

(9832 - 2595) Partial acidification of Arraias Rock Phosphate improves P use efficiency in tropical soils

Vinicius de Melo Benites¹; Sulian Junkes Dal Molin²; José Augusto Cabral Santos³
Embrapa Solos¹; UDESC²; UniRV³

Natural rock phosphates are characterized by low P water solubility. Acidification is the normal method to improve P solubility on these materials but it represents costs and operational issues. The aim of this study was to evaluate the agronomic efficiency of partially acidulated Arraias rock phosphate. The experiment was conducted in a greenhouse at the University of Rio Verde, Rio Verde, GO. A Red Yellow Oxisol from Cerrado was used as testing soil ($\text{pH}_{\text{CaCl}_2} = 5.17$,

clay = 540 g kg^{-1} and $\text{P} = 0.3 \text{ mg dm}^{-3}$). Plastic pots (2 L) were filled with 2 kg of this soil (dry basis). The treatments consisted in Arraias Rock Phosphate (ARP) (Arraias, Tocantins, Brazil); Triple super phosphate (TSP) and three partially acidulated rock phosphate (PARP) with 5, 10 and 15 % H_2SO_4 relative to RP mass. Fertilizers were applied in the rate of 100 mg P per pot, mixed in the whole soil mass before seeding. Maize was seeded with 5 seeds per pot and one week after emergence were thinned to 2 plants per pot. Soil moisture was maintained between 60% and 50% of the field capacity. After 45 days, plant shoot was cut close to the soil surface. Shoot dry mass and its P concentration, after plant digestion, were measured, and P uptake was calculated. TSP treatment results in the highest shoot dry mass. Among PARPs, the highest dry mass yield was observed in the 15 % PARP which was higher than 5 %, the Arraias rock phosphate and the control. The higher dry mass yield in the 15 % PARP was due to higher water solubility of the phosphate. Unlike the dry mass yield, the ARP has shown the highest P content in shoot tissue, contrasting with the control and other fertilizers. Lower tissue P concentration in higher yield biomass treatments is due to a dilution effect on the P content in shoot tissue in the fertilizers of greater solubility. The amount of P uptake was correlated to shoot dry mass yield, with highest P uptake on TSP followed by the 15 % PARP which differed from control, ARP and 5 % PARP. The relative efficiency in shoot dry mass increase with rate of H_2SO_4 until 35.84 % in the 15 % PARP treatment. The partial acidification of the Arraias rock phosphate increased shoot dry mass and P uptake as well as its efficiency relative to TSP. We concluded that acidification with 10 % H_2SO_4 was the best alternative, since it was similar to 15 % and represents a lower industrial cost.

Keywords: Phosphate solubility, available P, P uptake

Financial support: DuSolo Fertilizers Inc.

(9014 - 1169) Partially acidulated rock phosphates containing zeolites for regulating the solubility in soils.

Ana Paula Bettoni Teles¹; Paulo Sérgio Pavinato¹; Gabriel Novoletti¹
Escola Superior de Agricultura Luiz de Queiroz¹

The consumption of phosphate fertilizers in Brazil has almost triplicated in the last decades and the most common ones used in agriculture are the solubles or with high reactivity, mostly with low efficiency in tropical soils. Thus, knowing that the sources of phosphate are finite, a study was developed aiming to: evaluate the solubility of partially acidulated phosphates with the incorporation of zeolites (Zeo), produced from distinct rock phosphates; Araxá (RFA), Bayóvar (RFB) and Morocco (RFM); and to evaluate P availability from these sources in the soil. To obtain the fertilizers the Zeo was mixed with rock phosphates in powder and then partially acidified (25 and 50% of the total chemical reaction) by the addition of sulfuric acid. Eleven treatments were evaluated: 1) RFA + Zeo + 50%; 2) RFA + Zeo + 25%; 3) RFB + Zeo + 50%; 4) RFB + Zeo + 25%; 5) RFM + Zeo + 50%; and 6) RFM + Zeo + 25%; 7) Triple superphosphate (TSP); 8) RFA; 9) RFB; 10) RFM and 11) Control (Without P). The solubility was

