

Evaluation Tests in 1953 of U. S. 400 and Related Black Root- and Leaf Spot-Resistant Varieties of the U. S. Department of Agriculture¹

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Agronomic evaluation tests as conducted in 1953 included:

A. U. S. 400 and another black root-resistant variety, both of which were developed from U. S. leaf spot-resistant varieties through repeated selections of outstanding individuals under severe black root exposures

B. three hybrids—1. the F_x between a leaf spot-resistant inbred U. S. 225 MS) and a black root-resistant variety as pollinator, and 2. the F_x between U. S. 225 MS and a highly productive line as pollinator, and 3. U. S. 216 MS x U. S. 226, a commercial production of this hybrid and

C. an increase of the sugar x garden beet hybrid as bred by Deming.

In all tests, comparisons were made with European check, obtained by growing seed from a pool of 9 European brands, and a local variety as supplied by the cooperators.

Tests as conducted by members of the Sugar Plant Investigations staff and by cooperators in the sugar beet industry at a total of 13 locations are reported. The cooperators in research organizations of the industry who contributed data are H. E. Brewbaker and H. L. Bush, Great Western Sugar Co. (tests at Longmont and Fort Morgan, Colo.) ; C. W. Doxtator, R. E. Finkner and D. B. Ogden, American Crystal Sugar Co. (test at Mason City, Ia.) ; J. M. Cass, Canada and Dominion Sugar Co. (test at Wallaceburg, Ont.) ; Clare Irvin, Lake Shore Sugar Co. (test at St. Louis, Mich.) ; G. E. Nichol, Monitor Sugar Div. (test at Bay City, Mich.) , and Perc A. Reeve, Farmers and Manufacturers Beet Sugar Assoc. (tests at Saginaw and Bay City, Mich., and at Fremont, Ohio).

The varieties in the agronomic tests were as follows:

SP 521601-01	U. S. 225 MS (LSR) x U. S. 1177. (Black Root Res.)
SP 521602-01	U. S. 225 MS (LSR) x Line "D" (SP483-0 (LSR)
Accession 1234	Increase of SP50A1-00, Black Root Res. (West Coast No. 2200)
U. S. 400	Accession 1241, Increase of SP50B3-0, Black Root Res., (West Coast No. 2309)
U. S. 216 x 226	Accession 1242, Commercial production

¹ Investigations on leaf spot and black root resistance are conducted in cooperation with the Colorado, Michigan, and Minnesota Agricultural Experiment Stations, and in cooperation with beet sugar companies which are members of the Beet Sugar Development Foundation. The F. & M. Beet Sugar Association, through the Foundation, supports this research.

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Deming 520 Accession 1243, Sugar x garden beet hybrid
 European Check Originally grown from a pool of seed of 9 European brands,
 since then produced by direct increase.

Local Supplied by cooperators:
 In Colorado tests, G.W. 359-51R, and G.W. 359-
 52A; at Mason City, Ia., Amer. Cryst. 2; at Stewart,
 Minn., Amer. Cryst. 3-S; tests in Mich., Ohio, and
 Ontario, Com'l U. S. 215 x 216/3.

In 1953 Cercospora leaf spot was late in developing but severe enough to permit readings to be made at Eort Collins, Colo. (test under sprinkler system), Fort Morgan, Colo., Mason City, Ia., and Wallaceburg, Ont. The susceptible European check in the two Colorado tests read 5.6 and 6.7 respectively on the customary scale of 0 to 10, and its acre yields of sugar were significantly low. At Mason City, Ia., Stewart, Minn. (late infection), and Wallaceburg, Ont., the same relationship was shown. Leaf spot was not an important factor in the other tests.

In the two Colorado tests *in* which leaf spot was a factor the two leaf spot-resistant varieties (SP 521601-01 and 521602-01) were significantly better in sugar yield than the two varieties, U. S. 400 and Accession 1234, in which resistance to leaf spot and to black root were combined. This was not shown, however, at Mason City, Ia., or Stewart, Minn. (light leaf spot), where both leaf spot and black root were factors.

In the Colorado tests, including those in which leaf spot was severe enough to permit readings, the local variety, GW 359, either 51R or 52A, continued to give outstanding performance.

