rate of phosphate application was not sufficient to affect fruit quality. The effect of very heavy rates of phosphorus on quality of Ruby Red grapefruit is reported in the section on residual effects of phosphate and limestone.

PHOSPHORUS RATE EXPERIMENTS—YOUNG TREES

Procedures

Seven young tree experiments were initiated to study phosphate effects. Two of these are discussed herein. One (Experiment 4) was designed to evaluate the effect of phosphorus on tree top and feeder root growth at two levels of nitrogen and to determine whether the gypsum in superphosphate is beneficial to tree growth. The procedure involved the application of four rates of phosphate, two rates of nitrogen, and two rates of calcium to Hamlin orange trees on rough lemon rootstock growing on previously unfertilized Lakeland fine sand at the Citrus Experiment Station. The four phosphate rates were 0, 2 and 8 percent P_2O_5 in the fertilizer and 200 pounds P_2O_5 per acre broadcast as ordinary superphosphate before the trees were planted. The nitrogen rates were 4 percent and 8 percent nitrogen in the fertilizer. The two calcium variables were no calcium and calcium as gypsum equal to that in a mixed fertilizer containing 8 percent P_2O_5 as ordinary superphosphate. Plots that received no calcium (2 and 8 percent P_2O_5) were fertilized with phosphoric acid rather than ordinary superphosphate. The phosphoric acid was applied as a dilute aqueous solution at the same time as the other fertilizers.

The experiment was initiated on July 1, 1958, when trees were planted in the experimental area. The experimental design was a randomized block with four replications and four-tree plots. Fertilizer was applied at recommended rates (19). The trees received two ½-pound fertilizer applications during 1958. In subsequent years, each tree received the following yearly rates of fertilizer applied in four applications annually in approximately March, April, July, and September: 2½ pounds in 1959, 5 pounds in 1960, and 12 pounds in 1961. Dolomite at the rate of 1 ton per acre was applied prior to planting.

Trunk diameter six inches above the bud union was measured each year with a caliper to evaluate treatment effects on tree growth. Five- to six-month old spring flush leaves were obtained from non-fruiting twigs for chemical analyses. Fruit yields were