L. K. STROMBERG

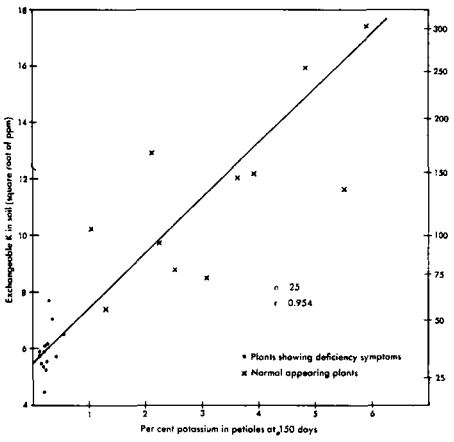
Need for Potassium Fertilizer on Cotton

determined by leaf and soil analyses

Fertilizer trials and field studies in 1957, 1958, and 1959 indicated that the soil in some cotton fields in the San Joaquin Valley was deficient in available potassium, and the application of potassium fertilizers significantly increased cotton yields. Where available soil potassium is in low supply, cotton plants show distinctive visible deficiency symptoms.

Deficiency symptoms have not been observed in Fresno County before mid-August, when the plants are about 120 days old. The symptoms appear only in the top third of the plant and are of the greatest severity in the youngest mature leaves.

Relationship between percent potassium in cotton petioles and the square root of exchangeable potassium in the soil.



The first symptom of potassium deficiency is premature wilting, which begins when the potassium content of the petioles of the youngest mature leaves—measured on a dry basis—drops to about 1%. Leaves well supplied with potassium are soft and feel like suede, but when the potassium content of the petioles drops to between 1% and 0.6% the leaves become thick, leathery and brittle. When crumpled in the hand, snapping and cracking of such leaves can be heard distinctly.

Leaf Symptoms

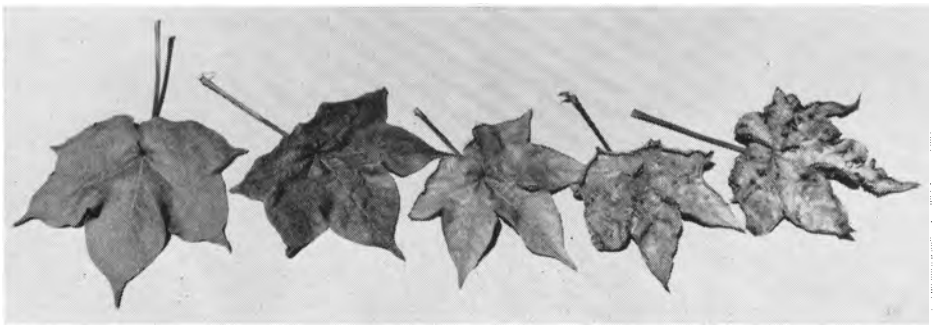
At a potassium level in the petioles below 0.6%, the leaves deteriorate rapidly. Leaf edges curl upward and turn yellow, followed by burning of the edges and interveinal yellowing. Eventually, large necrotic—dead—spots develop between the veins of the leaves. A fungus often infects the leaves during the necrotic spot stage.

When the petiole potassium level drops to 0.20%–0.15% the leaves die and fall from the plant. As a result, defoliation of the top leaves is sometimes so heavy it becomes impossible to take meaningful petiole samples.

In areas of severe potassium deficiency the main stem of the cotton plant becomes weak and brittle. Lodging is common.

The relationships between leaf symptoms and potassium levels in the petioles have been confirmed—almost without exception—in nearly 300 samples taken over a wide area during the late summers of 1958 and 1959.

A normal cotton leaf on the left and progressively severe potassium deficiency symptoms to the right.



The upper portion of a cotton plant deficient in potassium.

Studies in 1959

Studies made in 1959 to correlate petiole potassium levels in plants about 150 days old with exchangeable potassium in the soil revealed a high coefficient of correlation between petiole potassium and a function of soil potassium in samples taken from 25 widely separated fields.

During the studies, field trials were established in locations where potassium deficiency was suspected because of visible symptoms. In all cases the symptoms of potassium deficiency were corrected and the yield of lint cotton was increased an average of 207 pounds per acre by the application of 245 pounds of potash per acre in the 16 replicated experimental plots.

Petioles from all plots with and without potassium fertilizer in the 1959 field trials were sampled several times during the season.

The high correlations between the soil and petiole potassium found in the survey and the soil and petiole levels found

HAROLD F. MADSEN and LOUIS A. FALCON

New insecticides against

Orange Tortrix

tested on apples near Watsonville

The orange tortrix on apples in California usually has been controlled satisfactorily by the use of TDE in the codling moth schedule of treatments. However, the recent increase in cases of codling moth resistance to TDE—and to DDT—has caused some growers to change to other insecticides, although little is known about the effectiveness of the substitute compounds against orange tortrix.

The orange tortrix is almost as important a pest as the codling moth. The orange tortrix is a surface feeder, but the shallow bites the pests take in the calyx, stem, or the sides of the fruit make the fruit unsuitable for fresh shipment and rejected by most processors except those engaged in producing juice.

To evaluate several new compounds against the orange tortrix, a test plot was established in a Yellow Newtown Pippin orchard near Watsonville. The Yellow Newtown Pippin is an apple variety especially susceptible to orange tortrix because of the short fruit stem and the tendency for the fruits to touch. The larvae of the orange tortrix usually spin webbing in sheltered places provided by

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Overwintering sites on apple twig.

Damage to apple.

in the test plots suggest some working minimums for potassium.

It appears that at early bloom—75 days—the petioles of the youngest mature leaves should have a minimum of 4.5% potassium, measured on a dry basis. Also, it appears that at 130 days the petioles should have at least 1% potassium.

Apparently the exchangeable potassium in the soil should be present at a minimum of 60 ppm—parts per million—in the surface 12". As the studies are continued, the minimum levels may be increased.

Deficiency symptoms have been identified on a wide range of soils on the east side of the San Joaquin Valley. However, entire fields seldom show evidence of potassium deficiency. Visible plant symptoms and probable minimums of petiole and soil potassium—as determined by analyses—should indicate need of potassium fertilizer for cotton in some fields in the San Joaquin Valley cotton growing areas.

L. K. Stromberg is Farm Advisor, Fresno County, University of California.

Forrest Fullmer of the American Potash Institute assisted in the above studies.

Relationship of soil and petiole potassium in field fertilizer trials in 1959.