

complex can be greatly lowered. Because of local environmental differences in the districts of the humid area, a cure-all applicable everywhere should not be expected and therefore, more intensive tests are needed.

The leaf-spot-resistant sugar-beet variety U. S. 217, released in 1938, has demonstrated a high degree of resistance and under exposure to the disease has shown decisively better performance than the European brands with which it has been compared. Where leaf spot was not a factor the variety has been exceeded in root yield, and hence in sugar per acre, by certain improved tonnage types. A new leaf-spot-resistant release, U. S. 200 X 215, produces greater tonnage than U. S. 217, with practically equivalent sucrose percentage. To produce this variety, two inbred strains, which in themselves, regardless of leaf-spot-resistance, approximate European brands in performance, were intercrossed in order to take advantage of first-generation hybrid vigor. Tests in 1938 showed that the resistant variety exceeded the nonresistant check, taken as representative of European brands, by 333 pounds of sugar to the acre. The variety has as yet been produced only on a limited scale, something over 200,000 pounds of seed being available for 1939 commercial plantings.

It will be noticeable to you that the foregoing remarks have been limited to citing research activities of the Division of Sugar Plant Investigations. I am more conversant with details of those activities than with the numerous contributions to progress by others, and it is with no intention to slight their valuable basic steps, or parallel or accessory work on the same problems, that illustrations of practical adaptation of research were selected from those sponsored or vigorously pushed by the Division.

The raison d'etre of this talk is to emphasize in an impersonal way **an idea that** should be quickly recognized by biologists: the increasing control over living plant forms and their environments because of advances in biological and other science. Economic implications in the illustrations cited, with understanding of their extensive or limited use, are very great. The basis of the sugar industries is the mutable sugar-producing plant and very impressive are these recent demonstrations of opportunities to quickly change the character of plants in different producing areas with attendant changes in costs of production. Advances in plant breeding, unpredictable as to their impact upon the National economy, just as improvements in mechanics or chemistry, are sometimes far reaching and are likely to throw into confusion the calculations of economic planning.

REPORT ON 1939 TESTS OF U. S. 200 X 215

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Agronomic evaluation tests were conducted in 1939 on U. S. 200 X 215 and allied varieties by members of the staff of the Division of Sugar Plant Investigations in cooperation with Experiment Stations and with other cooperators, as shown, at 10 locations. In addition, Prof. J. H. Torrie of the Wisconsin Agricultural Experiment Station, Mr. M. J. Buschlen of the Farmers and Manufacturers Beet Sugar Association and Mr. H. D. Brown of the Canada and Dominion Sugar Company, Chatham, Ontario, conducted similar tests with the varieties supplied by the Division and have given permission to include in this report the data which they obtained. Mr. G. M. Bradford of the Monitor Sugar Co. of Bay City, Michigan, conducted two tests in which U. S. 217 and U. S.

200 X 215 were compared with several European brands, and he has supplied the data for use in this report. A total of 15 tests—6 in Colorado, 1 in South Dakota, 2 in Minnesota, 1 in Wisconsin, 4 in Michigan, and 1 in Ontario—are summarized.

Comparisons in table 1, except those for Bay City, and Au Gres, Michigan, are with 'Synthetic Check', a variety obtained by pooling equal quantities of 9 European brands and using this mixture to produce seed crop. In our experience, 'Synthetic Check' has shown a performance equivalent to the best European tonnage types and superior to many brands on the market. The 1939 results bear out this opinion, and in the absence of leaf spot, "Synthetic Check" proved a very strong competitor in several localities. In the Bay City and Au Gres tests, the average of all European brands included in the test is used instead of 'Synthetic Check'.

(Table 2)

Comparisons are also shown for U. S. 200 X 215 and some locally used brand or variety usually obtained from the Beet Sugar Company in whose territory the test was conducted. In the case of the Bay City and Au Gres test the European brand highest in sugar per acre was taken as the "Local Check".

Seed of U. S. 200 X 215 as used in all 1939 tests was commercial seed grown by the Western Seed Production Corporation in Arizona. The seed was produced from a planting stock made by mixing in proportions 1:3, commercial stock seed of U. S. 200 (highly leaf spot resistant inbred, high in sucrose, moderate in yielding capacity) and stock seed of U. S. 215 (a moderately resistant inbred, moderately high in sucrose, and of very high yielding capacity).

There is no way of determining with any degree of exactness how much intercrossing took place between the two inbreds in the seed field. U. S. 200 X 215, although indicated as a hybrid, consists of some unknown percentage of hybrids, along with selfs of the two inbred strains. Some experimental evidence exists that the cross of these two inbreds gives increased productiveness, and the introduction of this variety into commercial use represents an attempt to use in a practical way any advantage which might thus accrue from hybridizing.

In general, the data as summarized in tables 1 and 2 confirm the conclusions of the 1938 tests, namely, that U. S. 200 X 215 may be used to replace European brands in common use without reduction in sugar yields and that under conditions of leaf spot exposure, the variety may be expected to forge greatly ahead.

Table 1. SUMMARY OF 1939 TESTS OF U.S. 200 X 215
 Conducted by Division of Sugar Plant Investigations
 and cooperators.

Comparison with 'Synthetic Check' which approximates European tonnage types.
 (Actual weight basis; results given as 10-plot averages except as noted.)