Attention is called to SP 521601-01, the hybrid between U. S. 225 MS and U. S. 1177 (SP 48B3-0), the latter being the black root-resistant variety from which U. S. 400 is a reselection. In nearly all locations this hybrid gave outstanding performance, yielding as an average, over all tests, 14.7 percent more sugar and 9 percent more roots per acre than the European check. It tested, as an average, 5.1 percent higher in sucrose than the European check, taken as 100 percent, *in* the production of SP 521601-01, the parent, U. S. 225 MS, was rogued to leave only male sterile plants so that presumably all plants were hybrid.

The performance of the hybrid is considered especially important in showing that when male sterile equivalents of varieties or strains which carry certain desirable characters, such as monogermness, non-bolting, leaf spot resistance or other characters become available, then a type with high black root resistance may be utilized advantageously as a pollinator to contribute this quality also.

The sugar x garden hybrid (Deming 520) in most tests had a poor stand but in spite of this made a strong showing in acre yield of roots. However, it was low in comparison with others in sucrose percentage. As a mean of all tests it produced slightly more sugar per acre than the European check. The performance in these tests confirmed previous reports by Deming

and others as to capability of the variety to give high root yield. It was included in the tests to familiarize cooperators with its globose root type. Work is underway to improve its sucrose percentage while retaining the characteristic shape and, it is hoped, high productiveness.

The performance of U. S. 400 is of chief interest to the sugar beet districts in which black root is a serious factor. As an average of all experiments this newly released variety gave 7.7 percent more sugar production and a 3.3 percent higher acre yield of roots than the European check. In sucrose percentage it was 4.2 percent superior, maintaining the high quality characteristics of the black root-resistant selections.

Opportunity was afforded in some tests in Michigan and Ontario to determine its performance under conditions of severe black root exposure, notably the tests at St. Johns, Mich., Bay City, Mich., and Wallaceburg, Ont. Black root was reported as severe at the first two locations and judging from the stands was a factor at the other. In the three tests U. S. 400 had significantly better stands than the European check. In the three experiments the plant populations shown for U. S. 400 indicated nearly full stands. In the tests at St. Johns and Wallaceburg, U. S. 400 was highest in acre yield of sugar and was second at Bay City, being exceeded by SP 521601-01, the hybrid between a leaf spot-resistant inbred and a black root-resistant variety already discussed.

In the tests at Fremont, Ohio, St. Louis, and Saginaw, Mich., there was little exposure to black root and stands did not differ significantly among the varieties. Furthermore, leaf spot was not a factor. These tests therefore give some indication of the productivity of U. S. 400 *in* absence of disease. At the first two locations it did not differ significantly in acre yield of sugar from the highest yielding variety (SP 521601-01) but at Saginaw it was significantly lower than SP 521602-01. It was not significantly less productive in this test than SP 521601-01.

Seed of U. S. 400 was produced in 1953 in amounts adequate for abundant commercial testing in the coming season. The plantings for commercial seed harvest in 1954 were made largely with stock seed of U. S. 400. There should therefore be ample seed to meet grower demand in 1955.

Table 1.—Acre Yields of Gross Sugar (Pounds) in Agronomic Tests in Michigan, Colorado, Iowa, Minnesota, Ohio and Ontario in 1953. Data Are Given as 8-Plot Averages, Except as Noted.¹

