THE MINERALIZATION OF THE ORGANIC PHOSPHORUS OF VARIOUS COMPOUNDS IN SOIL
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The amounts of phosphorus present in many soils in forms available to higher plants and the value of green and farm manures as phosphorus carriers depend to a large extent upon the rate of liberation of phosphoric acid from organic combination. Although recent work (13, 17) has shown that some plants may absorb certain organic phosphorus compounds directly, it is generally believed that the bulk of the organic phosphorus in soils must be converted to inorganic form before it can be absorbed by plants. This process of mineralization is particularly important in soils high in organic matter, such as those of the Prairie group in the surface layers of which the phosphorus in organic combination often amounts to 50% or more of the total phosphorus (12). It is also of great importance in regions where commercial phosphate fertilizer cannot be obtained cheaply. This applies especially to such countries as China, India, and Japan, where phosphorus fertilization depends almost entirely upon the addition of organic phosphorus-bearing materials such as animal manure, green manure, and various plant products.

In spite of the importance of the problem to soil fertility very little is known about the rates of mineralization, or conversely, immobilization, of phosphorus by microorganisms in the soil, and the influence of soil reaction on these transformations. Vincent (16), however, has reported that the mineralization of the organic phosphorus compounds present in acid soils is favored by liming. Although several investigations (2, 6) have been made of the changes in the relative proportions of organic and inorganic phosphorus in decomposing organic materials, no similar study has been reported of the changes occurring in organic materials added to the soil.

During the course of this investigation, Dyer and Wrenshall (3) reported a study of the susceptibility of phytin and nucleic acid to decomposition after addition to soil. However, their conclusions were based on changes in dilute acid-soluble inorganic phosphorus which may not provide a wholly accurate measure of organic phosphorus decomposition. The rate of decomposition of these two compounds has a direct

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METHODS

Materials employed.—The soil used in this study is mapped (8) as Ames fine sandy loam in the eastern part of Story County, Iowa, developed under deciduous forest vegetation and glacial till. The surface layers range from sandy loam to silt loam, in color from dark brown to light gray, and in reaction from moderately acid to light gray, and in reaction from moderately acid to strongly acid. Crop yields obtained on cultivated areas of the soil type are considerably lower than on Claring and Webster soils. Applications of limestone are necessary for successful growth of alfalfa. The Ames soil was selected for use in the present study because of its low contents of organic and total phosphorus. The untreated soil was 5.83, and the organic and total phosphorus contents were 74 and 256 p.p.m., respectively.

Various plant materials, cow manure, and two organic phosphorus compounds were used as phosphorus sources. The barnyard manure was collected immediately after it was dropped and dried at 60 °C to prevent bacterial growth. It was ground to pass a 60-mesh screen and analyzed. The plant materials were also ground to the same size limit.

The results of analyses of these materials are presented in Table 1.

The organic phosphorus compounds used were yeast nucleic acid and phytin, both obtained from the Eastman Kodak Company. The nucleic acid consists of nucleic acid and phytin, both obtained from the Eastman Kodak Company. The nucleic acid consists of a mixture of nucleic acid and phytin, both obtained from the Eastman Kodak Company. The nucleic acid consists of a mixture of nucleic acid and phytin, both obtained from the Eastman Kodak Company. The nucleic acid consists of

Figures in parenthesis refer to “Literature Cited”, p. 175.

Phosphorus is expressed throughout this paper as the element.