

Report on Tests in 1945 of U. S. 215 x 216 and Other Varieties from Sugar Beet Leaf-Spot-Resistance Breeding Investigations of the U. S. Department of Agriculture

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Agronomic evaluation tests were conducted in 1945 with the first and third releases of U. S. 215 x 216, and with other varieties obtained in the federal leaf-spot-resistance breeding project. Tests at 13 locations as conducted by members of the staff of this Division in cooperation with Agricultural Experiment Stations and by cooperators in the beet sugar industry are reported. The cooperators in research organizations of the beet sugar industry -who contributed data are as follows: Fere A. Reeve, Farmers' and Manufacturers' Beet Sugar Association (tests at Holgate, Ohio, and Ogden Outer, Mich.); C. W. Doxtator, American Crystal Sugar Company (tests at Rocky Ford, Colo., Wood river, Nebr., and Mason City, Iowa); and C. E. Cormany, Holly Sugar Corporation (test at Sidney, Mont.). Two varieties were included in tests at Fort Morgan and Brush, Colo., by H. E. Brewbaker and R. L. Bush. The data for these two varieties are not included in this summary.

The distribution of the 13 tests summarized was as follows: four in Colorado, one each in Wyoming, Montana, Nebraska, Iowa, Minnesota, and Ohio, and three in Michigan.

In 1945 only minor damage was caused by leaf spot (*Cercospora beticola*). In two of the tests (Fort Collins and Rocky Ford) epidemic conditions were artificially produced by means of overhead sprinklers. At Wood River, Nebr., leaf spot occurred naturally in fairly severe form. The comparisons in 1945, as in 1944, therefore evaluate chiefly the agronomic characters of the varieties under conditions in which leaf spot resistance made relatively minor contribution. As pointed out in 1944 for a similar situation, data obtained when disease impact is below normal assist in appraisal of the general utility of leaf spot resistant introductions, but may show up some weaknesses in resistant varieties. Since exposures vary from year to year in the sugar beet growing districts, a resistant variety must not only be superior in seasons when leaf spot is severe, but it needs also to yield satisfactorily in non-leaf-spot seasons. At the present status of

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sugar beet breeding, if a resistant variety does not depart, in a season without leaf spot, very significantly from the general mean in a test or a series of tests, such performance probably represents reasonable expectation.

In previous comparative tests U. S. 215 x 216 had shown definite superiority over U. S. 200 x 215; in turn the variety designated as Improved U. S. 215 x 216 (SP 1-8-00) was found superior to the parent variety. The practice has now been adopted with the (J. S. curly top resistant varieties of designating a reselection from a variety improved in resistance or other qualities as second, third, or other numbered release of the parent number, instead of designating it as "Improved". In line with this practice, "Improved" U. S.

Table 1.—Comparison of first and third releases of U.S. 215 x 210 (SP 2-1-00 vs. SP 4-7-00) in 13 evaluation tests of U. S. leaf spot resistant varieties as conducted by Division of Sugar Plant Investigations and its cooperators. (Data given are averages of eight replicates unless otherwise noted.)

Location	Contributed by	Acre yield					
		Gross sugar		Beets		Sucrose	
		First release	Third release	First release	Third release	First release	Third release
		(Pounds)	(Pounds)	(Tons)	(Tons)	(Per-centage)	(Per-centage)
Colorado							
Ft. Collins sprinkler	J. O. Gaskill	2,724	3,080	9.64	10.06	14.14	15.34
Ft. Collins College	G. W. Deming	3,080	3,505	13.04	11.90	14.12	15.22
Ault	J. O. Gaskill	5,084	5,276	14.97	14.47	16.98	18.22
Rocky Ford	C. W. Dextator	4,344	4,676	14.35	14.10	15.17	16.68
Nebraska							
Wood River*	C. W. Dextator	5,086	4,975	14.72	14.07	17.25	17.80
Iowa							
Mason City*	C. W. Dextator	3,111	2,841	10.20	9.13	16.27	15.57
Wyoming							
Torrington	S. B. Nuckols	4,896	4,364	13.56	11.81	17.04	18.33
Montana							
Sidney	C. E. Cormany	3,080	2,802	12.54	11.00	12.11	12.00
Minnesota							
Mankato	R. W. Henderson	3,086	2,898	9.36	8.76	14.10	16.55
Michigan							
East Lansing	J. G. Lill	2,106	1,722	7.20	5.46	15.32	15.88
Merrill	J. G. Lill	3,448	3,201	10.12	9.78	16.08	16.87
Ogden Center†	Perc Keefe	4,502	4,004	13.89	14.61	16.41	16.51
	J. G. Lill						
Ohio							
Holgate	Perc Keefe	2,366	2,330	8.11	7.74	14.52	15.02
	J. G. Lill						
Average		3,650	3,506	11.72	10.90	15.60	16.21

*5 replications

†7 replications

215 x 216, as represented by SP 1-8-00 tested in 1944, is now designated as the second release, or U. S. 215 x 216/2. In 1945 a third release of U. S. 215 x 216 was tested as SP 4-7-00. This will be designated as U. S. 215 x 216/3.

