

Discussion:

None of the differences in yield of either roots or sugar per acre approached statistical significance. The leaf-spot-resistant varieties had consistently higher percentage sucrose than that of the checks. The differences slightly exceeded the amount needed for statistical significance in all cases in comparison with Synthetic Check and in all except one case in comparison with the local variety. Of the leaf-spot-resistant varieties No. 7 was highest in yield of roots and second in sucrose percentage. This variety stands first in the test in sugar per acre; slightly exceeding the local variety in this respect.

STAND AND SPACING TEST

This test duplicated that of 1938. (See 1938 report for discussion) Only the four inside rows of each plot were harvested in 1939. The results of this test tend in general to confirm those of the previous two years. Differences in yield are relatively small for stands of about 70 to about 140 beets per 100 feet of row. As stands fall below about 70 beets per 100 feet of row yields tend to decline till at a stand of about 30 beets per 100 feet of row the yield is approximately two thirds that of the optimum stands. Very thin stands produce beets of lower sucrose percentage, but there appears to be a considerable range in the stand in which sucrose percentage varies only slightly. Plot and general summaries for 1939 and a general summary for 1937, 1938, and 1939 follow.

SPACE-STAND TEST
1939
PLOT SUMMARIES

<u>Treatment</u>	<u>Plot No.</u>	<u>Beets Harv.</u>	<u>T. Beets Per A.</u>	<u>% Sugar.</u>	<u>App. Coef of Pur.</u>	<u>Lbs. Sug. Per A.</u>		<u>Beets* Harv.</u>
						<u>Gross</u>	<u>Ind. Av.</u>	
8" 40% Stand	55	121	15.60	17.10	92.65	5336	4944	60.5
	66	119	12.26	16.55	93.55	4057	3795	59.5
	70	122	10.51	15.55	94.75	3268	3096	61.0
	76	123	12.31	16.45	92.65	4051	3752	61.5
	89	123	15.02	15.10	92.95	4535	4215	61.5
	96	126	16.54	17.20	91.45	5691	5204	63.0
	104	122	14.19	16.75	91.95	4754	4371	61.0
	119	124	15.37	16.80	92.00	5166	4753	62.0
	126	124	15.36	17.05	94.30	5238	4939	62.0
	Mean		123	14.13	16.51	92.92	4677	4341
8" 70% Stand	50	211	17.47	17.55	92.40	6130	5664	105.5
	64	212	16.02	16.55	91.25	5303	4839	106.0
	67	205	12.32	16.95	94.70	4175	3954	102.5
	79	204	9.68	15.00	92.75	2903	2693	102.0
	92	213	15.84	17.40	93.40	5514	5150	106.5
	99	214	12.90	16.25	93.80	4194	3934	107.0
	105	211	16.81	17.25	94.05	5800	5455	105.5
	120	205	17.48	17.30	93.25	6050	5642	102.5
	125	211	18.18	17.10	92.70	6219	5765	105.5
	Mean		210	15.19	16.82	93.14	5143	4788
8" Full Stand	51	266	18.04	17.00	93.95	6134	5763	133.0
	61	262	16.29	17.35	94.35	5652	5333	131.0
	74	257	15.45	16.90	93.75	5223	4897	128.5
	80	260	9.08	13.50	92.25	2452	2262	130.0
	86	262	19.36	18.00	93.25	6970	6500	131.0
	102	268	16.61	17.15	93.05	5697	5301	134.0
	109	281	17.35	17.55	93.90	6089	5718	140.5
	117	289	16.96	16.60	93.15	5631	5245	144.5
	121	265	19.82	17.15	92.20	6797	6267	132.5
	Mean		268	16.55	16.80	93.32	5627	5254

