

# Summary of Date-of-Planting Experiments With Sugar Beets in Nebraska and Wyoming, 1938-1945<sup>1</sup>

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Plantings of sugar beets by commercial growers in this area formerly were principally done between April 15 and April 30. During the past 5 years the practice has radically changed and a large number of growers now plant their entire beet crop before April 15. Many commercial sugar beet growers had held the opinion that there is a greater danger of having to replant the crop when plantings are made before April 15 than when the plantings are made later than that date. They believed that the greatest cause for replanting came from frost damage to the sugar beet plants. In the date-of-planting tests reported here, it has been found that frost damage was only slightly more common to beets planted early in April than to beets planted the latter part of April.

Observations made in connection with these tests indicate the chief factor bringing about poor stands of sugar beets is poor germination caused by lack of sufficient soil moisture.

In these districts, irrigation for germination of seed is not used, since water is not commonly available for irrigation until about May 10. The districts in which these tests were conducted usually have rainfall in April that supplies sufficient moisture for germination of early planted sugar beets, but the later beets are planted in April the greater is the chance that moisture for germination will be lacking. In these date-of planting tests, the entire field has been prepared for seeding before the first planting, and this favors the late plantings over the usual late commercial plantings since these are made on land that has been prepared only a few days previously. Preparation of the land for planting always dissipates part of the available soil moisture. In other tests in which the land was prepared in mid-March and in mid-April and planted April 20 it was found that the yields on the land prepared early was about 2 tons of beets per acre more than that from the land plowed later.

<sup>1</sup>Tests at Torrington, Wyo., were conducted in cooperation with the Goshen County Experiment Farm of the Wyoming Agricultural Experiment Station. Acknowledgment is made to Superintendent L. H. Paules for assistance in these experiments. Tests at Mitchell, Nebr., were made at the U.S.D.A. Scotts Bluff Field Station. Acknowledgment is made to Lionel Harris, superintendent, for assistance in these experiments.

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Tests concerned with the effects of different dates of planting of sugar beets were started at Torrington, Wyo., in 1938 at the Goshen County Experiment Farm and have been continued each year until 1945. During 5 of these years, similar tests have been conducted at the U.S.D.A. Scotts Bluff Field Station, Mitchell, Nebr. The two places are about 30 miles apart and climatic conditions are very similar. The difference in elevation between the two sites is small.

In all, 13 tests have been conducted in which sugar beets were planted at 5- or 10-day intervals from March 20 to April 30. When weather conditions did not permit of planting on the selected date, it was done as soon as possible thereafter. These tests have been conducted on two farms that differ considerably in soil type. The land at Torrington is a sandy loam and the soil at Scottsbluff is classified as Tripp fine sandy loam. Randomized-block plot design has been used in all tests, with replications ranging from 5 to 10 for each planting date. Data for the 13 tests have been analyzed by the analysis-of-variance method and are summarized in tables 1 to 4. The data as reported are from plots which have not been fill-in planted in any instance. During the period in which these experiments were conducted, the only plots replanted because of frost injury were the 1941 plantings at the Scotts Bluff Station. These replanted plots were irrigated to germinate the seed. The year of 1941 represents the

Table 1.—The average number of sugar beet plants per 100 feet of row from plantings made in the period from March 20 to April 30. Experiments were conducted at Goshen County Experiment Farm, Torrington, Wyo., and at the Scotts Bluff Field Station, Mitchell, Nebr. (Data are given as averages of 5 to 10 replications for each date of planting for the specified year.)

		Plantings were made on or as soon as possible after specified date.				
Location of field	Year	March 20	April 1	April 10	April 20	April 30
Torrington, Wyo.	1938	51	49	40	45	37
Torrington, Wyo.	1939	77	73	53	25	46
Torrington, Wyo.	1940	56	48	43	30	24
Torrington, Wyo.	1941	50	73	84	85	75
Torrington, Wyo.	1942	92	97	82	82	84
Torrington, Wyo.	1943	88	92	85	65	64
Torrington, Wyo.	1944	72	78	67	74	51
Torrington, Wyo.	1945	80	81	77	55	63
Torrington, Wyo.	Mean	71	74	66	58	56
Mitchell, Nebr.	1940	42	60	44	38	26
Mitchell, Nebr.	1941	69	62	97	97	85
Mitchell, Nebr.	1942	75	80	49	56	58
Mitchell, Nebr.	1943	78	61	70	80	80
Mitchell, Nebr.	1945	83	82	80	75	66
Mitchell, Nebr.	Mean	69	69	68	69	63
Mean of both areas		70	72	67	62	58

Difference required for significance for means of both areas, odds 19 to 1—9.1 plants.

only instance of May irrigation and all plots in the field were irrigated.

