STRAINS AND HYBRIDS TEST.

This test was designed to test the progeny of several more or less random combinations of inbred lines, a selection and a synthetic variety. A key to the varieties, and some notes on the inbred material involved will be found on the following pages.

Six random blocks, each 8 plots wide and 2 plots long, were used for this test. Plots sizes and harvest was the same as for the Agronomic test of Leaf-Spot-Resistant varieties and both tests were in the same fields. In this test, the productiveness of the field declined from block I to block VI, but was fairly uniform for any one block.

Roots of each line for the group crosses were planted alternately in the row or in alternate rows, and the whole planting harvested together. Each seed lot is therefore a mixture of hybrids, sibs and selfs of unknown proportions. Observations on the plots indicated that the degree of crossing probably varied considerable. Apparently there was very little crossing of the Fredriksen plants in Nos. 6 and 7. This is substantiated by the results of another cross in which the Fredriksen parent was harvested separately. This was a cross of a very few roots and the progeny of the seed from the Fredriksen female was probably less than 10 percent hybrid; while that of the other line, when it was the female, was about 90 percent hybrid. This inbred line of Fredriksen has excellent vigor, appears highly resistant to leaf spot and tends to be quite low in percent sucrose.

However the high degree of self ferti ity will make its utilization for the production of single cross seed difficult.

Due principally to poor germination of some of these lots, poor stands resulted in some cases. This condition appeared to be aggrivated on a few plots by the previously mentioned weed problem. With the exception of Nos. 6 and 7 stands were for the most part fairly adequate. The yield of No. 9 may also have been adversely affected to a small degree by poor stands. Because of the high percentage of selfed and sibbed plants in Nos. 6 and 7, it is doubtful if adequate stands would have made much difference in the rank of these hybrids. However, it is of interest to note that in the case of No. 6 with a stand of 38 plants per 100 feet of row, the yield of roots is over 60 percent of the yield of the commercial check, No. 16, with a stand of 103 plants per 100 feet of row.

Plot and general summaries for this test follow.

Strains and Hybrids Test 1940

Plot Summaries

Var. No.	Plot No.	No. Beets	T. Beets per A.	% Sucr.	lb. Sug. per. A.	Stand
1	906	192	25.16	14.05	7069	107
	925	177	23.39	13.85	6480	98
	942	209	23.53	12.30	5788	116
	959	183	16.89	12.75	4306	102
	979	178	16.15	12.95	4182	99
	992	192	15.89	11.90	3782	107
Mean			20.17	12.97	5268	105
2	911	184	21.43	14.10	6044	102
	926	141	16.62	9.95	3307	78
	948	186	17.65	13.70	4836	103
	954	192	18.07	14.00	5060	107
	977	112	8.77	11.65	2043	62
	987	183	12.94	13.65	3532	102
Mean			15.91	12.84	4137	92
3	914	154	20.53	14.55	5975	86
	919	163	18.01	14.95	5386	91
	936	172	19.17	15.00	5750	96
	955	168	14.03	13.15	3691	93
	969	157	13.10	15.30	4010	87
	988	137	14.93	15.55	4642	76
Mean			16.63	14.75	4909	88
4	905	177	21.75	14.05	6112	98
	932	181	20.45	15.20	6217	101
	948	192	21.22	13.95	5921	107
	965	153	17.45	14.10	4920	85
	967	198	16.92	13.15	4449	110
	995	163	12.72	13.50	3434	91
Mean			18.42	13.99	5176	99

5	916	158	18.04	15.35	5539	88
	933	148	18.54	16.00	5933	82
	938	187	18.89	15.80	5969	104
	952	189	17.70	14.90	5275	105
	975	166	10.98	14.35	3150	92
	993	181	10.72	14.25	3056	101
Mean			15.81	15.11	4820	95
6	903	73	14.55	12.10	3521	41
	924	54	12.66	13.35	3381	30
	937	85	13.86	13.85	3839	47
	962	65	10.58	13.00	2750	36
	968	68	11.02	13.10	2886	38
	997	69	7.98	13.75	2194	38
Mean			11.78	13.19	3095	38
7	917	104	17.59	12.55	4415	58
	922	103	18.34	11.45	4200	57
	947	127	13.61	12.10	3294	71
	964	94	14.06	11.55	3248	52
	974	149	12.57	12.45	3129	83
	991	102	8.27	12.90	2133	57
Mean			14.07	12.17	3403	63
8	912	192	20.73	15.40	6386	107
	929	181	19.41	15.50	6018	101
	949	172	15.42	15.35	4734	96
	958	193	15.75	14.95	4711	107
	971	178	16.06	15.55	4994	99
	986	187	14.29	14.40	4115	104
Mean			16.94	15.19	5160	102