<u>Treatment</u>	<u>Plot No.</u>	<u>Beets Harv.</u>	<u>T. Beets Per A.</u>	<u>% Sucr.</u>	<u>App. Coef of Pur.</u>	<u>Lbs. Sug. Per A.</u>		<u>Beets* Harv.</u>
						<u>Gross</u>	<u>Ind. Av.</u>	
12" 40% Stand	54	81	14.22	17.10	93.10	4865	4529	40.5
	62	83	14.83	16.45	92.20	4878	4498	41.5
	75	81	12.01	16.65	93.10	3999	3723	40.5
	78	82	12.36	16.85	93.10	4164	3877	41.0
	91	66	11.16	16.80	93.40	3750	3502	33.0
	97	82	14.39	17.15	93.15	4937	4599	41.0
	110	85	14.09	16.55	92.90	4663	4332	42.5
	112	80	14.00	16.90	92.10	4731	4357	40.0
	122	74	11.87	16.40	92.05	3892	3583	37.0
	Mean		79	13.21	16.76	92.79	4431	4111
12" 70% Stand	56	146	17.52	17.30	94.20	6063	5711	73.0
	59	143	16.31	17.40	93.55	5673	5309	71.5
	72	145	11.92	14.00	94.85	3337	3165	72.5
	84	142	14.67	16.70	92.95	4899	4554	71.0
	87	138	18.34	17.25	93.35	6328	5907	69.0
	94	147	17.45	17.80	93.15	6211	5786	73.5
	107	138	18.38	17.10	92.50	6286	5815	69.0
	118	144	15.94	17.15	92.75	5468	5072	72.0
	124	142	15.91	16.20	93.75	5155	4833	71.0
	Mean		143	16.27	16.77	93.45	5491	5128
12" Full Stand	52	190	18.41	17.25	93.40	6352	5933	95.0
	63	191	16.73	16.65	93.65	5570	5216	95.5
	68	190	14.37	16.30	94.40	4686	4424	95.0
	83	194	15.89	16.65	92.30	5292	4885	97.0
	93	186	13.91	16.05	93.50	4465	4175	93.0
	98	195	18.66	16.85	91.95	6289	5783	97.5
	103	191	18.33	16.70	91.85	6124	5625	95.5
	114	190	19.31	17.20	93.05	6642	6180	95.0
	127	176	15.84	16.70	91.80	5290	4856	88.0
	Mean		189	16.83	16.71	92.88	5634	5231

Treatment	Plot No.	Beets	T. Beets	%	App. Coef of Fur.	Lbs. Sugar Per A.		Beets*
		Harv.	Per A.	Sugar.		Gross	Ind. Av.	Harv.
16" 40% stand	53	64	14.99	16.00	92.50	4796	4436	32.0
	58	62	11.35	16.70	92.35	3791	3501	31.0
	69	62	11.12	16.00	94.05	3559	3347	31.0
	82	63	10.96	15.55	92.15	3410	3142	31.5
	90	63	11.76	15.10	89.95	3552	3195	31.5
	101	64	12.13	16.55	93.20	4014	3741	32.0
	106	63	13.35	16.35	92.10	4365	4020	31.5
	113	62	12.24	15.75	91.90	3857	3545	31.0
	129	59	12.77	16.10	89.95	4113	3700	29.5
	Mean		62	12.30	16.01	92.02	3940	3625
16" 70% stand	49	105	17.13	16.35	92.05	5600	5155	52.5
	60	110	15.22	17.55	93.05	5344	4973	55.0
	73	107	16.20	16.50	93.60	5345	5003	53.5
	81	107	9.96	15.10	92.55	3009	2785	53.5
	88	106	14.30	16.25	93.50	4648	4346	53.0
	95	107	18.08	16.80	92.45	6075	5616	53.5
	111	107	14.99	16.40	93.50	4916	4596	53.5
	116	108	16.83	16.85	93.50	5672	5303	54.0
	128	109	14.48	16.80	92.80	4865	4515	54.5
	Mean		107	15.24	16.51	93.00	5053	4699
16" Full stand	57	144	15.81	17.00	92.50	5376	4973	72.0
	65	137	15.86	16.30	93.35	5172	4828	68.5
	71	139	12.07	14.80	92.10	3574	3292	69.5
	77	141	15.10	16.55	93.45	4998	4671	70.5
	85	142	17.63	18.05	93.75	6364	5966	71.0
	100	141	15.90	17.25	93.10	5485	5107	70.5
	108	143	15.13	16.60	92.55	5022	4648	71.5
	115	150	18.57	16.70	93.70	6202	5811	75.0
	123	142	16.15	16.85	93.30	5441	5076	71.0
	Mean		142	15.80	16.68	93.09	5293	4930

