STRUVITE CROP TRIALS

Crop and Soil Science
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Phosphorus supply is a major limitation to global food production. Global estimates suggest that 0.3 to 3.3 million tons/year of Phosphorus can be generated from human faeces and urine. Interest in nutrient recovery has focused more on technology optimization; however limited research exists with regards to the use of these products for agricultural production.

The aim of this study was to compare two different sources of excreta derived fertilizers, Struvite and LaDePa pellets, with a commercial phosphate fertilizer (Single Superphosphate) to determine the effect on maize growth at various stages up to 6 weeks in different soils (acidic loam, clay and a sand).

Figure 1: Struvite Powder

Struvite, shown in Figure 1, is a magnesium ammonium phosphate formed by combining source-separated human urine with a magnesium salt to produce an odourless and safe fertilizer. It is thought to be a promising compound that can provide an alternative and cheap source of phosphorus for the future.

LaDePa (Latrine Dehydration and Pasteurisation) is a process developed by eThekwini Water and Sanitation in conjunction with PSS (Particle Separation Systems) which produces dry pasteurised pellets from the sludge from Ventilated Improved Pit latrines (VIP).

The study was carried out in a glasshouse (Figure 2) at the University of KwaZulu-Natal, Pietermaritzburg.

Figure 2: Experimental layout in the glassshouse

The results at 3 weeks growth suggested that Struvite was comparable to inorganic fertilizer, but performed better than LaDePa pellets with regards to Maize growth and seedling vigour. This trend persisted up to six weeks, although all the plants began to show symptoms of nitrogen deficiency (see Figure 3).

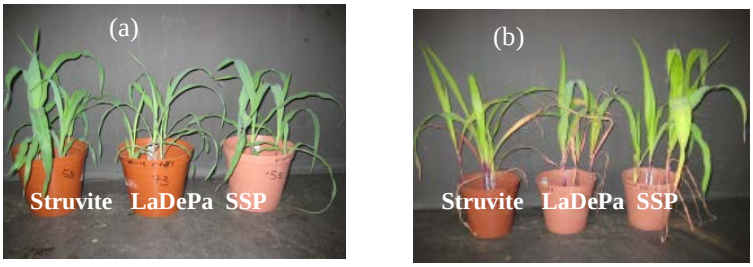

Figure 3: Maize at (a) 3 weeks and (b) 6 weeks of growth after the application of double the optimal rate of Struvite and Ladepa pellets.

Further comparisons were made to determine the response of Maize to different concentrations of Struvite application. Additions were made at half, normal and double the phosphorus requirements for Maize. These results are shown in Figure 4 compared to a Maize plant where no Struvite was added (control).

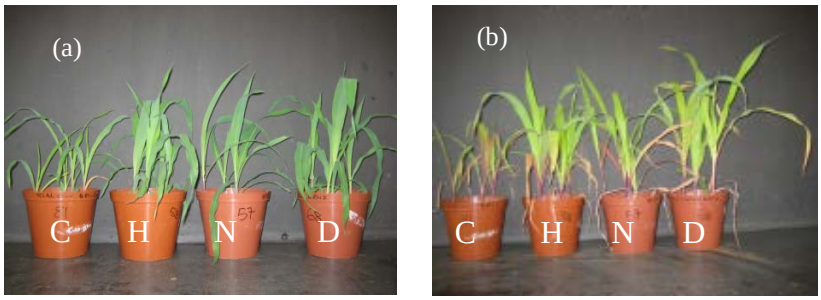

Figure 4: Struvite applied at 3 different rates half (H), normal (N), double (D) and control (C) on maize plants growing on a sand for (a) 3 weeks and (b) 6 weeks.

Figure 4 shows that there was an increase in Maize growth with increasing struvite concentrations at both 3 and 6 weeks growth.

A further study investigated the response of Maize to the addition of Struvite and LaDePa at double the optimum phosphorus concentrations. These results are shown in Figure 5.

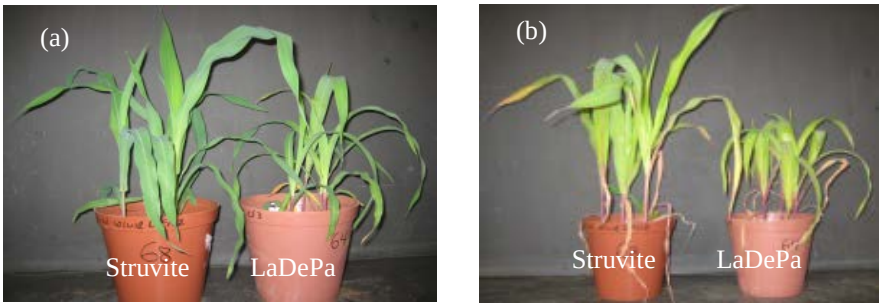

Figure 5: Maize at (a) 3 weeks and (b) 6 weeks of growth after the application of double the optimal rate of Struvite and Ladepa pellets.

These preliminary results suggest that Struvite has potential as a phosphorus source. It is thought that the reason Struvite performed better than LaDePa pellets is due to its higher phosphorus content and that phosphorus plays an important role during early seed development.

Soil and plant tissue analysis are ongoing which will provide further evidence on uptake and utilisation of these fertilizer sources and assess phosphorus release.