

Seasonal changes of Micronutrient Concentrations

in Washington Navel orange leaves

Leaf analysis as a tool for effective diagnosis and correction of micronutrient deficiencies or excesses in citrus requires determination of the seasonal trends of zinc, copper, boron, manganese, and iron concentrations in the leaves.

To determine seasonal changes in micronutrient concentrations in Washington Navel orange leaves, four treatment plots were selected from a group of 43 plots in a long-term fertilizer experiment. Leaf samples of the April-May growth flush were collected from six trees within each of four replications of each treatment, at monthly intervals from May, 1957, to April, 1958. Each sample consisted of a composite of 20 leaves per tree from nonfruiting terminals. When collected, the leaves were hand-washed in tap water containing a solution of 1% detergent, rinsed in demineralized water, and dried in a forced-draft air oven at 140°F. When dry, the leaves were ground in an 8" laboratory mill.

Concentrations

Weighed portions of the ground material were ashed at 932°F for chemical determinations of zinc, copper, manganese, boron, and iron concentrations.

The concentrations of boron and manganese in the leaves increased during the first five months after the period of spring bloom and vegetative growth. Thereafter, for three months—during fall and winter—the concentration of boron, and for five months the concentration of manganese, did not vary significantly. However, prior to the following spring bloom and growth flush the concentrations of both micronutrients decreased significantly.

Iron concentrations gradually increased with the increasing age of the leaves, with the exception of an apparently unusually high iron concentration in the leaf samples taken in August and in November.

The low zinc and copper concentrations found in the leaf samples taken in

May reached an approximate maximum when the leaves were from two to five months old, and then gradually decreased. The decrease in zinc concentrations is in harmony with the symptoms of zinc deficiency observed during the winter and spring on the trees sampled.

Variations

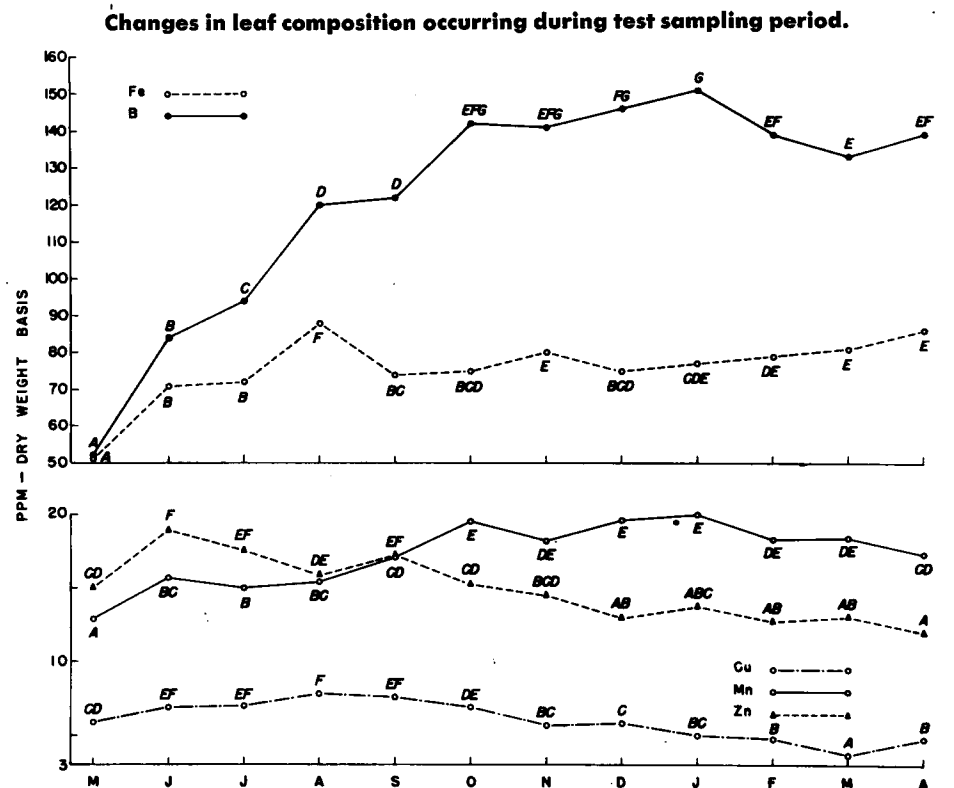
Commonly 4–7-month-old spring cycle leaves are analyzed for diagnostic purposes. However, on the basis of year-round sampling used in these studies, the concentrations of zinc, copper, manganese, and boron in the old leaves decreased during initiation of new bloom and growth flush in the spring. Iron, on the other hand, increased in concentration

in the same leaf during this period, indicating no appreciable redistribution of iron to the new growth flush. According to the data collected, it is possible that Washington Navel orange leaves serve as a storage reservoir for zinc, copper, manganese, and boron, but not for iron. A slight decrease in manganese concentration in the old leaves before the end of the season also indicated that manganese is not redistributed as effectively to the new flush as zinc, copper, and perhaps boron.

C. K. Labanauskas is Assistant Horticulturist, University of California, Riverside.

W. W. Jones is Horticulturist, University of California, Riverside.

T. W. Embleton is Associate Horticulturist, University of California, Riverside.



Letters at connection points on the curves indicate statistical populations. Mean values plotted on the curves are statistically significant from each other if they do not have a common letter. Common letters on the curves at connection points indicate that the differences between means are not statistically significant.