* Beets harvested per 100 feet of row.

SPACE-STAND TEST
1939
GENERAL SUMMARIES

Treatment	Beets [†]	T. Beets	%	ADD. Coef	Lbs. Sug. Per A.		Gross Sug.
	Harv.	Per A.	Sug.	of Pur.	Gross	Ind. Av.	Rank
8" Spacing 40% Stand	61	14.13	16.51	92.92	4677	4341	7
8" Spacing 70% Stand	105	15.19	16.82	93.14	5143	4788	5
8" Spacing Full Stand	134	16.55	16.80	93.32	5627	5254	2
12" Spacing 40% Stand	40	13.21	16.76	92.79	4431	4111	8
12" Spacing 70% Stand	71	16.27	16.77	93.45	5491	5128	3
12" Spacing Full Stand	95	16.83	16.71	92.88	5634	5231	1
16" Spacing 40% Stand	31	12.30	16.01	92.02	3940	3625	9
16" Spacing 70% Stand	54	15.24	16.51	93.00	5053	4699	6
16" Spacing Full Stand	71	15.80	16.68	93.09	5293	4930	4
Mean		15.06	16.62	92.96	5032	4679	
F		8.33**	1.47	2.25*	7.18**	7.52**	
S.E. of Mean		.538	.31	.274	216.4	202.1	
S.E. of Mean in % of Mean		3.57	1.87	.29	4.30	4.32	
Twice S.E. of a Diff.		1.52	.88	.77	612	572	

† Beets Harvested per 100 feet of row.

* F exceeds 1% point.

** F exceeds 5% point.

SPACE-STAND. TEST. FORT COLLINS, COLORADO, 1939
THREE YEAR SUMMARY

Treatment	Beets Harv. per 100 ft. of row				Gross Pounds Sugar per Acre.			
	1937	1938	1939	Ave.-	1937	1938	1939	Ave.
12" Full Stand	95	96	95	95.3	3461	5051	5634	4715
16" Full Stand	72	73	71	72.0	3799	4858	5293	4650
8" Full Stand	135	141	134	136.7	3414	4868	5627	4636
12" 70% Stand	71	70	71	70.7	3585	4562	5491	4546
8" 70% Stand	103	103	105	103.7	3303	4894	5143	4447
16" 70% Stand	54	52	54	53.3	3427	4051	5053	4177
8" 40% Stand	61	61	61	61.0	3154	3961	4677	3931
12" 40% Stand	42	40	40	40.7	2927	3441	4431	3600
16" 40% Stand	32	30	31	31.0	2687	2921	3940	3182
Mean					3306	4290	5032	4209
F					11.79**	61.98**	7.18**	39.59**
S.E. of Mean					98.85	94.55	216.4	85.34
Two times S.E. of a Diff.					280	267	612	241

