

Sugar-Beet Growth and Soil-Moisture Study

(V. B. MARCUM, GEO. L. BARRY, G.D. MANUEL¹)

Experimental evidence is not conclusive as to the effect, on plant growth of maintaining the soil moisture somewhere near the field capacity, as compared with permitting the soil moisture to approach the wilting point before replenishing it.

To obtain information on the effect of varying moisture levels on sugar-beet production, plots were laid out in commercial sugar-beet fields in the Woodland District of California on soil of the Yolo sandy loam series in 1941.

The procedure called for three treatments:

1. Wet treatment : Soil moisture to be kept as near as possible to field capacity for a depth of 5 feet throughout the entire growing season.
2. Medium treatment : The average soil moisture for a depth of 5 feet not to be allowed to drop below 50 percent of the field capacity.
3. Dry treatment: Soil moisture to be allowed to reach the permanent wilting point in the surface 4 feet of soil before applying additional water.

The plots were 300 feet long, 12 rows in width, and the spacing between the rows was 20 inches. Each treatment was replicated 5 times in randomized series. Beets were planted on April 16, and the average thinned stand for each of the plots was as follows:

	Beets per 100 Feet of Row
Wet Treatment.....	142
Medium Treatment.....	147
Dry Treatment.....	142

Each treatment was separated by a border levee. To obtain yield data, 250 feet in each of the two center rows of each replication were harvested.

Irrigation treatment of the various plots is as follows:²

1. Wet Treatment: The permanent wilting percentage (P.W.P.) was reached in the first foot of soil twice during the season but was kept above P.W.P. at all other depths during the entire growing period. The fourth and fifth foot of soil were maintained above a point midway between field capacity and P.W.P. during the entire growing season. No wilting was observed in any replications of this treatment.

¹ Spreekels Sugar Company.

² For graphs of soil-moisture content for the three treatments, see figures 1, 2, and 3, respectively, in the article by L. D. Doneen in these Proceedings, entitled "Some Soil-Moisture Conditions in Relation to Growth and Nutrition of the Sugar-Beet Plant."

2. Medium Treatment: The permanent wilting percentage was reached or closely approached twice in the first, second, and third-foot depths of soil during the season. Only the fifth foot was maintained above the midway point between field capacity and the permanent wilting percentage.
3. Dry Treatment: The permanent wilting percentage was reached or closely approached five times in the first foot, four times in the second foot, twice in the third foot, and twice in the fourth foot. The moisture in the fifth foot came as close as five points to the permanent wilting percentage three times, but wilting of the beets in several of the replications necessitated addition of irrigation water to prevent possible injury.

Yield data obtained are as follows:

	Tons Per Acre
Wet Treatment.....	23.03
Medium Treatment.....	22.02
Dry Treatment.....	22.84

Discussion.—Failure to obtain satisfactory penetration of moisture resulted in less difference in moisture treatment between the three plots than had been anticipated. It is probably significant to note, however, that within the range of differential moisture treatment in the three plots, there was no significant difference in beet yields.