et al.*, 2014a). Both are ultrapotassic igneous rocks classified as alkali feldspar syenite. The TA-18 is from Goiás state (TERRATIVA Acreúna Project – Oliveira *et al.*, 2014b) and it is alkaline mafic-ultramafic rocks classified as ugandite.

Keywords: Alternative fertilizer, root zone, silicate agromineral

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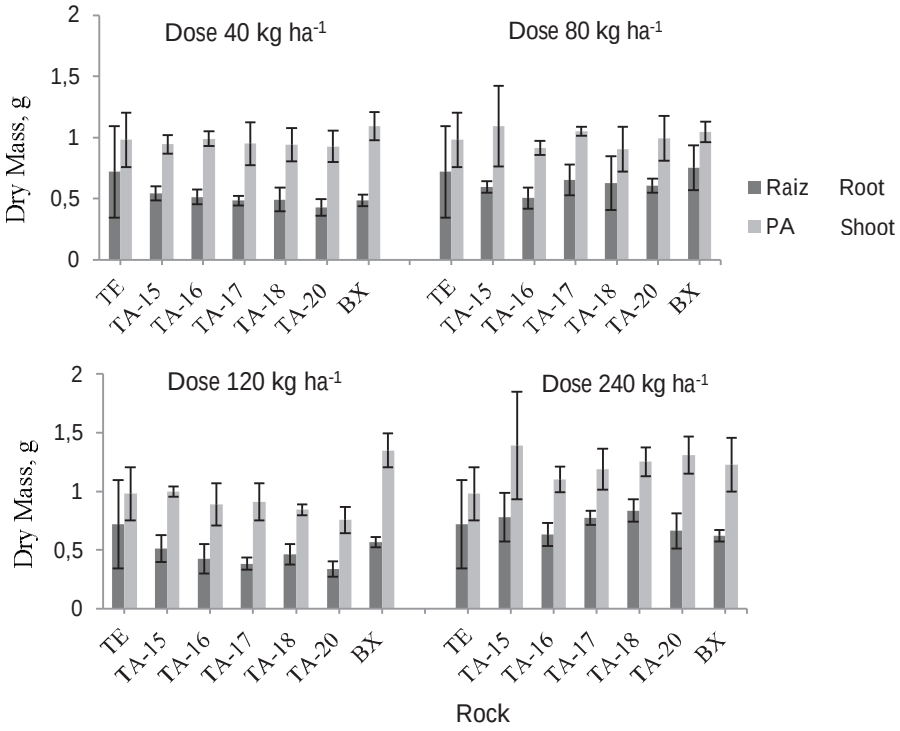


**Figure 1.** Dry mass production of corn plant (roots and shoots) culivated in soil pot with silicate agrominerals aplication.

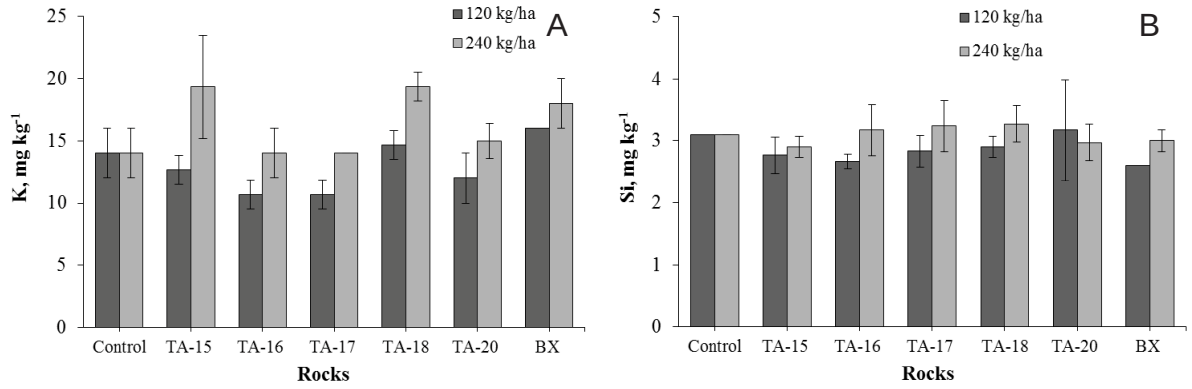


**Figure 2.** Available K(A) and Si (B)in soil for corn plants (variety "Sol da manhã") by the application of silicate agrominerals.

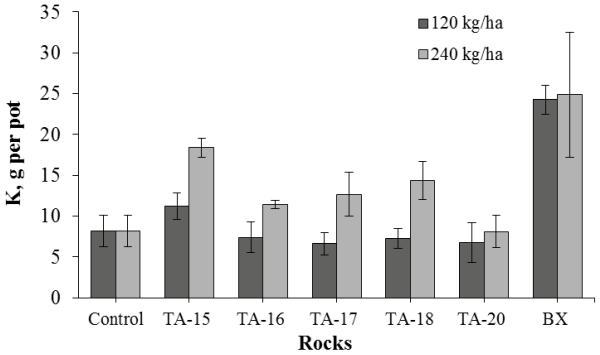


**Figure 3.** Accumulation of K in corn plants treated with doses of silicate agrominerals.