

The Effect Of Planting Dates And Seedling Density On The Development Of Sugar Beet Across Growth Stages

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Abstract

In this article, under the conditions of the typical sierozem soils of the Tashkent region, when the sugar-beet varieties “Sado” and “Eldona” were sown between March 20–30 and April 5–15, it was observed that the variety “Eldona” is 4–5 days later-maturing compared to “Sado.” The growing period of the varieties, when sown between March 20–30, amounted to 179–182 days, and when sown between April 5–15, reached 183–186 days. Furthermore, the study reports that when the varieties were sown on March 20–30, their growing period ranged from 175 to 182 days, whereas sowing between April 5–15 resulted in a growing period of 179 to 186 days.

Keywords: Sugarbeet, vegetative period, development, experiment, leaf, Sado, Eldona, variety, root crop, plant density

INTRODUCTION

According to the statistical report presented by the Food and Agriculture Organization of the United Nations (FAO) for 2023, a total of 172.8 million tons of sugar are produced worldwide. Of this amount, 66.7 million tons are produced in the Americas, 65.1 million tons in Asia, 24.9 million tons in Europe, and 4.5 million tons in Oceania. Among individual countries, Brazil is the largest sugar producer, with an annual production of 38.4 million tons. In our country, the annual per capita consumption requirement is estimated at 30–35 kg of sugar or sugar products. Therefore, to fully meet the population’s demand for sugar, 1.1–1.3 million tons of sugar products are required annually.

The germination process of sugar beet proceeds rapidly when the soil temperature is 10–12 °C; seeds germinate within 25–30 days at a soil temperature of 3–4 °C and within 3–4 days at 15–25 °C [2]. Sugar beet is a biennial plant and includes sugar beet, semi-sugar beet, fodder beet, and leaf beet, all of which belong to the species *Beta vulgaris* L. The response of this species to external factors varies depending on the stages of its development [3]. A well-developed root system of sugar beet ensures intensive root crop growth: in yield-oriented varieties this occurs during the initial growth stage, whereas in sugar-oriented varieties it is observed at the later stages of development [4].

METHODS

This study was conducted in 2023–2025 at the experimental site of Tashkent State

Agrarian University, under typical sierozem soil conditions in Kibray district, Tashkent region.

The experiment consisted of 16 variants, studying two sugar beet varieties, “Sado” and “Eldona,” under two planting dates and four seedling densities. The area of each variant was 240 m², with a harvested area of 120 m². The experiment was carried out in a single-factor design with three replications. The area of one replication was 3,840 m², and the total area was 1.15 hectares.

The experiment was conducted based on the methodology of Khalikov B.M [1], “Methods for conducting experiments and phenological observations in sugar beet.”

RESULTS AND DISCUSSION

The growing period of the sugar beet varieties studied in this research ranged from 190 to 198 days. This is considered a relatively long period for these plants. Sugar beet is a long-day plant, belonging to crops that require a higher amount of light. Therefore, it is essential to carry out all agronomic practices on time and with high quality. If any agronomic operation is delayed or performed poorly during the cultivation of sugar beet, its growing period may be prolonged, and productivity can decrease.

According to the initial data obtained in 2023, the “Sado” variety, when sown during the period of March 20–30 (specifically on March 26 that year), had the following development durations: the full emergence process took 13 days from sowing, the 1–2 true leaf stage lasted 22–23 days, the leaf development stage lasted 72–75 days, and the root crop development stage lasted 146–150 days. Thus, this variety required 176–178 days to reach full maturity.

When this variety was sown during April 5–15 (specifically on April 9), the full emergence process took 10 days from sowing, the 1–2 true leaf stage lasted 20–23 days, the leaf development stage lasted 73–76 days, and the root crop development stage lasted 150–156 days. Therefore, compared to the first sowing period, this variety required 4–5 days longer to reach full maturity, totaling 179–183 days.

According to data on the effect of different seedling densities on the growing period of sugar beet, it was observed that higher seedling density extended the plant’s growing period by several days.

For this variety, when sown during March 20–30 and maintained at a density of 166,000 plants per hectare, the 1–2 true leaf stage lasted 23 days, the leaf development stage 75 days, the root crop development stage 150 days, and full maturity was reached in 178 days. When the density was reduced to 90,000 and 83,000 plants per hectare, the corresponding durations were 22, 72, 147, and 176 days, respectively.

When sown during April 5–15 and maintained at a density of 166,000 plants per hectare, the 1–2 true leaf stage lasted 23 days, the leaf development stage 76 days, the root crop development stage 156 days, and full maturity was reached in 183 days. At densities of 90,000 and 83,000 plants per hectare, the corresponding durations were 20, 73, 150, and 180 days, respectively.

