

Phosphorus availability in calcareous soils amended with organic and inorganic phosphorus sources

Khalid Al-Rohily¹, A. M. Ghoneim², A. S. Modaihsh², M. O. Mahjoub², and Mongi Zekri³

¹Saudi Basic Industries Corporation, P.O. Box 42503, Riyadh 11551, Saudi Arabia

²Soil Science Department, College of Food and Agricultural Sciences, King Saud University, Riyadh 2460, 11451 Saudi Arabia

³University of Florida, Hendry County Extension Office, P.O. Box 68, LaBelle, FL 33975, USA

Introduction

Phosphorus (P) availability in calcareous soils is almost always limited. After P fertilizer is added to a calcareous soil, P undergoes a series of chemical reactions with Calcium that decrease its solubility with time (a process referred to as P fixation). Addition of organic manure not only provides additional sources of nutrients, but improves the soil physical and chemical conditions and may increase the efficiency of added P fertilizers. Information on the availability of P following chemical fertilizer and compost application to soil may improve the management of P fertilization. Studies on P reactions over time and the role of organic matter in calcareous soils are important for developing P fertilizers and manure management practices.

Objective

To study the combined effect of various levels and types of organic and inorganic P fertilizers on P availability in a calcareous soil through an incubation experiment.

Experimental Design

Treatments included four rates of P (20, 40, 80 and 160 mg P₂O₅ kg⁻¹ soil) and a control. Phosphorus was from one inorganic source (KH₂PO₄) and from two organic sources (cattle manure and sludge compost). The soil was incubated at 25°C and was maintained at 80% water holding capacity. Change in the amount of available P was measured during 16 weeks. Analysis of variance (F-test) was used to determine significant differences among treatments and the least significant difference (LSD 0.05) was employed for mean separation.

Figure 1: Effect of incubation period on available P in soil

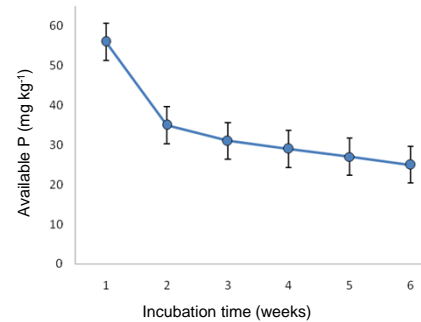
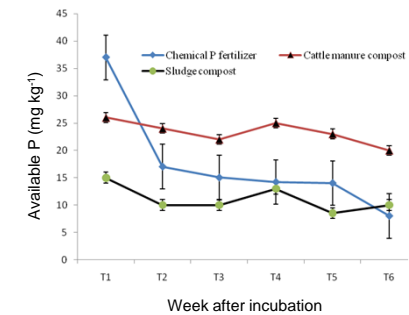


Figure 2: Effect of incubation time and fertilizer sources on available P of soil



Conclusions

By increasing the time of incubation, P availability in soil significantly decreased for both organic and inorganic fertilizers. It was concluded that the most critical time for incubation was the first week. During this period, the soil lost about 50% of the added P. During the first week, inorganic P fertilizer yielded more extractable P compared with the two organic sources. During the rest of incubation period, the amount of P available from the cattle manure compost was the highest.

Figure 3: Available P content as affected by fertilizer P sources

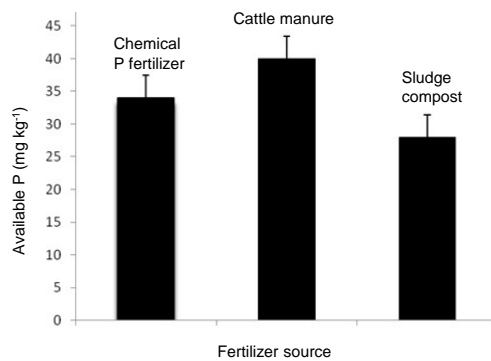


Figure 4: Effect of organic fertilizer on available P content in soil

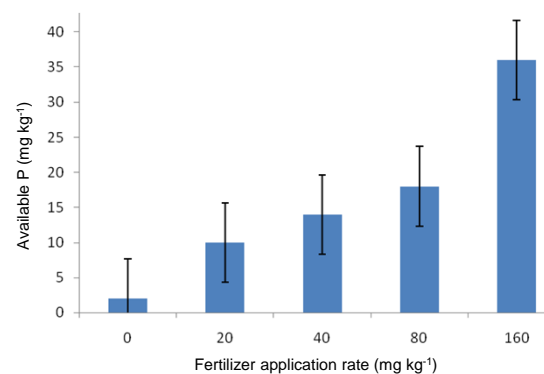


Figure 5: Effect of organic fertilizer in the presence of chemical fertilizer on available P content of soil

