Lemon Response to Phosphate

substantial increase in yield of lemons followed application of phosphate in trials in two counties

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Part II of a two-part progress report.

Part I of this progress report, published in the February 1951 issue of California Agriculture, *described the marked improvement observed in the vegetative characteristics of lemon trees receiving soil applications of phosphate fertilizer in field trials in Ventura and in San Diego counties in 1949–50.*

Vegetative Growth response of lemon trees—showing phosphate deficiency symptoms—to phosphate applications has been outstanding but the effectiveness of fertilizer treatments must finally be evaluated in terms of yield.

In February 1950, arrangements were made with the owner of a lemon grove located near Fillmore to maintain picking records on all of the trees involved in the fertilizer test plots. On several occasions this has required monthly picking records from this grove.

A summary of the lemon yield data obtained from the trees in these plots is shown in the accompanying table. While much more yield data must be obtained before sound conclusions can be drawn, it appears that phosphate fertilization has substantially increased the yield of lemons in this grove.

The data reveal on the other hand that potassium fertilization is reducing the yield of lemons when compared with the yield of trees receiving only nitrogen.

An explanation of this reduction in yield by potassium fertilization may be found in the leaf analysis data collected. Potassium additions to the grove near Fillmore have reduced the magnesium content of the trees to a level that is suggestive of magnesium deficiency. Further, the addition of potassium with phosphorus appears to have reduced the phosphate level of the nitrogen, phosphorus, and potassium treatment when compared to the nitrogen plus phosphorus treatment. The effect of potassium on the yield of phosphate-deficient lemons was noted for the first time in these trials and undue emphasis of this relationship should not be made until more yield information is obtained.

Through the cooperation of packing house managers in San Diego County it will be possible to obtain yield data on lemon fertilizer test plots established more recently in that area. The first picking records from two of those plots were recently obtained and are included in the table.

While the yield data from these groves are far from conclusive, the relationship of treatment to yield is similar to that obtained from the orchard near Fillmore. Yield estimates made on groves for which actual yield data are not available suggest the beneficial effect of phosphate fertilization.

All of the experimental groves cited in this report were selected on the basis of a general occurrence throughout the grove of the deficiency symptoms described in Part I of this report. Diseases—such as shell bark, gummosis—often found in lemon trees were absent in the groves selected for study.

Chemical analyses of leaves collected from these groves indicated consistently a direct relationship between the described leaf symptoms and a deficiency level of phosphorus. Leaf analysis also indicated a direct relationship between vegetative stimulation and increased fruit production and a substantial increase in the phosphorus content of these lemon trees as a result of phosphate fertilization.

There are possible exceptions to the relationship that lemon trees showing leaf symptoms described in this article will respond to phosphate fertilization.

These exceptions involve lemon trees that function abnormally due to the presence of diseases like shell bark, gummosis, and phloem collapse. When any one of these diseases makes sufficient headway in the lemon tree, root decay occurs and nutrient absorption is impaired. Deficiency symptoms may be produced which can not be corrected by fertilizer applications. The inability of the diseased lemon trees to absorb nutrients can be confirmed by leaf analysis.

When phosphate deficiency symptoms occur in lemon trees as a result of a soil deficiency, symptoms occur generally throughout the grove. Deficiency symptoms which are a secondary effect induced by disease occur sporadically in a grove inasmuch as they are associated with diseased trees. Such trees are not likely to respond to fertilization. An exception to this case, of course, would be the diseased tree located on a phosphate-deficient soil. Here correction of the primary deficiency might be possible if the inroads of the disease were not severe and some improvement in vigor of the tree would result. However, the effects of the disease itself would still have to be considered.

Phosphate fertilizer trials have been established in Santa Barbara County on lemon trees inflicted with phloem collapse and which show scattered phosphate deficiency symptoms. These trials have been established for approximately one year, a period sufficient to produce stimulation where a soil deficiency of phosphorus is involved. Yet no evidence of vegetative stimulation or phosphorus uptake by the tree has been detected up to this time. These experiments will be continued to determine if nutrition plays a part in the lemon collapse problem.

Surveys of the incidence of phosphate deficiency in lemons due to soil deficiency are being completed in lemon-producing areas. A résumé of these findings will be included in a future report on this subject.

Preliminary Lemon Yield Data from Fertilizer Plots Located near Fillmore, Escondido, and Rancho Santa Fe, California (Yield in field boxes)*

Grove	N	NP	NK	NPK
Fillmore† mulched plots	14.5	21.6	10.8	22.3
nonmulched plots	15.0	24.4	12.3	21.8
Rancho Santa Fe°	2.1	3.3	1.2	4.1
Escondido°	5.8	8.3	6.6	8.8

* Each yield figure represents the total number of field boxes picked to date from the 5 trees in each treatment.

† The yield data for the plots at Fillmore represent the total number of boxes picked from the 5 trees in each treatment during period February to September, 1950.

° The yield data from the plots at Rancho Santa Fe and Escondido represent the boxes of fruit picked from the 5 trees in each treatment at the time of the first pick made September, 1950.

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