on the tensiometer indicated that water was being applied when the potential at 30 cm reached between −50 and −20 centibars and reached between −5 and −0 centibars at 100 cm. The oxygen diffusion rate measured at 30 cm when the soil-water potential was −10 centibars was 0.04 $\mu g\ cm^{-2}\ min^{-1}$. This oxygen diffusion rate is very low and probably indicates too little oxygen for maximum root growth. Following these observations, the amount of water added each week was reduced and root elongation was again initiated after the 42nd day.

The roots did not grow into the dry layer in the columns which were wet to 100 cm. The data indicate that these plants were not able to transfer water within the root system from zones of ample water to zones of inadequate water supply. The roots immediately above the dry layer were growing profusely, but did not penetrate into the dry layer.

Root penetration was at a constant rate for the columns which were watered only initially. Roots extracted water from the soil progressively downward. In one container, the soil-water potential never reached as low as −60 bars at 15 cm. The soil-water potential was lowered to at least −60 bars at 15 and 30 cm in another replication. These data indicate that the shrubs are capable of lowering the soil-water potential, even though more water is available at greater depths.

Apparently roots of this desert shrub will grow wherever there is water, but will not grow into extremely dry layers.

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RESIDUAL EFFECTS OF LETTUCE HERBICIDES ON FOLLOWING CROPS

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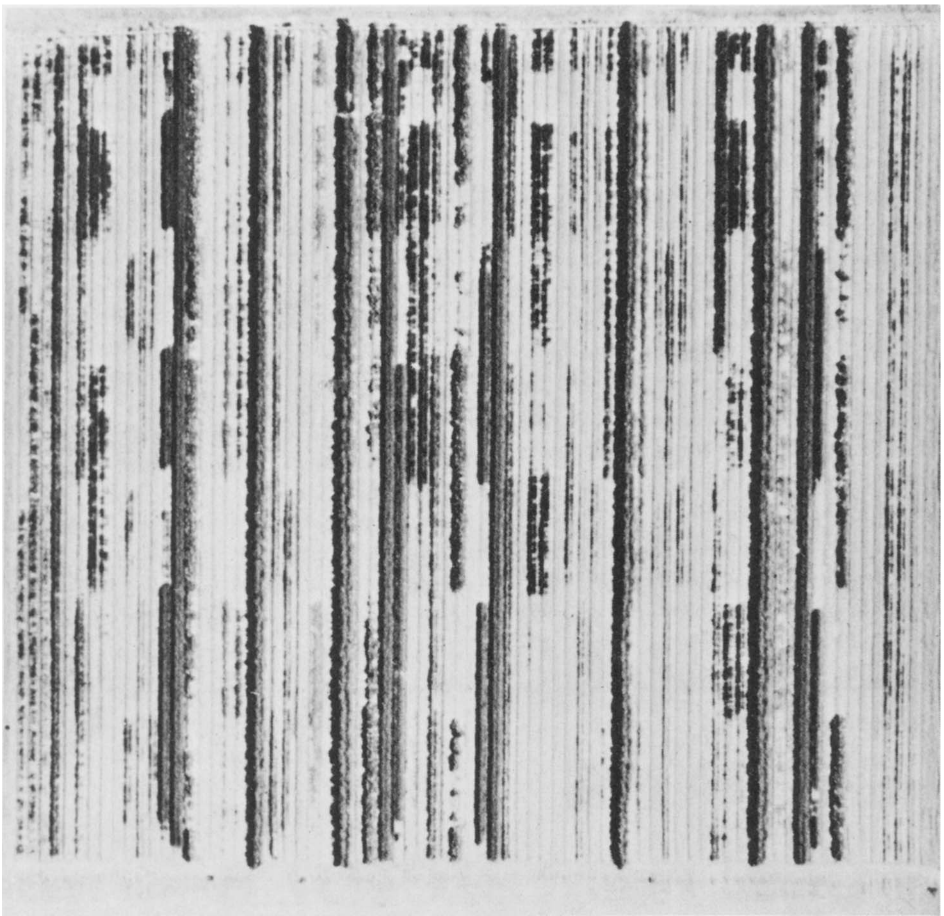
LETTUCE IS THE most important vegetable crop grown in California's Imperial Valley, grossing up to $73,000,000 annually. Nearly all lettuce in the valley is treated with herbicides—mostly with Balan (benefin). Balan has a broad weed spectrum; however, growers have known for some time that Balan residues may cause damage to sorghum plantings that follow lettuce crops. Kerb (pronamide) has now been released for use on lettuce, and has been found to be an excellent herbicide against weeds in the mustard group, such as London Rocket, normally not controlled with Balan. Little information was available, however, about residual effects of Kerb under desert conditions, except that it could damage cereal crops planted after lettuce.