9	908	137	16.23	15.50	5032	76
	983	151	16.87	14.90	5028	84
	934	170	17.77	13.55	4816	94
	960	163	13.50	13.90	3754	91
	973	129	12.84	14.65	3761	72
	983	138	9.22	14.05	2591	77
Mean			14.40	14.42	4164	82
10	907	194	20.71	15.60	6462	108
	920	177	18.77	14.70	5520	98
	941	160	16.86	15.40	5192	89
	961	161	12.92	13.55	3502	89
	966	168	14.28	12.85	3670	93
	996	180	15.20	14.95	4546	100
Mean			16.46	14.51	4815	96
11	910	183	17.55	12.75	4476	102
	930	201	20.07	14.55	5842	112
	944	192	16.48	14.70	4845	107
	963	190	12.97	13.10	3397	106
	951	156	12.81	15.05	3855	87
	985	185	10.16	12.85	2612	103
Mean			15.01	13.83	4171	103
12	909	166	18.98	14.60	5544	92
	928	173	19.30	13.25	5116	96
	945	209	17.36	15.35	5329	116
	956	170	17.82	13.40	4775	94
	978	159	14.59	13.40	3909	88
	990	136	9.84	13.40	2638	76
Mean			16.32	13.90	4552	94

13	915	189	21.95	14.55	6389	105
	927	192	17.02	12.45	4237	107
	940	180	18.08	14.05	5080	100
	957	166	16.71	15.20	5081	92
	976	162	11.33	12.50	2833	90
	982	169	13.63	14.00	3818	94
Mean			16.45	13.79	4573	98
14	904	198	19.16	13.90	5326	110
	918	208	19.44	15.00	5830	116
	943	290	17.83	14.55	5189	117
	953	175	16.10	13.40	4314	97
	980	202	17.92	15.05	5395	112
	994	199	15.69	14.00	4393	111
Mean			17.69	14.32	5074	110
15	913	186	18.38	14.65	5386	103
	931	195	18.59	16.00	5947	108
	935	191	20.39	15.15	6177	106
	950	193	17.74	14.40	5108	107
	970	190	15.80	14.05	4439	106
	989	164	13.29	16.10	4280	91
Mean			17.36	15.06	5223	104
16	902	180	19.81	11.70	4634	100
	921	181	20.66	13.85	5723	101
	939	193	17.85	13.05	4659	107
	951	182	17.95	12.35	4433	101
	972	187	21.75	12.70	5525	104
	984	185	12.49	12.00	2999	103
Mean			18.42	12.61	4662	103

Strains and Hybrids Test. 1940

General Summary.

Variety No.	T.Beets Per A.	Percent Sugar	Gross lb. Sug.per A.	Stand 1/
1	20.17	12.97	5268	105
2	15.91	12.84	4137	92
3	16.63	14.75	4909	88
4	18.42	13.99	5176	99
5	15.81	15.11	4820	95
6	11.78	13.19	3095	38
7	14.07	12.17	3403	63
8	16.94	15.19	5160	102
9	14.40	14.42	4164	82
10	16.46	14.51	4815	96
11	15.01	13.83	4171	103
12	16.32	13.90	4552	94
13	16.45	13.79	4573	98
14	17.69	14.32	5074	110
15	17.36	15.06	5223	104
16	18.42	12.61	4662	103
Mean	16.37	13.92	4575	92
F Value	6.74**	6.76**	5.65**	26.20**
2 times S. E. of a difference	2.15 T.	1.02	764lbs.	10 Feet
S. E. of Mean in percent of the mean.	46.5%	2.59	5.90%	3.85%

1/ Beets harvested per 100 feet of row.
** Exceeds 1% point.