The three releases of U. S. 215 x 216 represent valuable additions to the list of American sugar beet varieties. All have high resistance to leaf spot. U. S. 215 x 216/3 is very outstanding in this respect and is indicated for use in all districts having records of severe leaf spot exposure. In comparison with the parent variety it classifies definitely as a sugar type.

In view of the depressing effects of leaf spot on sucrose percentage this capacity to produce high sucrose, even under leaf spot exposure, may be very important. U. S. 215 x 216/1 or /2 will probably continue to be utilized as the all-around leaf spot resistant types, high

Table 2.—Summary* of gross sugars and root, weights (acre yields) and of sucrose percentages for the varieties included in 13 replicated tests in 1945. Three records from similar tests in 1944 are given for comparison. The data for the individual varieties are also expressed as percentages of the performance of U. S. 215 x 216/1 (SP 2 1-00), for the indicated year.

SP Seed No.	Description	Year of test	Acre yield					
			Gross sugar		Roots		Sucrose	
			Average	As percentage of 2-1-00	Average	As percentage of 2-1-00	Average	As percentage of 2-1-00
			Pounds	Percent	Tons	Percent	Percent	Percent
2-1-00	U.S. 215 x 216/1	1945	3,659	100.0	17.72	100.0	15.50	100.0
		1944	4,434	100.0	13.24	100.0	13.81	100.0
4-7-00	U.S. 215 x 216/3	1945	3,686	98.3	16.96	98.8	16.21	104.0
3-1834-00	Synthetic variety	1945	3,975	108.6	12.96	110.8	15.27	98.5
		1944	4,854	100.0	14.47	109.3	16.67	100.4
4-8-0	Synthetic U.S. 215 x 216 x Cesena	1945	3,664	105.6	12.17	103.8	15.82	102.1
3-3011-0	Previous generation of above	1944	4,622	104.2	13.48	101.8	17.23	102.5
4-1836-00	Synthetic variety	1945	3,872	105.8	12.24	104.4	15.76	101.7
4-6-00	U.S. 215 (Imp.) x SP 8-270-0	1945	4,060	111.0	13.28	113.3	16.28	98.3
4-5-0	Synthetic check (Seed of 9 European brands was pooled. This is second increase without selection from pool.)	1945	3,763	103.7	12.26	104.8	16.43	99.5
	Local variety†	1945	3,780	103.6	12.36	105.5	15.31	98.8

*Locations at which the tests were conducted and the names of those contributing data are shown in table 1.

†"Local variety" was Great Western in four tests (GW 59 in 2 tests); American 1 or 3 in four tests; Imperial 40 in four tests and Midwest in one test.

in root yield and moderately high in sucrose, with U. S. 215 x 216/3 being allocated to the more seriously affected districts. The results obtained with the first and third releases of U. S. 215 x 216 at 13 locations are shown in table 1.

In table 2 a summary for 1945 of the results for all varieties tested is given, together with an expression of these results in terms of XI S. 215 x 216/1. Insofar as the same variety was included in last year's tests, the 1944 data are included.

The performance of Synthetic Check (SP 4-5-0) in the 1945 tests deserves consideration. In a year without serious and general leaf spot attack, this variety, a composite of nine European brands, gave a greater sugar production, on the average, than II. S. 215 x 216, and as good an average performance as the local varieties, product of breeding work of American beet sugar companies. It was exceeded in sugar production by synthetic varieties and by one single cross in which leaf spot resistance was sacrificed for greater tonnage.

These considerations seem to point to the necessity for increased emphasis on breeding for specific adaptation, including resistance to disease, and the combining of these factors with those influencing productiveness. When such adaptations are obtained as stabilized characters in inbred lines, then through utilization of the male sterility factor it may be possible to produce 100 percent hybrids that are high yielding and carry the other desired characters.