A STUDY OF THE UTILIZATION OF PHOSPHORUS IN GREEN MANURE CROPS BY THE SUCCEEDING CROP, USING RADIOACTIVE PHOSPHORUS

MINERAL constituents of green manure crops contribute to the nutrition of succeeding crops. Until recently, the exact magnitude of this direct contribution had not been measured because of the inability to determine the source of nutrients which finally appear in a succeeding crop.

The use of radioactive phosphorus in measuring the efficiency of utilization of phosphatic fertilizers suggested a similar use in determining the contribution of the phosphorus in green manure crops to phosphate fertility. An experiment was designed for this purpose. After it was underway, it was found that Fuller and Dean had attacked this problem by a similar technique. The purpose of this note is to summarize the findings from our study.

Alfalfa plants were grown in nutrient solution sand cultures at a low level of phosphorus for 38 days after which they were grown for two weeks on a high level of phosphorus containing P\textsubscript{32}. The tops were then harvested, finely chopped, and incorporated into the desired treatments. The equivalent of 60 grams of dry plant material was added to triplicate 2-gallon pots containing Crosby silt loam very low in available phosphorus (12 ppm available P\textsubscript{2}O\textsubscript{5} as determined by modified Bray method; pH of 5.6). The plant material was placed in a layer and covered with soil to a depth of about 2 inches. Similar additions were made to pots containing white silica sand. The sand cultures were inoculated with 100 grams of the Crosby soil.

For the purpose of comparing the efficiency of organic and inorganic sources of phosphorus, 100 ml of a radioactive phosphorus solution and sufficient potassium di-hydrogen phosphate to give 0.281 gram of phosphorus per pot (approximately equivalent to the total phosphorus in the 60 grams of dry plant material) were added in triplicate to pots of Crosby silt loam and white silica sand. The solution was absorbed on shredded filter paper to hold the phosphorus in the zone and the paper placed in a layer and handled in a manner similar to that for the green manure. Sudan grass was planted 1 week after the incorporation of the green manure and the filter paper containing radioactive phosphorus and potassium di-hydrogen phosphate. The above-ground portion of the grass was harvested 4 weeks after planting and the active phosphorus in the plant material determined by the method of MacKenzie and Dean.

The grass in the sand pots containing radioactive phosphorus on the filter paper showed calcium, and iron deficiencies. These deficiencies were alleviated by addition of calcium nitrate and spraying with ferrous sulphate solution. Sudan grass was vigorous on the soil pots with no apparent deficiency symptoms.

The data obtained are shown in Table I. The green manure was as effective a source of phosphorus as the soil. The utilization of phosphorus in the sand was from three to five times as great as in the soil. The differences between the soil and the sand are largely due to the differences in their phosphorus capacities. However, other factors such as microbial activity, and related factors are involved.

The low percentage utilization of both organic sources of phosphorus was very low in the soil. The utilization of phosphorus in the sand was from three to five times as great as in the soil. The percentage utilization of the phosphorus cultures was at a near maximum.

The occurrence of deficiency symptoms in the plants indicates that growth was retarded and therefore the absence of deficiency symptoms inorganic sources of phosphorus was very low in the soil. The utilization of phosphorus in the sand was from three to five times as great as in the soil. The differences between the soil and the sand are largely due to the differences in their phosphorus capacities. However, other factors such as microbial activity, and related factors are involved.

The low percentage utilization of both organic sources of phosphorus was very low in the soil. The utilization of phosphorus in the sand was from three to five times as great as in the soil. The percentage utilization of the phosphorus cultures was at a near maximum.

The occurrence of deficiency symptoms in the plants indicates that growth was retarded and therefore the absence of deficiency symptoms inorganic sources of phosphorus was very low in the soil. The utilization of phosphorus in the sand was from three to five times as great as in the soil. The differences between the soil and the sand are largely due to the differences in their phosphorus capacities. However, other factors such as microbial activity, and related factors are involved.