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THE EFFECT OF SOWING DATES AND PLANTING DENSITIES ON THE EMERGENCE AND PLANT DENSITY OF SUGAR BEET

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Abstract

This article presents the data obtained on the effects of sowing dates and plant densities of sugar beet on its germination and plant density, along with the results of their analysis. It was found that when both varieties were sown 12–13 days later than the March 20–30 period, that is, between April 5–15, their germination occurred 3–4 days earlier. By the end of the growing period, the variety "Eldona" had 0.2–0.5% fewer plant losses compared to the variety "Sado." The findings also show that sowing between April 5–15 instead of March 20–30 allows for preserving 0.1% to 0.3% more seedlings.

Keywords: sugar beet, growing period, sowing dates, germination, seedling density, Sado, Eldona.

Introduction

In our country, the annual per capita consumption of sugar or sugar products is estimated at 30–35 kg. This means that in order to fully meet the population's demand for sugar, approximately 1.1–1.3 million tons of sugar products are required annually. Based on this, sugar beet is an invaluable crop for ensuring the population's demand for sugar and sugar products and for reducing reliance on foreign imports of these products. Therefore, the scientific study of appropriate cultivation practices to obtain high and high-quality yields of sugar beet under the conditions of typical sierozem soils of the Tashkent region is considered one of the most pressing issues in modern agriculture.

The germination process of sugar beet proceeds rapidly when the soil temperature is 10–12 °C. At a soil temperature of 3–4 °C, seeds germinate within 25–30 days, whereas at 15–25 °C germination occurs within 3–4 days [2].

In experiments conducted by X.S. Romanov [3] under the conditions of typical sierozem soils of the Tashkent region, it was reported that maintaining a sugar beet plant density of 80–90 thousand plants per hectare ensures a yield exceeding 50–60 tons per hectare.

In contrast, experiments carried out by Ye. Gorelov, N. Xalilov, and X. Botirov [4] under the conditions of light sierozem soils of the Samarkand region indicated that the most optimal plant density for sugar beet is 90–100 thousand plants per hectare.

Materials and Methods

The present research was conducted during 2023–2025 at the experimental field of Tashkent State Agrarian University, under the conditions of typical sierozem soils in the Qibray district of Tashkent region.

The experiment consisted of 16 treatments, in which two sugar beet varieties ("Sado" and "Eldona") were studied at two sowing dates and four plant density levels. The total plot area of each treatment was 240 m², with an accounting (harvested) area of 120 m². The experiment was arranged in a single-tier layout with three replications. The area of one replication was 3,840 m², and the total experimental area covered 1.15 hectares.

The experiment was conducted in accordance with the methodology described by B.M.Khalikov [1], entitled "Methods for conducting experiments and phenological observations in sugar beet.

Results and Discussion

It is well known that the yield level of any crop is primarily determined by plant density.

According to the data obtained in the first year of the experiment (2023), the sugar beet variety "Sado" was sown on March 26 within the sowing period of March 20–30. The first germination assessment was carried out on the third day after sowing, on March 29. At this stage, seed germination across the four variants ranged from 6.3 to 6.9%. After 6 days, germination increased to 35.2–38.7%, on the 9th day to 65.1–69.8%, and by the 12th day it reached 86.3–87.3%. Thus, the seeds of this variety achieved full germination within 12 days after sowing during this period.

In the second sowing period (April 5–15), sowing was carried out on April 9, which was 13 days later than the first sowing date. Under these conditions, seed germination occurred much more rapidly compared to the first period. On the 3rd day after sowing, germination reached 15.7–17.5%, on the 6th day 53.5–57.9%, and by the 9th day full germination was observed, reaching 87.4–88.2%. Therefore, when sowing was delayed by 13 days compared to the March 20–30 period, full germination occurred within 9 days.

The sugar beet variety "Eldona" was also sown on March 26 within the March 20–30 sowing period. On the 3rd day after sowing (March 29), seed germination in variants 1, 2, 3, and 4 amounted to 7.1%, 7.9%, 6.8%, and 6.7%, respectively. After 6 days, germination increased to 38.3%, 41.2%, 39.0%, and 39.2%; on the 9th day to 65.4%, 68.1%, 65.9%, and 66.3%; and by the 12th day it reached 84.4%, 85.3%, 84.1%, and 84.5%. Similar to the "Sado" variety, seeds of the "Eldona" variety achieved full germination within 12 days when sown during this period.

Table 1

Effect of Sowing Dates on Sugar Beet Germination Dynamics, %; 2023

Var №	varieties	sowing dates	Planting system	Seedling density, thousand/ha	Sowing date	Germination dynamics, %			
		Observation dates				29.03	01.04	04.04	07.04
1	Sado	20-30.03	60x15-1	110 (control)	26.03	6.6	36.6	67.7	86.4
2			60x10-1	166		6.9	38.7	69.8	87.3
3			60x18-1	90		6.3	35.4	65.1	86.7
4			60x20-1	83		6.3	35.2	66.0	86.3
		Observation dates				12.04	15.04	18.04	-
5		05-15.04	60x15-1	110 (control)	09.04	16.1	54.1	87.4	-
6			60x10-1	166		17.5	57.9	88.2	-
7			60x18-1	90		15.9	53.5	87.6	-
8			60x20-1	83		15.7	54.1	87.9	-
	Eldona	Observation dates				29.03	01.04	04.04	7.04
9		20-30.03	60x15-1	110 (control)	26.03	7.1	38.3	65.4	84.4
10			60x10-1	166		7.9	41.2	68.1	85.3
11			60x18-1	90		6.8	39.0	65.9	84.1
12			60x20-1	83		6.7	39.2	66.3	84.5
		Observation dates				12.04	15.04	18.04	-
13		05-15.04	60x15-1	110 (control)	09.04	17.2	56.8	88.2	-
14			60x10-1	166		18.9	59.3	88.5	-
15			60x18-1	90		17.1	55.4	87.6	-
16			60x20-1	83		16.8	55.3	87.8	-

