During the past 3 years greenhouse pot experiments have been conducted on heavy clay soils from the Black Belt of Alabama and the results have been reported (4). Nearly all of the soils studied showed a marked deficiency of available phosphorus and produced satisfactory crop yields only when very heavy applications of phosphatic fertilizers were made. The soils in this area differ greatly in reaction, varying from very acid to alkaline. Some of the latter soils have a very high CaCO₃ content. Preliminary experiments showed that phosphates were rapidly made unavailable to plants. In order to learn more about the phosphate fixing properties of the soils in this area, two greenhouse experiments were conducted and the results are herein reported.

The objects of these experiments were to study (a) the degree and rate of fixation of different phosphates in a highly colloidal, acid clay soil; (b) the influence of CaCO₃ on the phosphate fixation in the acid soil; and (c) the degree and rate of fixation of superphosphate in a highly colloidal clay soil having a high CaCO₃ content.

EXPERIMENTAL

The Vaiden and Sumter clays from the Black Belt were used to represent the acid and the calcareous soil groups, respectively. The Vaiden clay is an intermediate type between the Oktibbeha and the Eutaw clays. It has a colloidal content of about 60% (dry basis). The sample used had a pH value of 4.8 and a lime requirement, according to the method of Pierre and Worley (2), of 11,474 pounds of CaCO₃ per 2 million pounds of soil. The Sumter clay soils are weathered from a soft chalk. The sample used had a pH value of 7.5, a CaCO₃ content of 9.3%, and a total P₂O₅ content of 0.1081%.

ACID SOIL

Sufficient Vaiden clay to fill 268 2-gallon glazed pots was thoroughly mixed, potted, and placed in a greenhouse. The fertilizer treatments were made in duplicate on an unlimed and a limed series. Nitrogen and potassium were added in solution as NaNO₃ and KCl, respectively, to all the pots with the first watering after planting. Phosphorus was supplied as mono-calcium, di-calcium, tri-calcium, ferric (C. P., old precipitate), and mono-ammonium phosphates, and as superphosphate. Each of these phosphates was mixed into the soil at three rates equivalent in P₂O₅ content to 300, 900, and 1,800 pounds of 16% superphosphate per acre, respectively, and was applied at four intervals of time, which were 365, 180, 30, and 0 days before planting. At the same time intervals before planting lime in the form of precipitated CaCO₃ was applied at the rate of...