

# THE EFFECT OF SOWING TIMES AND MINERAL FERTILIZER RATE ON SUGAR BEET GROWTH AND STONE THICKNESS

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## Abstract

As is known, obtaining a plentiful and high-quality harvest from any plant directly depends on its planting dates. This factor has been studied by many scientists in various plants and appropriate recommendations have been made. The weight and quality of the harvest from sugar beet also depend on its planting dates and healthy and early germination of seeds. Therefore, in the dissertation, the dynamics of sugar beet germination depending on the planting dates were studied, and calculations were carried out every three days. This article provides information on the effect of planting dates and mineral fertilizer rates on sugar beet germination and seedling thickness.

**Keywords:** Sugar beet, planting dates, mineral fertilizer, fertilizer rates, germination, seedling thickness, seed, plant.

## Introduction

According to the initial experimental data, conducted in 2022, when sugar beet was sown on 27.03 during the period 25.03-01.04, the number of seeds that germinated on the 3rd day of sowing was 7.5-8.0%, on the 6th day 36.2-38.3%, on the 9th day 68.9-71.6%, and on the 12th day 88.7-89.7%. It was determined that the seeds fully germinated in 12 days.

When sugar beet was planted on 07.04 in the second term 05-10.04, it was 14.3-15.8% on the 3rd day of sowing, 45.2-48.7% on the 6th day, 74.5-77.1% on the 9th day, 89.9-91.2% on the 11th day, which is the first sowing of seeds. It was found that it sprouted 1 day earlier than the deadline, i.e. in 10 days, and 6.3-11.4% faster.

In the third period of sugar beet, 15-20.04, when it was planted on 18.04, the number of seeds germinated on the 3rd day after sowing was 20.0-21.9%, on the 6th day - 67.2-69.7%, and on the 9th day - 89.7-91.2%. In this case, the seeds fully germinated in 9 days, which is 12.1-32.1% faster than the variants planted in the first and second terms, and ultimately it was noted that the seeds fully germinated 3 days earlier than in the first term and 1 day earlier than in the second term. This



is due to the increase in air and soil temperature.

So, from the obtained data, it can be concluded that when sugar beet is planted in the period of 25.03-01.04, the seeds fully germinate in 12 days, when planted in the period of 05-10.04, in 10 days and 6.3-11.4% faster than in the first planting period, and in 9 days when planted in the period of 15-20.04, compared to those planted in the first and second periods Germinates faster by 12.1-32.1%.

These patterns were also identified in the data obtained in 2023 and 2024 of the experiment.

Detailed data are presented in Tables 1, 2, 3 of the article.

**Table 1 The influence of sowing dates and mineral fertilizer rates on the dynamics of sugar beet germination, %. 2022**

| №  | Planting periods | Rate of mineral fertilizers, kg/ha | Planting day | Germination dynamics, % |              |              |              |
|----|------------------|------------------------------------|--------------|-------------------------|--------------|--------------|--------------|
|    |                  |                                    |              | 30.03                   | 02.04        | 05.04        | 08.04        |
| 1  | 25.03-01.04      | No fertilizer (control)            | 27.03        | 7,8                     | 37,8         | 68,9         | 89,7         |
| 2  |                  | NPK 120:90:60                      |              | 7,5                     | 36,2         | 71,4         | 88,7         |
| 3  |                  | NPK 160:120:80                     |              | 7,9                     | 38,3         | 70,4         | 89,5         |
| 4  |                  | NPK 200:140:100                    |              | 8,0                     | 37,6         | 71,6         | 88,7         |
|    |                  |                                    |              | <b>10.04</b>            | <b>13.04</b> | <b>16.04</b> | <b>18.04</b> |
| 5  | 05-10.04         | No fertilizer (control)            | 07.04        | 14,7                    | 45,2         | 74,5         | 90,4         |
| 6  |                  | NPK 120:90:60                      |              | 15,8                    | 47,6         | 76,5         | 91,2         |
| 7  |                  | NPK 160:120:80                     |              | 14,6                    | 48,7         | 77,1         | 89,9         |
| 8  |                  | NPK 200:140:100                    |              | 14,3                    | 47,4         | 76,5         | 90,1         |
|    |                  |                                    |              | <b>21.04</b>            | <b>24.04</b> | <b>27.04</b> | <b>30.04</b> |
| 9  | 15-20.04         | No fertilizer (control)            | 18.04        | 20,4                    | 68,7         | 91,2         | -            |
| 10 |                  | NPK 120:90:60                      |              | 21,9                    | 67,2         | 90,3         | -            |
| 11 |                  | NPK 160:120:80                     |              | 20,0                    | 68,4         | 89,7         | -            |
| 12 |                  | NPK 200:140:100                    |              | 21,5                    | 69,7         | 90,5         | -            |