STRAINS AND HYBRIDS TEST.
Key to Varieties

Var. No.		Description
1.	'39 Seed No. 308.	Group cross Original Normal and Pioneer lines.
2.	" " No. 310.	" " " " " " "
3.	" " No. 3121	" " Pioneer and Fredriksen lines.
4.	" " No. 319.	" " " " Delitzsch "
5.	" " No. 333.	" " Unknown and Flat Foliage lines.
6.	" " No. 334.	" " Fredriksen and Flat Foliage lines.
7.	" " No. 337.	" " " " " " "
8.	" " No. 339.	" " unknown and Flat Foliage lines.
9.	" " No. 340.	" " Flat Foliage and Nebr. No.30 lines.
10.	" " No. 343.	Reselection Pioneer and Flat Foliage. Basis of selection root type, size and quality.
11.	" " No. 345.	Group cross Asarco 2 and Flat Foliage lines.
12.	" " No. 346.	" " " " " " "
13.	" " No. 347.	" " Flat Foliage and Pioneer lines.
14.	'38 " No. 277.	" " two Flat Foliage lines.
15.	'38 " O-P Va.Dale.	Open pollinated seed from several hundred two to four times inbred roots, mostly Normal, Pioneer and Flat Foliage. Essentially Synthetic variety.
16.	Commercial	Commercial check variety.

Notes on Pedigrees and Seed Producing Roots in Group Crosses.

Hybrid Var. No.	Source Parent Line	Pedigree1/	Averages of roots used in group cross. Weight (lb.)	% sucrose	Notes
1.	Original Normal	ss	1.8	11.1	LSR.
	Pioneer	ssss	1.3	16.0	LSR.
2.	Pioneer	ssss	2.6	13.9	Slight LSR.
	Original Normal	ss	1.8	10.8	
3.	Pioneer	sgss	1.8	14.2	
	Fredriksen	ssss	2.2	14.3	
4.	Pioneer	sss	3.0	11.5	
	Delitzsch	sgss	2.0	14.7	Good LSR.
5.	"Path. Acc."	ssss (or more)	1.6	11.3	LSR.
	Flat Foliage	Sugar selection	1.8	15.7	LSR.
6.	Fredriksen	ssss	2.2	11.2	Very LSR.
	Flat Foliage	ggg	2.0	15.9	Slight LSR.
7.	Fredriksen	ssss	2.2	10.8	Very LSR.
	Flat Foliage	ssg	1.8	15.2	LSR.
8.	"Path. Acc."	ssss (or more)	2.0	9.8	LSR.
	Flat Foliage	ssg	2.1	15.1	
9.	Flat Foliage	ggsg	1.6	13.7	
	Nebraska 30	sg	1.8	16.4	
11.	Asarco 2	sg	2.1	13.8	
	Flat Foliage	ssg	1.8	16.1	
12.	Flat Foliage	ssg	2.1	14.0	LSR.
	Asarco 2	sg	1.9	15.9	
13.	Flat Foliage	sgss	2.2	12.0	
	Pioneer	ssg	2.0	15.7	Slight LSR.
14.	Flat Foliage*	sss	2.9	15.2	
	" " *	ssg	2.0	13.6	

1/ s indicates one gereration of selfing by isolation.
g " " " " sib pollination of 2 or more roots.

* 1937 roots and therefore not strictly comparable with foregoing root data.

Discussion.

On the basis of this test No. 1 appears to be an excellent combination, probably fully equal to the check in yield of roots and quality. No. 4 is also probably equal to the check and Nos. 3, 8, 10, 14, and 15 do not appear to be inferior to the check in yield of sugar per acre with root yield of 1 to 2 tons less than the check. Due to relatively high percent sucrose, the acre yield of sugar of No. 5 is also fairly good.

The relative yields of Nos. 14 and 15 in comparison with the check substantiate the conclusions reached on the performance of these strains in the 1939 test. No. 14 appears on the basis of the 1939 and 1940 tests to be a fairly good combination. Regarding No. 15, it appears that a random recombination of a large number of inbred lines will result in a variety with yielding ability fully equal to or slightly above that of the parent material from which the lines came. However, these two tests do not indicate that any great improvement will result from such random combinations.