CONCLUSIONS AND RECOMMENDATIONS

Phosphorus rate experiments in bearing Valencia orange groves indicated no response to applied phosphorus during the first three years. Soil tests on samples from these groves indicate that soil test values above 22, 80, and 130 pounds phosphorus per acre by the acid ammonium acetate, the Bray P_1 and Bray P_2 tests, respectively, would probably be adequate amounts of phosphorus for growth of citrus. Soils which test higher than these levels by either of the soil test methods probably do not need immediate phosphate additions. Soils which test less than these levels should receive some phosphate in the fertilizer for optimum citrus production.

Phosphate applications improved growth of young trees growing on previously unfertilized Lakeland fine sand. No detrimental effects on either growth or root concentration occurred as a result of normal rates of phosphorus applied to the young trees. Phosphorus, when used at recommended rates, had no effect on the amount of freeze injury to young trees.

Studies indicated that very heavy rates of phosphorus will unfavorably affect quality of grapefruit. However, when phosphorus was applied at the more normal rate of application of 120 pounds P_2O_5 per acre annually in the Valencia experiments, no detrimental effects of phosphorus on fruit quality were noted. The growth of rough lemon seedlings in pots and Pineapple orange trees in the field demonstrated that soil which received heavy rates of phosphate in combination with limestone in Experiment 6 was no longer toxic to the growth of citrus feeder roots. Best growth of both seedlings and budded trees occurred in soil from plots which had received either the high or medium rate of phosphate in combination with limestone.

The results of the research on phosphate fertilization and the growth of citrus feeder roots lead to the conclusion that the reported detrimental effects of phosphorus fertilization on root growth in field experiments were due to toxicity of copper mobilized or made more toxic by the acid phosphates. The same mechanism—mobilization and toxicity of copper—was probably responsible for reported detrimental effects of high rates of nitrogen on root development (10) and tree condition and yields (32).

Copper mobilization and consequent toxicity is not a very important factor in young trees planted on previously unfertilized