Use of alternative fertilizers and phosphorus content and accumulation in maize plants

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Introduction

Among the various nutrients that plants need to produce, the phosphorus (P) is a major concern due to its widespread deficiency in most soils brasileiros. The most used in agriculture are water soluble and require elemental sulfur and concentrates apatite during production, leading to large losses of P during the manufacturing process. In generating these wastes there are still relatively rich in P materials whose use is not possible by current industrial methods, thus representing a mineral well used and not a worrying environmental problem due to the large volumes involved. It is possible that for soils with high P fixation capacity, some sources with lower solubility in water can, over time, become viable alternatives from the point of agronomic and economic perspective, compared to sources of high solubility in water.

Objective

The objective of this work was to seek new alternatives for use and management of alternative sources of P, according to the evaluation of the levels and accumulation of P in corn.

Materials and Methods

Were carried out in pots of 20 L in a greenhouse.

The treatments consisted of applying four sources of phosphorus: Triple superphosphate (TSP) (reference), Bayovar (reactive phosphate), phosphate precipitate 1 and 2 phosphate precipitate, and a treatment without P and five soil types. The P level was 120 mg dm-3.

To determine the levels of P were collected aerial parts of the plants in each plot at the end of the cycle, 55 days after emergence. The plants were subjected to washing with distilled water and drying in a forced draft oven and ground in a Willey mill. Nutrient contents were determined according to the methodology described by (Malavolta et al., 1989).

Considering the results of the levels of P in the plant, it was determined the accumulation of P, obtained by the product between P content and dry matter production.The variables of growth and biomass production were evaluated 55 days after plant emergence.

The variables were subjected to analysis of variance (F test), Tukey 5% through Sisvar 4.2 program

Results

Table 1: Phosphorus content in soil (mg dm^{-3}), depending on soil types and sources of P in corn.

Corn plant height (cm)					
	Without P	NRP	PP1	PP2	TSP
Typ. Quart. 1	1,3 Bc	1,7 ABb	2,6 a	2,4 a	2,0 Bb
RH (medium texture)	1,3 Bd	1,4 Bbc	2,2 a	2,3 a	1,8 Bb
Alf. Ferrud.	1,9 Ab	2,1 Ab	2,4 ab	2,6 a	2,0 Bb
Typ. Quart. 2	1,3 Bc	1,6 Bbc	2,7 a	2,6 a	1,9 Bb
RH (clay)	1,4 Bb	1,7 Bb	2,3 a	2,3 a	2,4 Aa
CV(%) 10,22					

Means with different lowercase letters in the same row and averages with capital letters in the same column differ significantly by the Tukey test at P<0.05

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- **The P sources showed positive interaction with soil types. The precipitate source 1 and 2 showed higher levels of P in plants in all soils.**
- **When comparing the values of P uptake is observed that the reference source obtained the highest accumulated P. However, the alternative sources showed large amount of P uptake, mainly precipitated source 2, becoming very useful like fertilizer.**

- **The buffering characteristics of three soils used and the different sources of P justifies analyzed the variations in the magnitude of response of maize relative to P accumulation observed between soils.**
- **It is observed that in sandy soils the accumulation of P was higher for all sources, mainly due to differences in clay content of the soil, resulting in reduced adsorption to colloids in a sandy soil.**

The PP1, compared to the other tested sources that after the source of reference provided the highest levels and accumulation of P in corn plants.

The NRP, obtained the lowest values of P accumulated indicating that the use of less soluble sources is not recommended for corn.

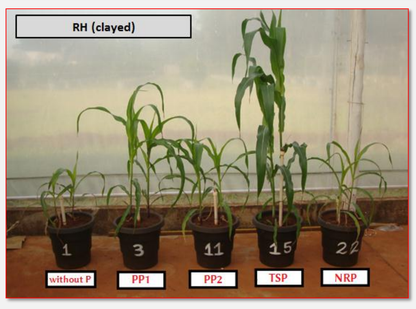
Table 2: Accumulation of P (mg pot^{-1}), depending on soil types and sources of P in corn.

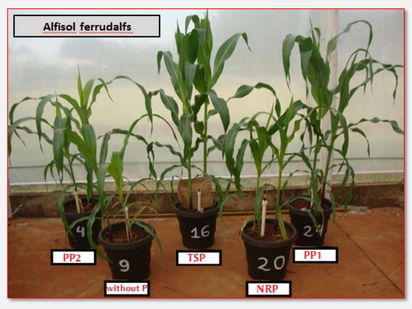
Dry mass of maize plants (g)					
	Without P	NRP	PP1	PP2	TSP
Typ. Quart. 1	5,4 Bc	12,6 ABc	141,2 BCb	113,1 Ab	214,8 Aa
RH (medium texture)	5,3 Bc	5,6 Bc	112,7 CDb	38,9 Bc	225,3 Aa
Alf. Ferrud.	25,4 Ac	45,0 Ac	186,9 Aa	117,7 Ab	201,4 Aa
Typ. Quart. 2	6,2 Bd	8,9 Bd	154,9 ABb	58,7 Bc	231,4 Aa
RH (clay)	4,6 Bc	9,0 Bc	80,1 Db	49,2 Bb	133,7 Ba
CV(%) 19,78					

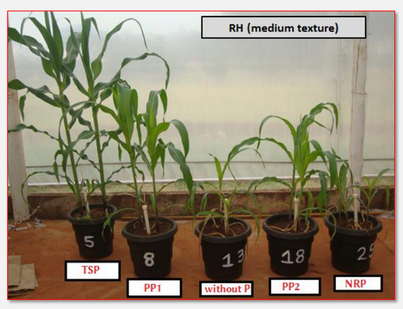
Means with different lowercase letters in the same row and averages with capital letters in the same column differ significantly by the Tukey test at P<0.05.

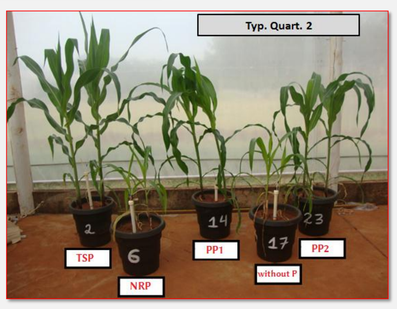
Conclusion

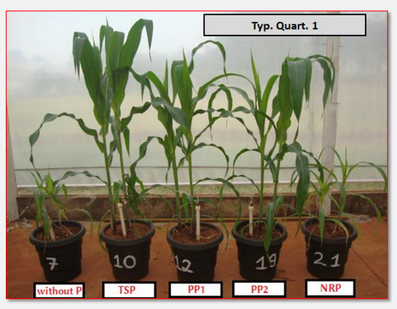
- **Alternative sources of P had a high capacity to supply phosphorus to corn plants.**
- **The source PP1, obtained the highest accumulation of phosphorus when compared to later sources after the TSP.**
- **The reactive phosphate provided lower values accumulated in corn plants, it is not recommended to use natural plants to phosphate cycle.**











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