HARVEST SAMPLING STUDIES WITH FIVE VARIETIES OF SUGAR BEETS
(Demonstration Paper)

C. W. Doxtator[1]/

In the past, harvest data has often been obtained from variety tests prior to the normal harvesting period for the purpose of determining which varieties are the more productive.[2]/ When data taken at preharvest dates indicate significant differences between varieties, it has been commonly expected that these differences would be maintained up to and including the harvest made on the normal harvesting date.

In the increase of elite and breeders stock of sugar beet seed at Rocky Ford, Colorado, there is a timely need for additional information on the performance of new breeding strains so that only the best may be increased. Since in this area the latest safe date for fall planting for seed production is September 5th, it is not possible to obtain yield data of the normal harvest date (approximately October 10) on varieties for evaluation purposes. If however, harvests made prior to September 5th are found to give similar information to harvests made at the normal harvest date, the earlier harvests are the more valuable, since information is obtained when needed.

From certain preharvest data obtained from variety tests conducted in 1937 at Rocky Ford, Colorado, it was indicated that the prediction of yields of varieties from the preharvest date to the normal harvest date might be erroneous. Since much of the previous work done in preharvest sampling was not sufficiently replicated to give a reliable estimate of error, the present study was undertaken.

The purpose of this study was to determine what yield relationship varieties bear to each other at different harvest dates during the fall season, and what use could be made of advance information in the shaping of a seed increase program.

Materials and Methods

Five commercial varieties were used, four of which were of domestic origin. Three of these were classified as intermediate type, one was a tonnage type and one was a sugar type. The varieties were planted in fifty foot, four row plots in four replications, for each of seven harvest dates and for each of the two years, 1938 and 1939. The tests for each year were arranged in a split plot experimental design; the varieties being arranged so that the greater precision would be obtained between varieties at each date of harvest, thus allowing the lesser precision to fall in the different harvest dates where differences were likely to be large. All plots were planted in 20 inch rows, and a thinned stand of 10 inches between beets obtained. All harvests were made by the competitive method, and yields were recorded on a single beet basis. Of the seven harvest samplings made, four were considered as made at preharvest dates, two were normal harvest dates and the last sampling was made at a post harvest date. All harvest data was statistically analyzed by the Analysis of Variance Method.

1/Plant Breeder, American Crystal Sugar Company

2/American Beet Sugar Company---Research Department---Annual Reports 1919-1929 inclusive.

Experimental Results

Since the data obtained on the five varieties in test is in reality a study of rate of growth, the data are presented in graphic form as growth rate curves. The following graph shows relative yields in pounds weight per beet, percent sucrose and pounds sugar per beet respectively. The growth rate curves are an average for the two years 1938-1939.

In Graph No. 1 a fairly consistent rank in weight per beet is shown for the five varieties. The slight changes in rank seen in the September 26 harvest are small enough to be within limits of experimental error. The three leading varieties, numbers 1, 2 and 3 of the August 23 harvest are, for the last two harvests not significantly different between each other, but are different from varieties No. 4 and 5; these being the low ranking varieties at the first harvest date. The reduction in weight on the October 20 and November 1 harvests is accounted for in lack of irrigation during the month of October for both years. In percent sucrose, there is a consistent performance for all varieties at all harvest dates. Changes in rank are all well within experimental error. For pounds sugar per beet, the performance of the varieties at the seven harvest dates indicates that the relative performance of the varieties over the harvesting period does not greatly differ. However, in the case of varieties No. 1 and 5, the reversal of form shown on the September 26th harvest does approach significant proportions. At all other dates however, differences in yields of these two varieties are not significant.

