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SORPTION AND DESORPTION OF INORGANIC PHOSPHATE  
BY SOILS AS INFLUENCED BY COMPETING INORGANIC  
AND ORGANIC ANIONS

by

KEVIN DAVID EARL

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Introduction

Anions play a very significant role in the retention and plant availability of soil and fertilizer inorganic phosphate (P). Evidence that different inorganic and organic anions can modify P retention was presented by many workers prior to 1950 ( Kurtz et al., 1946; Dean and Rubins, 1947; Swenson et al., 1949 ). The exact mechanisms of this effect was little understood. In addition, a range of chemical extractants have been used to assess the available P status of soils; these included citrate, tartrate, fluoride, arsenate, and other anions capable of forming stable complexes with Fe and Al in soils.

It is now well recognised that microorganisms and root excretions greatly modify the chemical environment in the rhizosphere. Organic compounds found in the root exudates of several plants ( reviewed by Rovira, 1965 ), and produced by microorganisms, include many organic acids known to form strong complexes with metal ions. Such compounds may be an important factor affecting the mobility of P in soils.

There is now a reasonable amount of information concerning the reactions of certain anions with soil components. The significance of inorganic and organic anions in the soil solution, and their effect on P sorption and desorption by soil components and soils, however, is not so well documented. Recent studies by Deb and Datta ( 1967 a, b ), Hingston et al. ( 1970, 1971, 1974 ), Nagarajah et al. ( 1968, 1970 ), and Barrow ( 1974 a, b ) have enabled a better understanding of the extent to which competing anions influence the uptake and release of P by soil components and soils.

The literature pertaining to the uptake and release of P by soils, as influenced by other anions, is reviewed in three sections :

- I. The mechanism of P sorption by soil components and soils,
- II. The influence of competing inorganic and organic anions on the sorption of P by soil components and soils, and
- III. The influence of competing inorganic and organic anions on the desorption of sorbed P from soil components and soils.

Sorption reactions may conveniently be divided into adsorption reactions ( concentration of ions at solid surfaces due to removal from solution ) and absorption ( diffusive penetration of ions into retaining components ).