In experiments of this character, the time of emergence of sugar beets is perhaps more important than the planting date. The March plantings of sugar beets normally emerge about April 15 but in one instance they emerged April 3 and did not frost. In 1945, no plants emerged until April 25. As is to be expected, there is less difference in the yields associated with differential planting dates when emergence in early planting is delayed. Furthermore, the greatest differences in yield have occurred when the late plantings suffered from lack of moisture for germination. As an average of the 13 experiments, the stands of sugar beets in the March 20 plantings are significantly better than in April 30 plantings (table 1). The April 10 plantings also have significantly better stands than the April 30 plantings. These stand differences, being in favor of the early plantings, indicate that the factor of frost damage to the sugar beets is not so great as the damage to stands that is caused by the lack of normal rainfall to insure germination of the later plantings.

There was a significant gain in acre yield of roots in favor of the March 20 and April 1 plantings in comparison to those planted on April 20 and April 30. The average yield for April 20 plantings

Table 2.—Average tons of sugar beet roots harvested per acre from plantings made in the period from March 20 to April 30. Experiments were conducted at Goshen County Experiment Farm, Torrington, Wyo., and at the Scotts Bluff Field Station, Mitchell, Nebr. (Data are given as averages of 5 to 10 replications for each date of planting for the specified year.)

Location of field	Year	Plantings made on or as soon as possible after specified date.				
		March 20	April 1	April 10	April 20	April 30
				Tons		
Torrington, Wyo.	1938	10.0	10.0	8.9	8.3	6.2
Torrington, Wyo.	1939	21.0	18.4	15.4	9.9	10.9
Torrington, Wyo.	1940	23.7	20.8	20.2	17.0	11.9
Torrington, Wyo.	1941	16.4	19.2	19.4	19.2	17.4
Torrington, Wyo.	1942	21.6	21.7	17.0	18.5	17.5
Torrington, Wyo.	1943	17.9	17.8	16.2	12.8	12.5
Torrington, Wyo.	1944	19.0	19.1	17.5	18.6	13.7
Torrington, Wyo.	1945	14.6	13.9	13.3	11.3	11.1
Torrington, Wyo.	mean	18.0	17.6	16.0	14.5	12.7
Mitchell, Nebr.	1940	19.0	20.1	20.1	17.8	13.0
Mitchell, Nebr.	1941	22.6	21.8	25.1	23.6	22.5
Mitchell, Nebr.	1942	21.1	21.2	19.4	19.9	19.2
Mitchell, Nebr.	1943	16.1	16.0	16.2	15.2	15.8
Mitchell, Nebr.	1945	15.8	15.7	16.6	16.6	13.7
Mitchell, Nebr.	mean	18.9	19.0	19.5	18.6	16.8
Mean of both areas		18.3	18.1	17.3	16.1	14.2

Difference required for significance for means of both areas, odds 19 to 1—1.47 tons.

was significantly greater than the corresponding average for the April 30 plantings. These 13 tests carried on over 8 seasons indicate, therefore, that for best yields of sugar beets in these districts planting should be completed by April 15 (table 2). There has been more difference in the yields from the different dates of planting on the Torrington field than on the Scotts Bluff Station field. The Torrington field is sandy land and the Scotts Bluff Station field is somewhat heavier land. Sandy land is especially subject to soil moisture deficiency for germination of late planted beets, and it is probable that the Scotts Bluff Station plantings benefited to some degree from the greater moisture-holding capacity of the soil.

If leaf diseases are not a factor, early planted beets usually show a higher sucrose percentage than late planted beets. In these experiments, no significant differences in sucrose percentages are shown among the averages obtained for the different planting dates (table 3).

Since the difference in sucrose percentage of roots taken from the different plantings was not significant, differences in acre-yield of gross sugar are attributable largely to the effects of root yield. The average acre-yields of sugar for the two earliest dates of planting significantly exceed the corresponding average sugar yields for the April 20 and April 30 plantings (table 4).

Table 3.—Average sucrose content of sugar beet roots harvested from plantings made in the period from March 20 to April 30. Experiments were conducted at Goshen County Experiment Farm, Torrington, Wyo., and at the Scotts Bluff Field Station, Mitchell, Nebr. (Data are given as averages of 5 to 10 replications for each date of planting for the specified year.)