1939 Location of Tests	Acre Yield (Calculated)				Sucrose		Apparent purity coefficient		Stand ^{4/}	
	Indic.-avail. Sugar		Roots							
	US 200	Check	US 200	Check	US 200	Check	US 200	Check	US 200	Check
	X 215	Check	X 215	Check	X 215	Check	X 215	Check	X 215	Check
	pounds	pounds	tons	tons	%	%			%	%
Colorado:										
Ft. Collins Sta. (Sprinkler)	4,343	3,742	17.69	17.20	13.81	12.51	88.9	87.1	93.8	91.1
do. College Farm	4,147	4,231	13.04	13.79	17.16	16.52	92.52	92.64	92.8	93.3
Ft. Morgan ^{1/}	6,447	6,114	20.98	21.52	17.24	16.23	89.20	87.6	88.5	84.7
Ault	5,109	5,438	16.50	17.53	16.78	16.88	92.2	91.8	88.0	87.8
Rocky Ford (Sprinkler)	5,733	5,026	25.27	25.08	12.72	11.54	88.70	87.08	121.0	116.0
do. West Ranch	5,386	5,715	17.64	19.06	16.53	16.31	92.59	92.18	124.0	105.0
Belle Fourche, S. Dak	3,882	4,347	13.3	14.6	17.0	17.3	85.7	85.6	63.0	61.0
Crookston, Minn. ^{2/}	(2,644)	(2,880)	10.69	11.18	12.44	12.76	---	---	84.7	88.0
Waseca, Minn.	2,851	2,792	11.05	11.70	15.46	14.48	83.45	82.36	87.4	83.0
Madison, Wisc.	3,794	3,892	12.81	12.22	17.60	18.6	84.4	84.8	101.8	97.2
East Lansing, Mich.	3,026	2,803	10.0	9.2	17.4	17.5	87.2	87.1	82.5	91.9
Saginaw, Mich.	3,756	3,055	12.95	11.98	16.23	14.57	89.61	87.8	91.0	78.1
Bay City, Mich. ^{2/3/}	(4,041)	(3,646)	12.38	11.23	16.32	16.24	---	---	103.0	101.0
Au Gres, Mich. ^{2/3/}	(5,404)	(4,777)	16.01	14.85	16.88	16.09	---	---	128.0	126.0
Chatham, Ont.	2,534	2,020	9.46	7.8	15.40	15.0	86.7	86.5	87.6	67.6
Average	4,206	4,032	14.65	14.60	15.93	15.50	88.43	87.71	95.8	91.4
Difference	+174		+0.05		+0.43		+0.72		+4.4	

^{1/} Fort Morgan test based on 5 replications.

^{2/} Gross sugar.

^{3/} Tests at Bay City and Au Gres, Michigan had 6 replications. Mean of all commercial varieties in test used as check.

^{4/} Stand in percent computed on basis of 12-inch spacing.

Table 2. SUMMARY OF 1939 TESTS OF U.S. 200 X 215
 Conducted by the Division of Sugar Plant Investigations
 and cooperators.

Comparison with European brand or variety supplied by the local beet sugar company.
 (Actual weight basis; calculated from 10-plot averages except as noted.)

1939 Location of Tests	Acre Yield (Calculated)				Sucrose		Apparent purity coefficient		Stand ^{4/}	
	Indic.-avail. Sugar		Roots							
	US 200 X 215	Check	US 200 X 215	Check	US 200 X 215	Check	US 200 X 215	Check	US 200 X 215	Check
	pounds	pounds	tons	tons	%	%			%	%
Colorado:										
Ft. Collins Sta. (Sprinkler)	4,343	4,035	17.69	18.20	13.81	12.64	88.9	87.7	93.8	93.3
do. College Farm	4,147	4,348	13.04	13.96	17.16	16.62	92.52	93.12	92.8	91.7
Ft. Morgan ^{1/}	6,447	6,896	20.98	22.60	17.24	17.06	89.2	89.4	88.5	85.7
Ault	5,109	5,472	16.50	18.10	16.78	16.59	92.2	91.1	88.0	89.6
Rocky Ford (Sprinkler)	5,733	4,944	25.27	21.03	12.72	13.21	88.70	89.20	121.0	120.0
do. West Ranch	5,386	5,723	17.64	17.33	16.53	17.66	92.59	92.66	124.0	111.0
Belle Fourche, S. Dak.	3,882	4,096	13.3	13.8	17.0	17.3	85.7	85.8	63.0	57.0
Crookston, Minn. ^{2/}	(2,644)	(2,464)	10.69	10.28	12.44	12.00	---	---	84.7	69.7
Waseca, Minn.	2,851	2,484	11.05	10.83	15.46	14.02	83.45	81.85	87.4	66.2
Madison, Wisc.	3,794	3,869	12.81	11.82	17.6	18.6	84.4	87.5	101.8	94.5
East Lansing, Mich.	3,026	2,540	10.0	8.5	17.4	17.1	87.20	87.05	82.5	84.8
Saginaw, Mich.	3,756	2,983	12.95	11.53	16.23	14.74	89.61	87.45	91.0	72.0
Au Gres, Mich.	(5,404)	(4,941)	16.01	14.95	16.88	16.53	---	---	128.0	125.0
Bay City, Mich.	(4,037)	(3,811)	12.382	11.52	16.32	16.55	---	---	103.0	103.0
Chatham, Ont.	2,534	2,718	9.46	9.54	15.4	16.3	86.7	87.4	87.6	79.0
Average	4,206	4,088	14.65	14.27	15.93	15.79	88.43	88.35	95.8	89.5
Difference	+118		+38		+14		+08		+6.3	

^{1/} Based on 5 replicates.

^{2/} Gross sugar.

^{3/} Tests at Bay City and Au Gres, Michigan are based on 6 replicates. Commercial variety showing highest sugar per acre used as check.

^{4/} Stand in percent computed on basis of 12-inch spacing.