**Table 2 Effect of planting dates and mineral fertilizer rates on sugar beet germination dynamics, %. 2023**

| №  | Planting periods | Rate of mineral fertilizers, kg/ha | Planting day | Germination dynamics, % |              |              |              |
|----|------------------|------------------------------------|--------------|-------------------------|--------------|--------------|--------------|
|    |                  |                                    |              | 31.03                   | 03.04        | 06.04        | 09.04        |
| 1  | 25.03-01.04      | No fertilizer (control)            | 28.03        | 8,9                     | 37,2         | 67,8         | 88,7         |
| 2  |                  | NPK 120:90:60                      |              | 8,6                     | 38,9         | 69,8         | 89,4         |
| 3  |                  | NPK 160:120:80                     |              | 9,1                     | 37,6         | 66,5         | 88,7         |
| 4  |                  | NPK 200:140:100                    |              | 8,4                     | 39,8         | 67,4         | 89,1         |
|    |                  |                                    |              | <b>09.04</b>            | <b>12.04</b> | <b>15.04</b> | <b>17.04</b> |
| 5  | 05-10.04         | No fertilizer (control)            | 06.04        | 18,7                    | 41,2         | 66,8         | 89,2         |
| 6  |                  | NPK 120:90:60                      |              | 18,3                    | 42,3         | 67,4         | 90,0         |
| 7  |                  | NPK 160:120:80                     |              | 19,0                    | 41,2         | 68,4         | 89,6         |
| 8  |                  | NPK 200:140:100                    |              | 18,5                    | 42,7         | 67,3         | 88,7         |
|    |                  |                                    |              | <b>20.04</b>            | <b>23.04</b> | <b>26.04</b> | <b>29.04</b> |
| 9  | 15-20.04         | No fertilizer (control)            | 17.04        | 22,4                    | 69,7         | 88,9         |              |
| 10 |                  | NPK 120:90:60                      |              | 24,3                    | 72,1         | 89,1         |              |
| 11 |                  | NPK 160:120:80                     |              | 23,3                    | 71,4         | 88,9         |              |
| 12 |                  | NPK 200:140:100                    |              | 22,8                    | 70,1         | 88,6         |              |

**Table 3 Effect of planting dates and mineral fertilizer rates on sugar beet germination dynamics, %, 2024**

| №  | Planting periods | Rate of mineral fertilizers, kg/ha | Planting day | Germination dynamics, % |       |       |       |
|----|------------------|------------------------------------|--------------|-------------------------|-------|-------|-------|
|    |                  |                                    |              | 02.04                   | 05.04 | 08.04 | 11.04 |
| 1  | 25.03-01.04      | No fertilizer (control)            | 30.03        | 7,3                     | 35,4  | 75,3  | 87,4  |
| 2  |                  | NPK 120:90:60                      |              | 7,5                     | 36,6  | 74,5  | 88,3  |
| 3  |                  | NPK 160:120:80                     |              | 7,2                     | 36,7  | 73,5  | 89,5  |
| 4  |                  | NPK 200:140:100                    |              | 7,4                     | 37,5  | 72,5  | 88,7  |
|    |                  |                                    |              | 12.04                   | 15.04 | 18.04 | 20.04 |
| 5  | 05-10.04         | No fertilizer (control)            | 09.04        | 16,4                    | 41,2  | 72,6  | 88,9  |
| 6  |                  | NPK 120:90:60                      |              | 17,5                    | 43,4  | 73,4  | 89,3  |
| 7  |                  | NPK 160:120:80                     |              | 16,4                    | 45,7  | 74,3  | 89,4  |
| 8  |                  | NPK 200:140:100                    |              | 17,4                    | 46,6  | 41,2  | 88,7  |
|    |                  |                                    |              | 22.04                   | 25.04 | 28.04 | 01.05 |
| 9  | 15-20.04         | No fertilizer (control)            | 19.04        | 30,7                    | 75,9  | 88,8  |       |
| 10 |                  | NPK 120:90:60                      |              | 31,5                    | 76,6  | 89,1  |       |
| 11 |                  | NPK 160:120:80                     |              | 32,4                    | 77,3  | 88,6  |       |
| 12 |                  | NPK 200:140:100                    |              | 30,7                    | 76,8  | 89,4  |       |