Location of field	Year	Plantings made on or as soon as possible after specified date.				
		March 20	April 1	April 10	April 20	April 30
		Percent				
Torrington, Wyo.	1938	15.0	14.6	14.8	15.3	15.0
Torrington, Wyo.	1939	15.0	15.0	14.6	14.1	14.3
Torrington, Wyo.	1940	13.7	13.4	13.6	13.3	12.6
Torrington, Wyo.	1941	15.0	14.7	15.3	15.8	16.4
Torrington, Wyo.	1942	14.2	14.3	13.9	14.7	15.0
Torrington, Wyo.	1943	15.7	15.8	15.8	16.6	16.5
Torrington, Wyo.	1944	16.8	16.7	16.3	17.0	15.4
Torrington, Wyo.	1945	16.7	16.4	16.4	16.2	16.6
Torrington, Wyo.	mean	15.3	15.1	15.1	15.4	15.2
Mitchell, Nebr.	1940	12.0	13.1	13.4	13.3	13.0
Mitchell, Nebr.	1941	15.2	15.6	15.6	15.4	15.9
Mitchell, Nebr.	1942	15.0	15.1	13.7	13.8	14.3
Mitchell, Nebr.	1943	14.4	14.3	14.3	14.7	14.9
Mitchell, Nebr.	1945	17.6	17.6	17.1	17.1	17.3
Mitchell, Nebr.	mean	14.8	15.1	14.8	14.9	15.1
Mean of both areas		15.1	15.1	14.9	15.2	15.2

Difference required for significance for means of both areas, odds 19 to 1—0.36 percent.

Table 4.—Average yields per acre of gross sugar from plantings made in the period from March 20 to April 30. Experiments were conducted at Goshen County Experiment Farm, Torrington, Wyo., and at the Scotts Bluff Field Station, Mitchell, Nebr. (Data are given as averages of 5 to 30 replications for each date of planting for the specified year.)

Location of field	Year	Plantings made on or as soon as possible after specified date.				
		March 20	April 1	April 10	April 20	April 30
				Tons		
Torrington, Wyo.	1938	1.505	1.452	1.318	1.280	.922
Torrington, Wyo.	1930	3.154	2.770	2.239	1.420	1.560
Torrington, Wyo.	3.940	3.234	2.789	2.738	2.180	1.454
Torrington, Wyo.	1941	2.458	2.838	2.960	3.035	2.862
Torrington, Wyo.	1942	3.069	3.115	2.362	2.721	2.630
Torrington, Wyo.	1943	2.803	2.800	2.551	2.121	2.057
Torrington, Wyo.	1944	3.210	3.210	2.857	3.233	2.116
Torrington, Wyo.	1945	2.449	2.282	2.193	1.821	1.850
Torrington, Wyo.	mean	2.723	2.657	2.402	2.226	1.931
Mitchell, Nebr.	1940	2.282	2.624	2.678	2.347	1.686
Mitchell, Nebr.	1941	3.417	3.406	3.906	3.620	3.582
Mitchell, Nebr.	1942	3.102	3.203	2.658	2.762	2.752
Mitchell, Nebr.	1943	2.297	2.290	2.299	2.223	2.340
Mitchell, Nebr.	1945	2.759	2.751	2.826	2.830	2.397
Mitchell, Nebr.	mean	2.771	2.855	2.873	2.756	2.551
Mean of both areas		2.749	2.733	2.583	2.430	2.170

Difference required for significance for means of both areas, odds 19 to 1—0.31 ton.

### Conclusions

These tests indicate that no significant difference in the average yield of sugar beets was obtained from plantings made in March as compared with plantings made up to April 10. The experiments show that, as an average, there was a loss of more than 2 tons of beets per acre if planting was delayed until April 20, and a loss of about 4 tons of beets was experienced when the planting was delayed until April 30. Differences of from 2 to 4 tons of beets per acre, taking into account the consistency of their recurrence, warrant the recommendation that earlier planting be practiced in the Torrington and Scotts-bluff districts. There is considerable evidence that since the cause of low yields is lack of moisture for germination where the plantings are made later than April 15 and that sandy lands are more subject to the moisture deficiency, there should be a greater effort made for early planting on sandy lands than on heavy lands. In any attempt to apply these findings in favor of early planting of sugar beets to other districts, careful consideration should be given to the particular climatic factors that operated here to bring about these differences in yield.