The experiment reported here was designed to evaluate the effect of Balan and Kerb on 13 crops which could be planted

Reduction in stand and growth is shown for the 4 lb (twice label rate) of Kerb. Crops were planted 84 days after a treatment to a lettuce crop which "failed."



Infrared photograph of lettuce plot area from 500 ft altitude. Skips in rows show evidence of herbicide residues.

after crop failure, or after a full-term lettuce crop.

Treatments

The following treatments were made: (1) Kerb at 2 lbs ai/A (the high label rate) applied preemergence; (2) Kerb at 4 lbs ai/A (twice the label rate) applied preemergence; (3) Balan at 1 lb ai/A (normal usage rate) applied preplant; (4) Balan at 2 lbs ai/A (twice normal usage rate) applied preplant; and (5) a mixture of 1 lb ai/A of Kerb and ¾ lb ai/A of Balan (reduced rates for both materials) applied preplant. A check plot was also included in the study.

The herbicides were applied using a backpack CO_2 hand sprayer with 8003E TeeJet nozzles (32 psi) at a rate of 28 gpa to the tops of 40-inch, double-row lettuce beds 33 ft in length. Each plot consisted of four beds. There were four replications. A power mulcher with "L"-shaped teeth were used to incorporate the Balan and Kerb/Balan combination to a soil depth of 3 inches. All treatments were made November 7, 1972, the initial planting date. The plots were sprinkled until lettuce seedling emergence.

TREATMENT A—Lettuce followed by small grains or cotton (normal practice)

Lettuce maturing in December or early January is commonly followed by wheat or barley. Lettuce maturing in late January, February, or March is often followed by grain sorghum and sometimes by cotton.

In this test lettuce was grown to maturity, the heads were harvested, and the crop was destroyed by power mulching the beds. The soil was mixed only within the beds, not with untreated soil from the furrows. Wheat, barley, cotton and grain sorghum were planted 130 days following the initial herbicide applications.

Wheat and barley planted after a mature crop of fall lettuce treated with Kerb at both 2- and 4-lb rates resulted in severe phytotoxicity. Balan had no effect on wheat or barley. The Kerb/Balan combination affected both barley and wheat.

Kerb caused slight injury to grain sorghum. Balan did not affect cotton, barley, or wheat, but caused severe injury to grain sorghum at the 2-lb rate.

TREATMENT B—Lettuce (destroyed), followed by alfalfa, cabbage, carrots, onions and sugar beets

Lettuce was destroyed 30 days after emergence—simulating a stand loss. Alfalfa, cabbage, carrots, onions and sugar beets were planted.

Kerb caused alfalfa stunting at both rates, but no damage was evident after the first cutting. The 2-lb rate of Kerb caused some phytotoxicity to all crops. At the 4-lb rate, carrots, onions, sugar beets and cabbage showed severe stand loss and phytotoxicity. By harvest, the 4-lb Kerb rate had caused sugar beet root distortion, with many roots growing above the soil surfaces.

Balan was not phytotoxic to alfalfa, cabbage, carrots or onions. However, sugar beets were severely affected. The combination of Kerb and Balan seriously affected only the sugar beets.

TREATMENT C—Lettuce (destroyed) followed by cantaloupes, watermelons, safflower, and tomatoes

The lettuce was destroyed 30 days after emergence, and the soil was allowed to remain fallow for 54 days before planting to cantaloupes, watermelons, safflower and tomatoes.

Safflower was not affected by Kerb or Balan treatments. Tomatoes were killed by Kerb and seriously injured by Balan at the 2-lb rate. The 1-lb rate of Balan did not seriously injure any of the crops. Only tomatoes were seriously affected by the Kerb/Balan combination.

At the 2-lb rate, Kerb caused noticeable injury to cantaloupes and watermelons; at the high rate there was almost a total loss of melons. Balan, and the combination, had little effect on cantaloupes and watermelons.

TREATMENT D—wheat

Wheat planted across the plots one year after the initial herbicide treatments showed no phytotoxicity symptoms.

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