



Phosphate Sorption and Desorption in Tanzanian Haplustox and Vitrandept Soils

B. M. Gama, B. R. Singh & A. P. Uriyo

To cite this article: B. M. Gama, B. R. Singh & A. P. Uriyo (1987) Phosphate Sorption and Desorption in Tanzanian Haplustox and Vitrandept Soils, East African Agricultural and Forestry Journal, 52:4, 213-220, DOI: [10.1080/00128325.1987.11663519](https://doi.org/10.1080/00128325.1987.11663519)

To link to this article: <https://doi.org/10.1080/00128325.1987.11663519>



Published online: 09 Dec 2015.



Submit your article to this journal [↗](#)



View related articles [↗](#)

PHOSPHATE SORPTION AND DESORPTION IN TANZANIAN HAPLUSTOX AND VITRANDEPT SOILS*

B. M. Gama, B. R. Singh, and A. P. Uriyo**, Department of Soil Science, University of Dar-es-salaam, P.O. Box 643, Morogoro, Tanzania

(Accepted for publication in November, 1987)

Phosphate sorption reactions in highly weathered tropical soils are important because they affect phosphorus (P) concentration in soil solution (intensity of P nutrition) and its amount retained by a soil (capacity for P nutrition). Such soils often possess a large number of positively-charged sites, particularly under acidic conditions and therefore, have opportunities for ligand exchange on their extensive surfaces (Fox *et al.*, 1971). Studies in Hawaii (Fox *et al.*, 1971; Rajan, 1973 and Rajan and Fox, 1972, 1975), Fiji (Chee *et al.*, 1978), Papua New Guinea (Parfitt, 1977 and Parfitt and Movo, 1975), and Sierra Leone (Rhodes, 1975) have shown that phosphate sorption in tropical soils is affected by a number of factors such as P solution concentration and its pH, soil pH, and amounts of organic matter and silica-sesquioxides.

This project studied: (1) the phosphate sorption in two commonly occurring Tanzanian soils belonging to the Great groups (Soil Survey Staff, 1975) Haplustox and Vitrandept (referred to as Haplustox soil and Vitrandept soil in the text) as affected by the period of mixing with phosphate solution, initial concentration and pH of P solution, and destruction of organic matter and (2) the effects of amounts and nature of the extractants on desorption of the sorbed P.

MATERIALS AND METHODS

Soil samples

The Haplustox soil was collected from the slope of the Uluguru mountain at Mzumbwe (altitude 520 m) in Morogoro Region, Tanzania. The Vitrandept soil was from the slope of Mount Meru at Olmotonyi (altitude 1600 m) in Arusha Region. The former soil developed from metasediments and the latter from basic volcanic ash. Both the soils occur extensively in Tanzania and have ample agricultural potential.

A surface (0-15 cm) sample of each soil was collected from virgin land, air dried and ground

to pass through a 0.16-mm sieve. The soils were analysed for some physico-chemical properties (Table 1) and subjected to differential thermal analysis.

Procedures for sorption studies

A 3-g (oven-dry basis) soil sample in a 100-ml centrifuge tube was shaken on a mechanical shaker with 30 ml of P solution for 24 hours, which was found adequate for a near equilibrium condition, except where different periods of mixing were evaluated. Three drops of toluene were added to arrest microbial activity. The P solution was prepared by dissolving A. R. grade KH_2PO_4 in 0.01M CaCl_2 . After shaking, the extract was centrifuged at 3×10^3 rpm until a clear supernatant was obtained. The supernatant was filtered and analysed for P. The difference between amount of P in the initial solution and that in the supernatant was taken as the quantity of P sorbed by the soil. The supernatant P concentration is referred to as "equilibrium P" concentration in the text.

The periods of mixing tested ranged from 0.5 to 72 hours. The soils were mixed with solutions of 5 and 50 $\mu\text{g P ml}^{-1}$ concentrations. Shaking was continuous for periods upto 12 hours. For 24-, 48- and 72-hour periods, one shaking for an hour was done in the morning and the other in the evening everyday. Centrifugation and filtration were carried out immediately after removal of the samples from the shaker. The period beyond which no significant change in phosphate sorption occurred was considered adequate for near equilibrium condition.

Solutions ranging in initial concentration from 0 to 100 $\mu\text{ P ml}^{-1}$ and adjusted to a uniform pH of 6 were used. Phosphate sorption isotherms presented in Fig. 1 were constructed by plotting sorbed P against equilibrium P.

Solutions of 0.5 and 5 $\mu\text{g P ml}^{-1}$ initial concentrations were adjusted to pH values of 2,

* Part of the senior author's M.Sc thesis, University of Dar-es-salaam, Tanzania.

**Present address: Tanzania Agricultural Research Institute, Ukirungu, Tanzania; Tanganyika Pyrethrum Board, P.O. Box 149, Iringa, Tanzania and International Institute of Tropical Agriculture, P. M. B. 5320, Ibadan, Nigeria, respectively.

Download English Version:

<https://daneshyari.com/en/article/5398922>

Download Persian Version:

<https://daneshyari.com/article/5398922>

[Daneshyari.com](https://daneshyari.com)