

VARIETAL ADAPTATION AS INDICATED BY CORRELATION
COEFFICIENTS BETWEEN LOCATIONS

H. L. Bush¹

The final step in any breeding program is the evaluation of the varieties as produced before they are released for commercial use. These tests should be conducted at several locations in order to determine the extent of varietal adaptation.

The variety testing program of The Great Western Sugar Company is divided into two categories, one series of tests (Colorado and Nebraska) for areas where leaf spot may be a factor, and other series (Montana and Wyoming) for testing curly top resistant varieties. The purpose of this paper is to study relative results obtained in Colorado and Nebraska by means of correlation coefficients.

In recent years the Colorado-Nebraska tests have been more or less standardized in tests at Longmont, Brush, and Eaton, Colorado, and in the Scottsbluff District of Nebraska. The procedure has been to combine the results for these various locations as homogeneous sets of data, and thus determine the more desirable varieties for this entire area, although certain varieties have been recommended for each area, separately. It has been noted that some varieties tend to perform well at all locations, while others fluctuate so that they consistently appear very good at one location, at the same time being rather poor at others.

In order to judge the extent to which a general recommendation might be reliable, correlation coefficients have been determined for the yield of beets in tons per acre and for percentage of sugar between the various locations. These coefficients are presented in Table I.

TABLE I

Coefficients of Correlation (r) for yield of beets in tons per acre and percentage of sugar between different locations as indicated.

<u>Correlation Between</u> <u>Locations</u>	<u>Year</u>	<u>Varieties</u> <u>No.</u>	<u>Tons</u>	<u>% Sugar</u>	<u>1% point</u>
			<u>per A.</u> <u>r</u>	<u>r</u>	<u>r</u>
Longmont-Brush	1944	38	.728	.565	.413
" "	1945	36	.154	.440	.424
" "	1946	36 ^a	.751	.863	.424
" "	1946	36 ^b	.424	.558	.424
Longmont-Eaton	1944	25	.708	.686	.487
" "	1945	36	.520	.600	.424
" "	1946	36	.446	.581	.424
Longmont-Scottsbluff	1944	35	.771	.561	.418
" "	1945	36	.744	.823	.424
Longmont-Gering	1946	36	.505	.799	.424
Brush-Eaton	1944	25	.429	.755	.487

^a Commercial varieties

^b Pedigreed varieties

¹ Statistician-Agronomist, The Great Western Sugar Co. Experiment Station, Longmont, Colorado

TABLE I (cont.)

<u>Correlation Between</u> <u>Locations</u>	<u>Year</u>	<u>Varieties</u> <u>No.</u>	Tons	% Sugar	1% point
			<u>per A.</u> <u>r</u>	<u>r</u>	<u>r</u>
Brush-Eaton	1945	36	.390 ^c	.520	.424
" "	1946	36	.534	.391 ^c	.424
Brush-Scottsbluff	1944	32	.620	.732	.437
" "	1945	36	.125	.474	.424
Brush-Gering	1946	36	.575	.684	.424
Eaton-Scottsbluff	1944	25	.731	.758	.487
" "	1945	36	.369 ^c	.566	.424
Eaton-Gering	1946	36	.447	.687	.424

^c Significant at 5% point

The only correlation coefficients which are not significant are those for tons per acre between Longmont-Brush and Brush-Scottsbluff in 1945. The test at Brush in 1945 was on a phosphate deficient field so the yields were very low and it appears as if there is a definite differential response between varieties under these conditions. Two coefficients for tons per acre between Brush-Eaton and Eaton-Scottsbluff are significant at the 5% point, while all others are as great or greater than the r value at the 1% point.

For percentage of sugar all correlations, except Brush-Eaton for 1946 which is significant at the 5% level, are greater than those for the 1% point. The results for percentage of sugar tend to be more consistent and will average somewhat higher than for tons of beets per acre, considering all tests studied. It might be pointed out that we use only half as many beets for sugar analysis as for determining yields, since the sugar percentage character produces lower Standard Error values, even with the smaller number of beets, than do the weight determinations. The results obtained in these correlation coefficients for sugar percentage would probably be expected, since we know this character is less variable than for yield, and indicates that the ability of a sugar beet variety to produce sugar is not affected as much by differences in growing conditions as is its ability with respect to growth of the root.

In 1946 there were two tests of 36 varieties, each, at Longmont and Brush. One of these was composed of commercial varieties and the other of pedigreed varieties. The commercial varieties show a higher value for both tonnage and percentage of sugar, which may suggest that the performance of varieties when they have reached the commercial generation may be more stable or more generally adapted, due to our generalized varietal selection program.

It would have been interesting to include correlations between years at each location, but in no case were enough varieties tested to make such calculations advisable.

These results would make it appear as if general recommendations might be made for this entire area, although a careful analysis of the results for each location is desirable, since we have noted some cases of definite varietal response to location.