Table 1
The effect of sowing dates and seedling density on the developmental stages of sugar beet, days, 2023

Var №	Varieties	Sowing dates	Planting system	Seedling Density thousand/ha	Sowing Day	Sowing - emergence	Sowing -1-2 True leaf stage	Sowing- leaf development	Sowing- Root crop Development	Sowing - maturity (sugar accumulation)	Growing period duration and time Of full maturity
1	Sado	20-30.03	60x15-1	110 (control)	26.03	13	22	73	146	175	175 (21.09)
2			60x10-1	166	26.03	13	23	75	150	178	178 (24.09)
3			60x18-1	90	26.03	13	22	72	147	176	176(22.09)
4			60x20-1	83	26.03	13	22	72	147	176	176 (22.09)

5		05-15.04	60x15-1	110 (control)	09.04	10	21	74	151	179	179 (06.10)
6			60x10-1	166	09.04	10	23	76	156	183	183 (10.10)
7			60x18-1	90	09.04	10	20	73	150	180	180 (07.10)
8			60x20-1	83	09.04	10	20	73	150	180	180 (07.10)
9	Eldona	20-30.03	60x15-1	110 (control)	26.03	13	22	75	149	179	179 (25.09)
10			60x10-1	166	26.03	13	23	77	153	182	182 (28.09)
11			60x18-1	90	26.03	13	22	74	150	180	180(26.09)
12			60x20-1	83	26.03	13	22	74	150	180	180 (26.09)
13		05-15.04	60x15-1	110 (control)	09.04	10	21	76	154	183	183 (10.10)
14			60x10-1	166	09.04	10	23	78	159	186	186 (13.10)
15			60x18-1	90	09.04	10	20	75	153	184	184 (14.10)
16			60x20-1	83	09.04	10	20	75	153	184	184 (14.10)

Table 2

The effect of sowing dates and seedling density on the developmental stages of sugar beet, days, 2024

Var №	varieties	sowing dates	Planting system	Seedling Density thousand/ha	Sowing day	Sowing - emergence	Sowing - 1-2 True leaf stage	Sowing - leaf development	Sowing - root crop development	Sowing - maturity (sugar accumulation)	Growing period duration and time Of full maturity
1	Sado	20-30.03	60x15-1	110 (control)	23.03	13	24	76	150	172	172 (15.09)
2			60x10-1	166	23.03	13	25	78	154	176	176 (18.09)
3			60x18-1	90	23.03	13	24	75	151	174	174 (16.09)
4			60x20-1	83	23.03	13	24	75	151	174	174 (16.09)
5		05-15.04	60x15-1	110 (control)	09.04	10	24	77	155	177	177 (04.10)
6			60x10-1	166	09.04	10	25	79	160	181	181 (08.10)
7			60x18-1	90	09.04	10	22	76	154	178	178 (05.10)
8			60x20-1	83	09.04	10	22	76	154	178	178 (05.10)
9	Eldona	20-30.03	60x15-1	110 (control)	23.03	13	24	78	152	176	176 (18.09)
10			60x10-1	166	23.03	13	25	79	156	179	179 (21.09)
11			60x18-1	90	23.03	13	24	76	153	177	177 (19.09)
12			60x20-1	83	23.03	13	24	76	153	177	177 (19.09)
13		05-15.04	60x15-1	110 (control)	09.04	10	24	78	157	180	180 (07.10)
14			60x10-1	166	09.04	10	25	80	162	183	183 (10.10)
15			60x18-1	90	09.04	10	22	77	156	181	181 (08.10)
16			60x20-1	83	09.04	10	22	77	156	181	181 (08.10)

Turning to data obtained for the sugar beet variety “Eldona,” when sown during March 20–30 (specifically on March 26 that year), the full emergence process took 13 days from sowing, the 1–2 true leaf stage lasted 22–23 days, the leaf development stage 74–77 days, and the root crop development stage 149–153 days. Thus, this variety required 179–182 days to reach full maturity.

When sown during April 5–15 (specifically on April 9), the full emergence process took 10 days from sowing, the 1–2 true leaf stage lasted 20–23 days, the leaf development stage 75–78 days, and the root crop development stage 153–159 days. Therefore, full maturity for this variety was reached in 183–186 days.

According to data on the effect of different seedling densities, it was observed that higher seedling density also extended the growing period for this variety.

When the “Eldona” variety was sown during March 20–30 and maintained at a density of 166,000 plants per hectare, the 1–2 true leaf stage lasted 23 days, the leaf development stage 77 days, the root crop development stage 153 days, and full maturity was reached in 182 days. At densities of 90,000 and 83,000 plants per hectare, the corresponding durations were 22, 74, 150, and 180 days, respectively.

When sown during April 5–15 and maintained at a density of 166,000 plants per hectare, the 1–2 true leaf stage lasted 23 days, the leaf development stage 78 days, the root crop development stage 159 days, and full maturity was reached in 186 days. At densities of 90,000 and 83,000 plants per hectare, the corresponding durations were 20, 75, 153, and 184 days, respectively.

The data obtained in 2024 and 2025 also confirmed that the same patterns were observed.

CONCLUSION

Based on the data presented above, it can be concluded that the sugar beet variety “Eldona” matures 4–5 days later than the “Sado” variety. When sown during March 20–30, its growing period is 179–182 days, and when sown during April 5–15, it is 183–186 days. Furthermore, for both varieties, when sown during March 20–30, the growing period ranged from 175 to 182 days, whereas when sown during April 5–15, it ranged from 179 to 186 days. In other words, delaying sowing by 12–13 days compared to the March 20–30 period extends the growing period by 4–5 days. In addition, increasing the seedling density from 83,000 to 166,000 plants per hectare also lengthens the growing period by 2–3 days.

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