Location	Reported by	SP	SP	Bl. R. Res.	U. S. 100	U. S. 216x	Deming	European Check	Local ²	Genl. Mean	LSD
		52160101	52160201	Ace. 1234	Ace. 1241	226 Ace. 1242	520 Ace. 1243				19:1
Colorado											
Fort Collins	Gaskill; Elder ³	3717	4060	3169	3212	2965	3146	2977	4244	3474	238
Fort Collins	Gaskill; Elder	5227	5578	4667	4800	4393	5267	5361	5517	5101	240
Fort Collins	Deming; Kintzley	5505	5680	4718	4484	4395	4565	4412	6612	5046	397
Longmont	Brewbaker; Bush	7975	8144	7501	7496	7094	7859	7651	8(568	7800	630
Fort Morgan	Brewbaker; Bush	8255	8166	7211	7516	7008	7454	7030	8482	7615	629
Iowa											
Mason City	Finkner; Ogden	6529	6428	6069	6321	5542	5224	5721	6414	6031	806
Minnesota											
Stewart	Schneider	3686	2594	4271	3600	3107	2743	2362	3445	3226	515
Michigan											
St. Johns	Bockstahler	3121	2215	3473	3431	2531	2616	2345	2233	2749	402
St. Louis	Irvin	8134	6694	7880	7602	7516	6788	7428	6812	7357	656
Saginaw	Reeve	6543	7064	6191	6122	5766	6507	6800	6022	6377	694
Bay City	Reeve	6599	5532	5826	6092	5466	5036	5282	5270	5712	547
Ohio											
Fremont	Reeve	8763	8699	8263	8293	7938	8102	7740	7963	8220	635
Ontario											
Wallaceburg	Cass	6696	6524	6331	6848 5832	6454	5702	5287	6005	6231	417
Means of all tests		6272	5954	5813							
As percent of European Check		114.7	110.0	107.3	107.7	99.7	102.1	100.0	110.4	106.5	
Mean Mich., Ohio and Ont. Tests		6643	6126	6327	6398	5945	5892	5814	5718	6108	

¹ Longmont and Ft. Morgan, Colo., 6 replications.
² Local variety at Fort Collins, Colo. (3 tests) GW 359-51R; at Longmont and Ft. Morgan, Colo. "59-52A; at Mason City, Ia., Amer. Cryst. 2; at Stewart, Minn., Amer. Cryst. 3-S; at Michigan, Ohio and Ontario locations, U. S. 215 x 216/3. ³ Under sprinkler; inoculated with *Cercospora beticola*.

Table 2.—Acre Yields of Roots (Tons) in Agronomic Tests in Colorado, Iowa, Minnesota, Michigan, Ohio and Ontario in 1953. Data Are Given as 8-Plot Averages, except as Noted.¹

Location	Reported by	SP		Bl. R. Res. Ace. 1234	U. S. 216 x		Deining		European Check	Local ²	Genl. Mean	LSD odds 19:1
		521601-01	521602-01		Ace. 1241	Ace. 1242	Ace. 1243	Ace. 1243				
Colorado												
Fort Collins	Gaskill; Elder ³	12.42	13.94	10.75	10.83	9.98	13.50	11.05	13.57	12.00	0.73	
Fort Collins	Gaskill; Elder	17.37	18.85	15.71	16.22	14.67	19.57	18.20	18.14	17.34	0.71	
Fort Collins	Deming; Kintzley	17.46	18.68	15.43	15.06	14.67	16.91	16.38	19.34	16.74	1.11	
Longmont	Brewbaker; Bush	23.36	24.08	21.63	22.27	20.73	24.84	22.73	25.30	23.09	1.65	
Fort Morgan	Brewbaker; Bush	24.04	24.85	21.59	22.04	20.82	25.32	21.20	23.92	22.95	1.66	
Iowa												
Mason City	Finkner; Ogden	19.03	18.91	17.24	18.59	16.01	17.23	18.03	18.44	17.94	2.49	
Minnesota												
Stewart	Schneider	10.72	7.75	12.30	10.49	9.15	8.90	7.06	9.78	9.52	1.51	
Michigan												
St. Johns	Bockstahler	7.81	6.30	8.59	8.55	6.80	7.47	6.10	5.91	7.19	0.95	
St. Louis	Irvin	21.45	18.62	20.57	20.28	19.70	20.33	19.46	18.57	19.87	1.57	
Saginaw	Reeve	18.96	20.94	17.63	18.00	16.99	21.21	19.39	17.81	18.87	1.96	
Bay City	Reeve	18.50	16.48	15.94	17.21	17.62	17.70	15.15	14.96	16.44	1.42	
Ohio												
Fremont	Reeve	24.56	25.39	23.67	23.62	22.58	26.60	23.92	22.97	24.16	1.36	
Ontario												
Wallaceburg	Cass	19.39	19.60	18.20	19.48	18.12	18.63	17.05	17.60	18.51	1.40	
Mean of all tests		18.08	18.03	16.87	17.13	15.99	18.32	16.59	17.41	17.28		
As percent of European Check		109.0	108.7	101.7	103.3	96.4	110.5	100.0	104.9	104.2		
Mean Mich., Ohio, and Ont. Tests		18.45	17.89	17.43	17.86	16.97	18.66	16.85	16.30	17.51		

