White Potatoes

effect of irrigation on production studied through three seasons

John H. MacGillivray

Potatoes—a shallow-rooted crop—give pronounced increased yields from irrigation in arid areas.

In California, irrigation practices on potatoes range in extremes from non-irrigated fields along the coast to rather excessive use of water in the Kern County area.

Irrigation experiments carried on for three seasons demonstrated that yield of potatoes was increased greatly by irrigation under the climatic conditions of Davis, California.

Four different treatments for the plots were used in the series of experiments:

1. Plot A was dry; no irrigation water applied; the only soil moisture being that stored from winter rains or preirrigation.

2. Plot B was wet and received large applications of water varying from 18 to 50 inches in the different years.

3. Plot C was medium where the water application varied from seven to 29 inches.

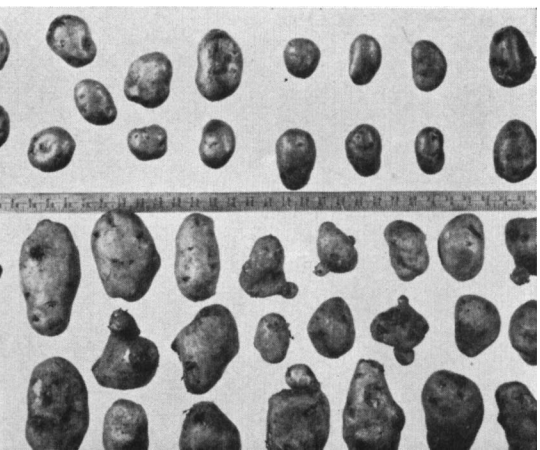
4. Plot D had light irrigation and received 3½ to 13 inches of water.

The water was applied in furrows between the rows.

These tests were conducted during the spring season of 1941, 1942, and 1943. In 1941 and 1942, the treatments received similar amounts of water and in 1943, considerably heavier amounts for all irrigation treatments.

The plots were replicated twice in 1941 but the crop was unfertilized. In succeeding years, the plots were replicated four times and fertilized with ammonium sulfate. In 1942, 700 pounds of ammonium sulfate were applied broadcast and the next year, 500 pounds were drilled into the bed.

Potato tubers, *upper part:* from A treatment—no irrigation water—and *lower part:* B treatment—19½ inches of water. Note the amount of potatoes with knobs or second growth.



Certified White Rose potato seed was planted in rows three feet apart, with plants one foot apart in the rows. The seed was planted for the different years as follows: March 19, 1941; February 21, 1942, and February 13, 1943.

In 1941, the potatoes were dug when the plants on all the plots were dead. Since the plants died first on the A-plot, and last on the B-plot, the digging was performed in the last two years as the plants died.

After being dug, the potatoes were graded, and samples of No. 1's were stored to determine whether irrigation affected loss of weight in storage—at 50° F.

A Yolo loam, used in these experiments, became very hard in the nonirrigated plots, so that the tubers were inclined to be rough. Specific gravity determinations were made by weighing the individual potatoes in air and in water. Standard methods were used for chemical analysis. If the tubers had knobs on them which were ½ inch in length, they were classified as knobby potatoes.

Results

Even though the soil was wet to a depth of five or six feet from winter rains, there was very small yield from the non-irrigated plots.

Irrigation greatly affected yield of potatoes in each of the three years, and many of the differences were significant at the 5% level.

All treatments were significant in 1941—except the B to C comparison. In 1942, there were fewer comparisons which were significant and the least significant difference was larger. The significant differences in 1943 were similar to those in 1941 and only the B to C comparison is nonsignificant.

The application of nitrogen fertilizer gave a considerable increase in yield in 1942 and 1943 as compared with 1941.

At the end of the experiment, the amount of growth made was proportional to the irrigation water applied.

There were considerable changes in the appearance of the plants in the different plots.

The wet treatment—B—plants exhibited a light green color throughout the growing season, and this would indicate that they made continuous growth. When growth ceased or slowed down because of insufficient water, the plants became dark green in color.

In the case of the dry—A—plots near maturity, the plants were a blackish green color. The appearance of this dark green color occurred first on the A plots, following in succession on D and C.

The plants also exhibited some wilting, although this did not appear so quickly as the change in color. In all years, the A and D plots exhibited wilting, as did the C treatments sometimes.

Each year the plants on the different plots died in regular succession, in direct relation to the amount of irrigation water applied. A given plot was harvested when most of the plants were dead.

In 1943, the harvest dates for the different plots were:

A treatment, June 15th.

D treatment, June 30th.

C treatment, July 7th.

B treatment, July 13th.

In 1943, there was severe wind damage with the greatest being to the A and D plots.