In the second sowing period (April 5–15), sowing was conducted on April 9, which was 13 days later than the first sowing date. In this variety as well, seed germination was significantly more rapid than in the first period. On the 3rd day after sowing, germination rates across the variants were 17.2%, 18.9%, 17.1%, and 16.8%; on the 6th day 56.8%, 59.3%, 55.4%, and 55.3%. By the 9th day, full germination was observed, with values reaching 88.2%, 85.5%, 87.6%, and 87.8%. Thus, for this sugar beet variety as well, seeds sown 13 days later than the March 20–30 period completed germination within 9 days.

Conclusion. The results showed that when both sugar beet varieties were sown 12–13 days later than the March 20–30 period, i.e., within April 5–15, seed germination occurred 3–4 days earlier compared to the earlier sowing date, and full emergence was achieved within 9–10 days. In addition, sowing seeds at a higher rate of 166 thousand seeds per hectare ensured a 1.0–1.5% increase in seedling density compared to lower sowing rates.

Data obtained during the 2024 and 2025 growing seasons confirmed the same patterns observed in 2023

Based on the data obtained for seedling density in sugar beet varieties, the “Sado” variety was standardized according to the sowing systems after full emergence. The following seedling densities per hectare were maintained: 110.0–110.2 thousand plants in the 60×15-1 system, 166.0–166.3 thousand plants in the 60×10-1 system, 89.8–90.1 thousand plants in the 60×18-1 system, and 83.0–83.1 thousand plants in the 60×20-1 system.

At the end of the growing period, for the March 20–30 sowing, the highest plant loss was observed in the variant with 166 thousand plants per hectare, reaching 3.9%, which is 1.2% higher than the control. In the variant with 90 thousand plants per hectare, losses were 1.8%, 0.9% lower than the control, while in the variant with 83 thousand plants per hectare, losses were 1.5%, 1.3% lower than the control.

For the April 5–15 sowing, plant losses at the end of the growing period were lower than in the earlier sowing. Specifically, in the 166 thousand plants per hectare variant, losses amounted to 3.8%, 1.2% higher than the control; in the 90 thousand plants per hectare variant, 1.5%, 1.1% lower than the control; and in the 83 thousand plants per hectare variant, 1.3%, which is 1.3% lower than the control.

For the "Eldona" variety, at the end of the growing period, sowing on March 20–30 and leaving 166.3 thousand seedlings per hectare resulted in 3.5% plant loss, 1.0% higher than the control. In the variant with 90 thousand seedlings per hectare, losses were 1.7%, 0.8% lower than the control, and in the variant with 83 thousand seedlings per hectare, losses were 1.2%, 1.3% lower than the control. Similarly, for the 90 thousand seedlings per hectare variant, plant losses were 1.7%, 0.8% lower than the control, while in the 83 thousand seedlings per hectare variant, losses were 1.2%, 1.3% lower than the control.

These results indicate that both sowing density and sowing date significantly affect the survival rate of sugar beet seedlings, with delayed sowing and moderate density contributing to reduced seedling loss.

Table 2

Effect of sowing dates and seedling density on the seedling density of sugar beet varieties in 2023

Var №	varieties	sowing dates	Planting system	Seedling density, thousand/ha	At the beginning of the growing period (after emergence), thousand/ha	At the end of the growing period, thousand/ha	Number of dead plants, thousand/piece	Percentage of dead plants
1	Sado	20-30.03	60x15-1	110 (control)	110.2	107.3	2.9	2.7
2			60x10-1	166	166.3	160.0	6.3	3.9
3			60x18-1	90	89.8	88.2	1.6	1.8
4			60x20-1	83	83.1	81.8	1.3	1.5
5		05-15.04	60x15-1	110 (control)	110.0	107.2	2.8	2.6
6			60x10-1	166	166.2	160.1	6.1	3.8
7			60x18-1	90	90.1	88.8	1.3	1.5
8			60x20-1	83	83.1	82.0	1.1	1.3
9	Eldona	20-30.03	60x15-1	110 (control)	110.1	107.5	2.6	2.5
10			60x10-1	166	166.1	160.4	5.7	3.5
11			60x18-1	90	89.8	88.3	1.5	1.7
12			60x20-1	83	83.1	82.1	1.0	1.2
13		05-15.04	60x15-1	110 (control)	110.1	107.6	2.5	2.4
14			60x10-1	166	166.0	160.5	5.5	3.4
15			60x18-1	90	90.1	88.8	1.3	1.4

For the sowing period of April 5–15, in the variant with 166 thousand seedlings per hectare, plant loss amounted to 3.4%, which is 1.0% higher than the control. In the variant with 90 thousand seedlings per hectare, losses were 1.4%, 1.0% lower than the control, while in the variant with 83 thousand seedlings per hectare, losses were 0.8%, 1.6% lower than the control.

Data obtained in the 2024 and 2025 growing seasons confirmed the same patterns.

Conclusion. Among the varieties studied, "Eldona" proved to be the most resistant to external stress, with plant losses at the end of the growing period being 0.2–0.5% lower compared to the "Sado" variety. In addition, delaying sowing from March 20–30 to April 5–15 allowed for the preservation of seedlings by 0.1–0.3%. In both varieties, increasing the seedling density from 83 thousand to 166 thousand plants per hectare resulted in seedling losses ranging from 1.3% to 2.5%.

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