Treatment	Tons of Beets Per Acre				Percent Sucrose in Beets			
	1937	1938	1939	Ave.-	1937	1938	1939	Ave.
12" Full Stand	15.10	17.72	16.83	16.55	11.49	14.26	16.71	14.15
16" Full Stand	15.85	17.34	15.80	16.33	11.97	14.01	16.68	14.22
8" Full Stand	14.68	17.37	16.55	16.20	11.62	14.00	16.80	14.14
12" 70% Stand	14.83	16.62	16.27	15.91	12.08	13.73	16.77	14.19
8" 70% Stand	14.40	17.25	15.19	15.61	11.41	14.17	16.82	14.13
16" 70% Stand	14.36	14.92	15.24	14.84	11.92	13.57	16.51	14.00
8" 40% Stand	12.73	14.68	14.13	13.85	12.35	13.49	16.51	14.11
12" 40% Stand	12.28	13.25	13.21	12.92	11.96	12.99	16.76	13.90
16" 40% Stand	11.24	11.46	12.30	11.67	11.94	12.74	16.01	13.56
Mean	13.94	15.62	15.06	14.87	11.86	13.66	16.62	14.05
F	32.47**	78.99**	8.33**	62.75**	1.26	11.99**	1.47	2.76**
S.E. of Mean	.265	.246	.538	.216	.266	.151	.310	.124
Two times S.E. of a Diff.	.75	.70	1.52	.61	.75	.43	.88	.35

** F exceeds 1% point.

Discussion of Three Year Summary:

In general stand variability from year to year was slight and harvested stands quite closely approximate perfect stands for the various treatments. Differences in sucrose percentage vary within narrow limits for all stands of 53 beets per 100 feet of row and more and there is a sharp trend toward lower sucrose percentages as the stand dropped to 41 and 31 beets per 100 feet of row. When stands of approximately 70 to approximately 140 beets per 100 feet of row are considered the yields in tons of roots per acre do not follow the order of the stands. While the extreme difference shown by these stands is less than one ton per acre this does slightly exceed the difference needed for statistical significance. None of the full stands; 8, 12 and 16 inches; resulted in differences in yield of roots that are statistically significant. It is suggested that the random reduction of the stands in these basic spacings, resulting in thick and thin areas within the plots, introduced another factor affecting yield. If this is the case lower yields may be expected from variable spacings than from uniform spacings even though the number of beets per 100 feet of row is the same in each case. The higher yield from the 70 percent stand of 16 inch spacing (54 beets per 100 feet of row) in comparison with 40 percent stand of 8 inch spacing (61 beets per 100 feet of row) supports the above conclusion regarding the effect of spacing variability. Yields of roots sharply declined as plant populations fell below approximately 70 beets per 100 feet of row. The yield from the lowest population, 31 beets per 100 feet of row, was approximately two thirds of the maximum yield of the test. A yield as great as this from a plant population of less than half the minimum necessary for optimum yields evidences the remarkable ability of the beet plant to utilize additional space. In general the yields of sugar per acre closely parallel the root yields.

SPACING AND IRRIGATION TEST

An examination of the data from this test for the years 1936, 1937 and 1938 and of the data from the space-stand test of 1937 and 1938 lead to the conclusion that spacing intervals of 8, 12 and 16 inches did not provide sufficient range to show the interaction of spacings and irrigations, if any. For the 1939 test spacings of 8, 14 and 20 inches were used. With this one change the plan of this test followed that of previous years.

Good to excellent stands were secured with the exception of a few plots adjacent to one side of the field. The general variability of the test may have been slightly increased by these few plots with relatively poorer stands.

Irrigations were applied as follows:

Six (7) Irrigations: June 8, 17, July 1, 18, Aug. 2, 12 and Sept 2.
Four Irrigations: June 17, July 1, 18, and Aug. 12.
Two Irrigations: July 1 and Aug. 12.

In general the appearance of the beets during the season was as follows: Six irrigation plots did not at any time appear to be short of moisture for optimum growth; four irrigation plots appeared to be slightly dry just previous to the irrigations and became quite dry at the last of the growing season, but no serious lack of moisture was apparent during most of the growth period; two irrigation plots were very dry with some burning of the foliage prior to the first irrigation and a serious lack of moisture was evident during the season except for a period of two or three weeks following each of the irrigations. The four inside rows of each plot were harvested; a total of 164 feet of row per plot being taken. Plot and general summaries follow.