evaluated in soil leaching columns (thermoplastic acrylic tubes with 2.1 cm internal diameter and 25 cm height). To each column was added 50 g of soil with low available P content and then it was saturated with distilled water. Fertilizer treatments were added in a dose of 100 mg P per column, superficially. For 60 consecutive days it was added 20 ml of deionized water to the columns and the leachates were collected for P content evaluation (Murphy and Riley, 1962). After, the soil was sampled in layers of 0-1; 1-2; 2-3; 3-6 and 6-10 cm from the top, and the available P by ion exchange resin was evaluated (first step of P fractionation proposed by Hedley et al., 1982). It was observed a partial solubilization of all fertilizers after 60 days, evidenced by the presence of P in the leachates. RFB and RFM both with 50% acidulation had 25 and 23% of the P leached, respectively, otherwise TSP presented highest leaching, with 63.7% of the total applied. No P leaching was observed under the control and under RFA, RFB and RFM without acidification. Phosphate fertilizers addition has provided increase in available P in all the layers of the soil, being this most significant increase in the toplayer (0-1 cm). The sources RFB + Zeo + 50% and RFM + Zeo + 50% provided available P values like those observed for TSP, and could become good options for slow-release fertilizer for crops.

Keywords: Phosphorus; leaching; rock phosphate

Financial support: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior

(8088 - 1508) Phosphate Fertilization via monoammonium phosphate in Corn Crop in Oxisol from Brazilian cerrado region

Gustavo Ferreira Sousa¹; Maila Adriely Silva¹; Paulo Henrique Soares²; Miguel Martins Neto²; Larrissa Pereira da Cunha²; Carlos Henrique Eiterer de Souza²

Universidade Federal de Lavras¹; Centro Universitário de Patos de Minas²

The phosphorus (P) is the element that exercises great influence on the crop development, however, it exhibits differentiated behaviour on the most soils cultivated, which makes to become unavailable for some plants. Thus, the objective of this study was evaluate that the aim of fertilizer to increase the efficiency of the nutrient utilization and with the use of the P stabilization technology. The experiment was carried out with the corn crop during the growing seasons 16/17, at the Fazenda Lanhosos, in Patos de Minas (Minas Gerais State – Brazil) under the Red Eutrophic Latosol. The soil has the following chemical attributes analyzed in depths of 0-20 cm; pH (H_2O) 5,84; H+Al (AcCa) $2,6 \text{ cmol dm}^{-3}$; Al (KCl) $0,08 \text{ cmolc dm}^{-3}$; Ca (KCl) $1,4 \text{ cmolc dm}^{-3}$; Mg (KCl) $1,4 \text{ cmolc dm}^{-3}$; K (Meh-1) $66,7 \text{ mg dm}^{-3}$; P (Meh-1) $0,22 \text{ mg dm}^{-3}$; P-rem (CaCl_2) + KH_2PO_4) $8,48 \text{ mg L}^{-1}$; V% 53. The area that the experiment installed was occupied for understory vegetation typical from Brazilian Cerrado region, therefore the current growing season was the first performed. It was used the randomized complete block design in factorial scheme (3 x 4) + 1, with 3 sources of monoammonium phosphate (MAP + humic substances, conventional MAP and polymer-coated MAP), 4 doses (30, 60, 90 and 120 Kg^{-1} of P_2O_5) + the additional treatment, without P application. To 92 days after sowing, evaluations of plant height, culm diameter, stem and leaves dry matter were performed. To 140 days after sowing evaluations of ears size, one thousand grain mass, predicting production. The data were submitted to the analyses of variances and when the significance mean among the sources were analysed by the Tukey test at 0,05 and the P_2O_5 doses were adjusted to the regression model. Significant difference was observed for the sources on the parameters of plant height, stem and leaves dry matter, therefor the conventional MAP source indicated higher values in relation to the others sources. When the doses application were evaluated, the increase linear adjustment was observed to the plant height, stem and