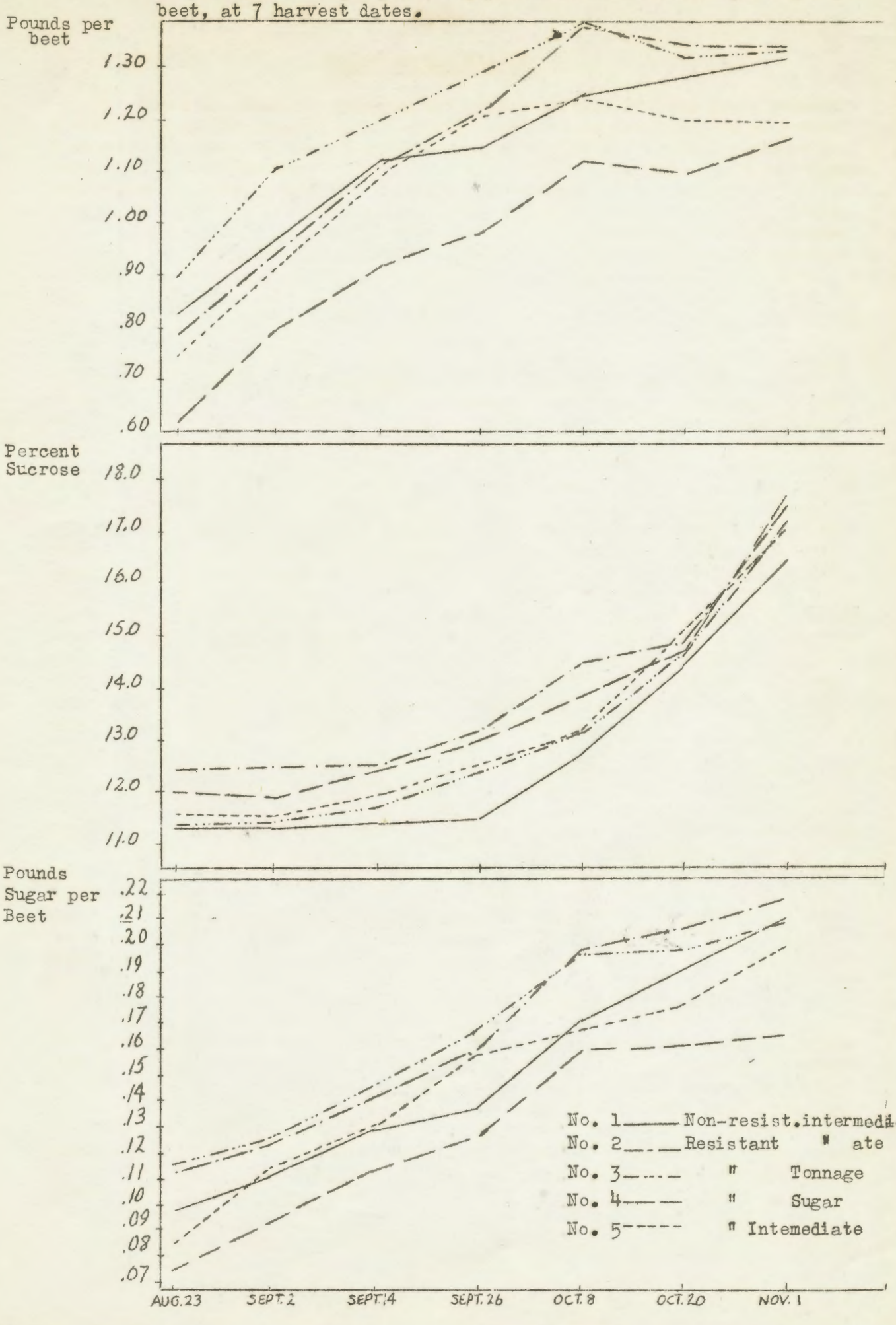
Since, as mentioned previously, the latest date for obtaining information in time for use in evaluating varieties to be planted for fall annual seed production at Rocky Ford is September 5th and the normal beet harvest date approximately October 10, it is of interest to compare the results obtained for these two dates. In Table I are given the data obtained for the harvest samplings made on September 2 and October 8th.

Table I. Comparison of 5 Varieties at the Two Harvest Dates, September 2 and October 8.

Variety	Weight Per Beet Lbs.				Percent Sucrose				Lbs. Sugar Per Beet			
	Sept. 2	Rank	Oct. 8	Rank	Sept. 2	Rank	Oct. 8	Rank	Sept. 2	Rank	Oct. 8	Rank
No. 1	.98	2	1.25	3	11.47	5	12.75	4	.110	4	.168	3
No. 2	.96	3	1.38	2	12.40	1	14.50	1	.124	2	.196	1
No. 3	1.10	1	1.39	1	11.58	4	13.20	3	.125	1	.195	2
No. 4	.80	5	1.12	5	11.84	2	13.92	2	.094	5	.159	4
No. 5	.94	4	1.24	4	11.61	3	13.20	3	.113	3	.168	3
Sign. Diff. (19:1)	.17		.18		.73		.70		.026		.027	

It will be observed that in weight per beet, variety No. 4 was lower than the other 4 varieties at both harvest dates. At both dates of harvest, Variety No. 2 was higher than No. 4, a result significantly demonstrated only at the October 8 harvest. In percent sucrose the relative performance of all varieties was quite similar at both harvests. In pounds sugar per beet varieties No. 2 and 3 rank above the other varieties at both dates, but significantly so only on the later date. Variety No. 4 was consistently low in yield.

Graph No. 1 - Weight per beet, percent sucrose and weight sugar per beet, at 7 harvest dates.



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)

J. E. Coke and H. I. Hechman[1/]

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