Conclusions

The data obtained from the seven harvest dates of the five varieties tested over the two year period, shows a fairly consistent relative performance for these varieties over the entire harvesting period. Certain changes in rank in different harvests do occur, but in most cases these are well within the limits of experimental error. Consequently, adequate evidence of interaction of varieties and dates of harvest is lacking. It appears therefore, that in this area it is a safe procedure to use data obtained from the preharvest samplings, in place of the normal date of harvest sampling data for the evaluation of varieties for use in determining which varieties to increase for seed.

THE USE OF SOIL MOISTURE DETERMINATIONS TO REGULATE IRRIGATION PRACTICES IN COMMERCIAL BEET FIELDS

(Demonstration Paper)

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Since the inception of irrigated agriculture, irrigations have been regulated largely by the appearance of the growing crop. In the production of sugar beets in California this method is not sufficiently accurate, in most instances, to permit maximum utilization of soil fertility, light, etc. Furthermore, many attempts to increase production of sugar beets by fertilization failed because sufficient soil moisture was not available to support the additional plant growth. Therefore, to make full use of soil fertility, light, and other growth factors and to make possible increased yields by increased fertilization, soil moisture must be maintained at proper levels throughout the growing period.

The amount of moisture in soils available to plants can now be accurately determined (1,2,3,4,5), so that irrigation may be regulated, thereby preventing an excessive or deficient supply of soil moisture. The technique of determining for a large commercial acreage, the amount of water available to plants in a soil throughout the growing period and regulating irrigation practices accordingly have been difficult. Because of the far-reaching importance of proper irrigation and the inability of most growers to secure the necessary soil moisture information, the Spreckels Sugar Company has undertaken to develop a program to supply this information. This program has been under way since 1937.

In 1939 the Spreckels Sugar Company selected 85 key growers, from whose fields it secured soil samples at intervals not exceeding ten days throughout the major sugar beet growing period (May to September). The percentage of water in these samples was determined and the data charted to obtain the trend of extraction of water. Each grower was advised regarding the irrigation procedure for his field. The moisture equivalent (water holding capacity), necessary for proper interpretation of moisture percentage data, was secured for each soil previous to the irrigation season. Moisture equiva-

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1/Spreckels Sugar Company

lent, and permanent wilting percentages determined for most soil types in the Spreckels Sugar Company supply area in 1937 showed the permanent wilting percentage of the large majority of these soils to be approximately one-half the moisture equivalent. Therefore, only moisture equivalents have been determined on soils in recent studies and the permanent wilting percentage of those soils has been calculated by dividing the moisture equivalent by 2.

The soil sampling procedure for a field was as follows:

(1) Samples at random were obtained in a field until the soil types representative of the majority of the field were located.

(2) In each representative soil area a stake was driven near the head, the middle, and the foot of an irrigation run. Samples for moisture equivalents and for all moisture determinations were secured within a few feet of these stakes.

(3) To obtain soil samples for moisture determinations two holes were bored near each stake at each date of sampling and dirt from the two holes composited for the following depths:

0 to 6	inches	- Sample discarded
6 to 24	"	- Sample No. 1
24 to 42	"	- Sample No. 2
42 to 60	"	- Sample No. 3

There were, therefore, three moisture determinations for each location or nine for each field at each date of sampling. The moisture percentage for each depth was plotted on charts, on which the permanent wilting percentage and moisture equivalent of that soil had been previously plotted. A copy of this chart was kept in a convenient place on the ranch for the grower to observe. By this means the grower was able to visualize the extent of penetration and the rate of extraction of soil moisture from his soil.

Soil samples were obtained with soil tubes 7/8" in diameter, 5 feet in length, equipped with cutting point head and a twelve pound hammer.

The usual laboratory method of determining the moisture percentage of soils requires 24 hours of oven drying. It was found essential that moisture percentages be known very soon after the samples were secured in order (1) to maintain the interest of the cooperator, and (2) to give timely advice regarding irrigation procedure. Various rapid methods of determining soil moisture were tested. The Alcohol Method developed by G. J. Bouyoucos of the Michigan Agricultural Experiment Station (6 & 7) was found most efficient and sufficiently accurate for the type of work involved. Wooden cases, 25" wide, 15" high and 6" deep were fitted with balance scale, cups for burning soil, shield to protect cups while burning, alcohol supply, and cleaning equipment, and were provided each field superintendent of the Spreckels Sugar Company. With this equipment it was possible to secure and make the required nine soil moisture determination for a field in approximately one and one-half hours. It was found impractical to use the equipment in the field because of the effect of wind on the scale, therefore the moisture determinations were made in a sheltered place.

A study of the 85 soil moisture charts of fields under irrigation control in 1939 and the resulting sugar beet yields show the real value of the project. Not only has the technique of interpreting the trends of soil moisture supply been improved, but growers are recognizing the importance and value of this project and are willing to use the moisture information as a guide in their irrigation program.

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