**Table 4 The effect of planting dates and fertilizer rates on seedling density, %, 2022**

| №  | Planting periods | Rate of mineral fertilizers, kg/ha | at the beginning of the period of operation (after the first), thousand/ha | at the end of the operation period, thousand/ha | number of dead plants, thousand/units | number of dead plants, thousand/units % |
|----|------------------|------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------|-----------------------------------------|
| 1  | 25.03-01.04      | No fertilizer (control)            | 110,7                                                                      | 105,7                                           | 4,9                                   | 4,5                                     |
| 2  |                  | NPK 120:90:60                      | 110,6                                                                      | 106,0                                           | 4,5                                   | 4,1                                     |
| 3  |                  | NPK 160:120:80                     | 110,5                                                                      | 106,2                                           | 4,3                                   | 3,9                                     |
| 4  |                  | NPK 200:140:100                    | 110,4                                                                      | 106,3                                           | 4,0                                   | 3,7                                     |
| 5  | 05-10.04         | No fertilizer (control)            | 110,7                                                                      | 106,2                                           | 4,4                                   | 4,1                                     |
| 6  |                  | NPK 120:90:60                      | 110,4                                                                      | 106,1                                           | 4,3                                   | 4,0                                     |
| 7  |                  | NPK 160:120:80                     | 110,5                                                                      | 106,3                                           | 4,2                                   | 3,9                                     |
| 8  |                  | NPK 200:140:100                    | 110,4                                                                      | 106,3                                           | 4,1                                   | 3,8                                     |
| 9  | 15-20.04         | No fertilizer (control)            | 110,6                                                                      | 106,6                                           | 4,0                                   | 3,7                                     |
| 10 |                  | NPK 120:90:60                      | 110,4                                                                      | 106,6                                           | 3,8                                   | 3,5                                     |
| 11 |                  | NPK 160:120:80                     | 110,5                                                                      | 106,9                                           | 3,6                                   | 3,3                                     |
| 12 |                  | NPK 200:140:100                    | 110,0                                                                      | 106,5                                           | 3,5                                   | 3,2                                     |

As it was mentioned above, in order to obtain high and quality plants from the plant, along with the level of germination, the thickness of the seedling is also important. Because the volume of productivity is determined by the thickness of the plant.

According to the initial data of the experiment, obtained in 2022, the sugar beet was planted in a 60x15-1 scheme, that is, leaving about 110 thousand plants per hectare. Based on this, in all variants of the experiment, seedlings were left at the same rate, from 110.0 thousand to 110.7 thousand plants per hectare.

According to the data obtained at the end of the experimental period, it was observed that the timing of sugar beet planting affected its seedling density. In variants 1, 2, 3 and 4, where sugar beet was planted from 25.03 to 01.04, the seedling density at the end of the experimental period was 105.7; 106.0; 106.2 and 106.3 thousand units per hectare, respectively, 106.2 in the 5th, 6th, 7th and 8th options planted on 05-10.04 in the second term; 106.1; 106.3; 106.3 thousand seeds, and 106.6 in the 9th, 10th, 11th and 12th options planted in the third period of 15-20.04; 106.6; 106.9; It was 106.5 thousand units. It is clear from the obtained data that delaying the planting period by 10 days can save the number of seedlings by 0.2-0.4%, and planting by 20 days by 0.5-0.8%. The reason for this can be explained by the duration of the operation period, the time and number of processing during the cultivation of sugar beet.

Now, according to the data obtained on the influence of mineral fertilizer rates on sugar beet seedling thickness, increasing the mineral fertilizer rates in the cultivation of sugar beet led to preservation of seedling thickness. When analyzing the data, the sugar beet of the experiment was planted early, i.e., between 25.03-01.04, in the 2nd option, where mineral fertilizers were used at the rate of NPK 120:90:60 kg/ha, the number of seedlings that died at the end of the period was 4.1%, while in the 3rd option, when mineral fertilizers were used at the rate of NPK 160:120:80 kg/ha, this the indicator was 3.9%, and in the 4th option, where NPK 200:140:100 kg/ha was used, it was 3.7%. It can be seen that, despite the increase in the rate of fertilizers, 0.2% per hectare of saplings remained. The same data were observed in the variants of the experiment where sugar beet was planted in the middle period, 05-10.04, in which mineral fertilizers were used at the rate of NPK 120:90:60 kg/ha of the experiment. In option 7, this indicator was 3.9%, and in option 4, where NPK 200:140:100 kg/ha was used, it was 3.8%. Even in these options, with increasing fertilizer rates, the number of seedlings was preserved by 0.1-0.2%. These regularities were also observed in the versions of the experiment where sugar beet was planted late, 15-20.04, and the indicators were 0.2-0.3%.

From the obtained data, it can be concluded that delaying the planting period for sugar beet by 10 days can save the number of seedlings by 0.2-0.4%, and delaying by 20 days by 0.5-0.8%. Increasing the rate of mineral fertilizers from NPK 120:90:60 kg/ha to NPK 160:120:80 kg/ha leads to maintaining the number of seedlings by 0.1-0.2%, and increasing NPK 200:140:100 kg/ha by 0.2-0.4%.

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