The application of water was rather excessive in 1943 so there was some standing water between the rows for a day or more. In 1941, there was a somewhat similar condition on one B plot due to a leaking standpipe.

No harm was noticed, in these experiments, from excessive irrigation, as has been true in some other western experiments. This difference may be due to better soil drainage. In these experiments, it is believed that there was no building up of an underground water table.

Irrigation produced several changes in the potato tubers. Each year, except 1941, showed some effect on size of both No. 1 and No. 2 potatoes produced by the different treatments.

The material on knobby potatoes is of interest since it is generally believed that a cessation of tuber growth followed by good growing conditions will cause knobs. Each year, on the nonirrigated plot, there were some knobby or second-growth potatoes. In 1943, this condition was more prevalent on the nonirrigated treatment.

Irrigation treatments did not appreciably affect the loss of weight in storage. There were significant differences in 1942 but none in 1943.

There was considerable effect by irrigation on the percentage of No. 1 potatoes. In all cases, the smallest percentage of No. 1 potatoes was found in the non-irrigated treatment. Size might have been a slight factor here, but a diameter of 1⅞ inches usually is not too critical. Some irrigation experiments in other states

Continued on page 16

CELERY

Continued from page 13

acre are necessary to produce a good yield of high quality celery.

Six hundred pounds of nitrogen per acre resulted in slightly increased yields, but it is doubtful that applications exceeding this rate would be paid for in higher yields. The addition of large quantities of phosphorus and potash appear to be unnecessary on these soils.

The results of these tests indicate that celery growers in southern California could make a substantial saving in fertilizer costs.

Disease and Insects

Disease and insect control methods and costs also varied widely. Some growers used a combination of sprays and dusts in their pest control operations while others applied only sprays.

The number of applications ranged from five to 25, and costs were from $39.00 to $146.00 with an average for all of $75.00 per acre for labor and materials.

Close watch on disease and pest conditions by careful field examinations at frequent intervals, and the use of the most effective pest control materials should enable growers to keep these at a reasonably low figure.

The use of boom-type sprayers, which cover eight to ten rows at one time, can effectively reduce the labor cost of insect and disease control.

Irrigation

The amount of irrigation water used varied from 19½ to 104 inches and frequency of application ranged from 13 to 31 irrigations.

Soil types make a great difference in the amount of water needed to produce this shallow-rooted crop. Lighter soils could easily require several times as much water as some of the heavier silt and clay loams.

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WHITE POTATOES

Continued from page 14

have shown that excessive amounts of water may lower grade, but such was not true of these experiments.

Irrigation affects the composition of potatoes. An insufficient amount of soil moisture causes an increase in the percentage of dry matter and of nitrogen in the tubers. Analyses of vegetables have shown that if growth is reduced because of a deficiency of some element, there is an increase in the other elements and usually in carbohydrates.

Irrigation treatment produced a noticeable effect on the appearance of the lenticels of the tubers. The nonirrigated potatoes have a normal, small appearing lenticel. The heavily irrigated potatoes exhibit a large, whitish tissue at the normal location for the lenticel.

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SWEET POTATOES

Continued from precedi..g page

Either above ground houses or cellars may be used. The important consideration for a storage house is to be able to maintain uniform desirable temperatures. The roof needs good insulation or a false ceiling should be provided to prevent condensation of moisture on the roof.

Provision for heat is necessary for curing and to prevent chilling during unusually cold periods.

It is advisable to divide large storages into compartments so the potatoes from a few days harvesting can be closed up and cured without delay.

Ventilators are essential for temperature and humidity control and should be arranged to avoid direct drafts on the potatoes. Storages should be rodent proof.

Windows should be covered to exclude light during the storage season.

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NEW PUBLICATIONS

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CALIFORNIA GREENHOUSE PESTS AND THEIR CONTROL, by A. Earl Pritchard, Bul. 713, May, 1949.

A handbook for both professional and amateur greenhouse operators with descriptions and many pictures of the insects and mites attacking their crops; methods of control; and an appraisal of all the new insecticides and their effectiveness in the control program.

SUN-DRYING FRUITS, by E. M. Mrak and H. J. Phaff, Cir. 392, July, 1949.

Good sun-drying practices for the farmer who has a drying yard for stone fruits, raisins or currants. Covers methods for drying apricots, freestone peaches, nectarines, clingstone peaches, pears, prunes, raisins, currants, cherries.

GROWING STRAWBERRIES IN THE HOME GARDEN, by Richard E. Baker, Ext. Cir. 151, May, 1949.

Designed to help the home gardener have better success with strawberries.

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S & W Tool Company — 1 quart Dianol insecticidal plaint
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