

All phosphate materials and other constituents were applied at five- to six-week intervals at the rate of 175 pounds P per acre of soil surface. The other constituents were applied at a rate equivalent to 175 pounds phosphorus. For example, sulfuric acid in Treatments 17 and 34 was applied at a rate equivalent to one-half the amount of hydrogen in monocalcium phosphate applied at the rate of 175 pounds P per acre. This is approximately equivalent to ionizable hydrogen in the monocalcium phosphate at the pH normally encountered in soils. Nine applications were made during the course of the experiment. A nutrient solution containing 0.01 M potassium nitrate, 0.0025 M ammonium sulfate, and 0.002 M magnesium sulfate was applied at weekly intervals.

Seedlings were grown for 11 months from November 22, 1960, to October 24, 1961. Leaf samples were obtained for chemical analysis prior to harvesting of the above-ground portion of the seedlings. Soil was sampled from the 0 to 6, 6 to 12, 12 to 24, and 24 to 36 inch depth in each tile. Root systems were removed from the tile. Any unusual characteristics were noted, and pictures were taken of representative root systems from several treatments which showed treatment differences. The root systems were divided into feeder roots and remaining below-ground portion of the plants. All plant parts were dried at 70° C. and weighed. Leaves and feeder roots were analyzed for phosphorus, copper, and manganese.

Experiment P-III.—Another greenhouse experiment, herein designated Experiment P-III, was designed to study the effects of very high concentrations of phosphate materials on pH and salt concentrations in the soil solution and the resultant effect on rough lemon seedlings and emergence of radish plants. The experiment was an attempt to differentiate between the effects of salt and acid in the toxicity of very high rates of phosphate materials reported by Rasmussen and Smith (18). For this purpose, phosphates were applied at rates from 88 ppm phosphorus—equivalent to the medium rate of triple superphosphate applied each application in Experiment 6—to 2,500 ppm phosphorus—the high rate of phosphorus used by Rasmussen and Smith. Sulfuric acid was applied in one treatment to produce approximately the same soil pH as 2,500 ppm phosphorus as triple superphosphate. Soil samples were obtained for pH and conductivity measurements prior to placing the mixture in 6-inch clay tile pots. One rough lemon seedling and five radish seeds