¹ Longmont and Ft. Morgan, Colo., 6 replications.
² Local variety at Fort Collins, Colo. (3 tests) GW 359-51R; at Longmont and Ft. Morgan, Colo. 359-52A; at Mason City, Ia., Amer. Crvst. 2; at Stewart, Minn., Amer. Cryst. 3-S; at Michigan, Ohio and Ontario locations, U. S. 215 x 216/3.
³ Under sprinkler; inoculated with *Cercospora beticola*.

Table 3.—Sucrose Percentages in Agronomic Tests in Colorado, Iowa, Minnesota, Michigan, Ohio and Ontario in 1953. Data Are Given as 8-Plot Averages, Except as Noted.¹

Location	Reported by	SP 521601-01	SP 521602-01	Bl. R. Res. Ace. 1234	U. S.400 Ace. 1241	U. S. 216x	Deming	European Check	Local-	Genl. Mean	LSD
						226 Ace. 1242	520 Ace. 1243				odds 19:1
Colorado											
Fort Collins	Gaskill; Elder*	14.95	14.56	14.73	14.83	14.83	12.77	13.46	15.65	14.47	0.50
Fort Collins	Gaskill; Elder	15.05	14.80	14.85	14.80	14.97	13.46	14.76	15.21	14.74	0.41
Fort Collins	Deraing; Kintzley	15.74	15.19	15.27	14.82	14.96	13.45	13.44	17.10	15.00	0.56
Longraont	Brewbaker; Bush	17.07	16.91	17.34	16.83	17.11	15.82	16.83	17.13	16.89	0.62
Fort Morgan	Brewbaker; Bush	17.17	16.43	16.70	17.05	16.83	14.72	16.58	17.73	16.59	0.67
Iowa											
Mason City	Finkner; Ogden	17.36	17.06	17.74	17.41	17.44	15.30	16.04	17.56	16.99	0.81
Minnesota											
Stewart	Schneider	17.14	16.66	17.31	17.11	16.96	15.37	16.62	17.47	16.83	0.39
Michigan											
St. Johns	Bockstahler	19.57	17.76	20.06	19.89	18.38	17.23	18.89	18.55	18.79	0.65
St. Louis	Irvin	18.96	17.96	19.14	18.73	19.08	16.71	19.08	18.34	18.50	0.55
Saginaw	Reeve	17.26	16.92	17.58	17.04	17.01	15.33	17.57	16.93	16.95	0.53
Bay City	Reeve	17.83	16.78	18.28	17.74	17.49	15.86	17.43	17.61	17.38	0.71
Ohio											
Fremont	Reeve	17.81	17.14	17.47	17.55	17.58	15.23	16.14	17.37	17.04	0.75
Ontario											
Wallaceburg	Cass	17.25	16.68	17.38	17.58	17.80	15.30	15.53	17.13	16.83	0.69
Mean of all tests		17.17	16.53	17.22	17.03	16.96	15.12	16.34	17.21	16.69	
As percent of European Check		105.1	101.2	105.4	104.2	103.8	92.5	100.0	105.3	102.1	
Mean Mich., Ohio, and Ont. Tests		18.11	17.21	18.32	18.09	17.89	15.94	17.44	17.66	17.58	

¹ Longmont and Ft. Morgan, Colo., 6 replications.

² Local variety at Fort Collins, Colo. (3 tests) GW 359-51R; at Longmont and Ft. Morgan, Colo. 359-52A; at Mason City, Ia., Amer. Cryst. 2; at Stewart, Minn., Amer. Cryst. 3-S; at Michigan, Ohio and Ontario locations, U. S. 215 x 216/3.

³ Under sprinkler, inoculated with *Cerrospora beticola*.