Effects of planting date on the growth and yield of romaine lettuce varieties

Sobir Sanaev[1*], *Javokhir* Ergashov[2], *Farrukh* Mahmadiyorov[1], and *Jasur* Fayzimurodov [1]

[1]Samarkand Agroinnovations and Research University, Samarkand, Uzbekistan
[2]Samarkand State University, Institute of Agro-Biotechnologies and Food Security, Samarkand, Uzbekistan

Abstract. In this article, under the conditions of gray soils of the Samarkand region, the number of surviving plants per unit area (1 ha), the number of leaves, leaf width, leaf length, lettuce head weight, lettuce head diameter, as well as the effect of planting dates on the productivity of romaine lettuce varieties Sladkiy Khrust, Aktina and Batzio were studied. During the experiment it was established that when sowing the romaine lettuce varieties Sladkiy Khrust, Aktina and Bacio in a repeated crop at 5 planting dates, the number of surviving plants per unit area (1 ha) between the varieties was 72.0-77.8 thousand or 86.5-93.4%, the size (height) of the basal leaf was 25.0-30.6 cm, the number of leaves was 16.7-29.5, the leaf width was 5.4-9.9 cm, the leaf length was 14.1-21.9 cm, the diameter of the lettuce head was 17.2-25.4 cm, the weight of the lettuce head was 291.8-409.2 g, and the yield was 22.2-30.9 t/ha. Also, when replanting romaine lettuce varieties at different planting times, the highest results for all varieties were recorded when planting on August 5, the yield was 28.3-30.9 t/ha, which is recommended for production.

1 Introduction

Lettuce contains provitamin A-carotene, vitamins C, B, B2, P, PP, K, E, and various elements such as iron, copper, manganese, zinc, boron, iodine, and cobalt. Therefore, lettuce is one of the green vegetables with valuable medicinal and dietary properties [1-8]. In Uzbekistan, lettuce is considered an unconventional vegetable crop, and there are several types of it, such as Bell lettuce, Yellow lettuce, Head lettuce, Leaf lettuce, and Romaine lettuce. Among these types, Romaine lettuce is of great importance, as it is very nutritious and useful, but it is not widespread in our country. Romaine lettuce is a cool-season plant that tolerates light frosts. Romaine lettuce is grown from seedlings in early spring and autumn. When grown in the summer, it is delayed due to increased air temperature [5-7]. Therefore, in a number of countries of the world, the demand for Romaine lettuce is not satisfied at all and seasonality has arisen. In order to extend the shelf life of Romaine lettuce grown in spring and autumn, they are stored in various ways. According to N.V. Leshchuk., V.V. Khareba, a head of lettuce (root leaf) weighing 310 g from the technical ripeness of romaine lettuce stored in a temperature-controlled warehouse for 30 days at a temperature of 1-5 ° C lost 26 g. or 8.4% of weight

* Corresponding author: s_sobir_samaru@bk.ru

during storage at a rate of 0.8 g per day, and at a temperature of 18-20 ° C lost 68 g. or 21.9% of weight during storage at a rate of 2.3 g per day [5, 6]. This indicates that there are also problems with the storage and consumption of the product and that costs increase. As a solution to these problems, it is important to select heat-tolerant varieties of Romaine lettuce and determine the optimal planting date for repeated crops. This will eliminate seasonality in Romaine lettuce production, establish continuous production, and thereby meet the needs of the population.

2 Materials and methods

The aim of our research was to eliminate seasonality in the cultivation of Romaine lettuce. In our experiments, the romaine lettuce varieties Sladkiy Khrust, Aktina and Batzio were planted in a repeated crop in 5 terms: July 15 (control), July 25, August 5, August 15 and August 25. The growth, development and productivity of the romaine lettuce varieties Sladkiy Khrust, Aktina and Batzio were compared according to the planting dates. In the experiment, the area of each plot was 24 m2, and the number of repetitions was 4. Field experiments, phenological observations and biometric measurements of plants, sampling of the topsoil, and sampling and analyzing of module plants were carried out on the basis of methodological manuals such as “Methodology of field experiments in vegetable and melon growing” [2], “Methodology of physiological and biochemical studies in vegetable and melon growing” [4], and “Methodology of experiments in vegetable, melon and potato growing” [1]. Statistical analysis of the research results was carried out using Microsoft Excel based on the dispersion method presented in the methodological manual “Methodology of field experiments” [3].

3 Results and discussion

In our studies, according to the experimental variants, when the Romaine lettuce variety Sladkiy Khrust was planted in 5 planting periods at a rate of 83.3 thousand units in a 60x20 cm scheme, the number of plants preserved per hectare was 72.0-77.8 thousand units or 85.6-93.4% of the planted seedlings. In the Romaine lettuce variety Sladkiy Khrust, depending on the planting periods, it was observed that the height of the rhizome increased from 25.0 cm to 27.9 cm, the number of leaves from 16.7 to 21.8, the width of the leaf from 5.4 cm to 8.1 cm, and the length of the leaf from 14.1 cm to 18.1 cm. The diameter of the head of lettuce was 17.2-23.1 cm, and the weight of the head of lettuce was 291.8 - 378.6 g. is 22.2 t per hectare. from 28.3 t. it was found that it increased up to.

It was found that 72,600 plants per hectare were saved before harvest when the cultivar Actina of romaine lettuce was planted on July 15 as a control option. When planted in this period, the productivity indicators were 27.8 cm (height) of the stem, 23.5 leaves, 7.8 cm of leaf width, and 18.9 cm of leaf length. The average diameter of a head of lettuce was 24.2 cm, the weight of a head of lettuce was 360.9 g, and the yield was 26.2 t/ha. When this variety was planted on July 25, it was noted that the productivity indicators were relatively high, with a root-leaf size of 28.1 cm, a leaf number of 24.1, a leaf width of 8.3 cm, and a leaf length of 19.4 cm. The diameter of a head of lettuce per plant was 23.4 cm, a head of lettuce weight of 375.4 g., and a yield of 27.9 t/ha. When planted on August 5, the productivity indicators were the highest, respectively 28.9 cm, 24.6 leaves, 8.7 cm, 19.8 cm, 22.8 cm, and 389.8 g. and 29.3 t/ha. Also, when this variety was planted on August 15 and 25, a sharp decrease in the indicators was observed, and the values were 26.8-26.0 cm, 21.4-19.1 pieces, 6.7-6.0 cm, 16.1-14.9 cm, 22.0-18.5 cm, 345.7-295.2 g. and 26.2-22.7 t/ha, respectively. Among the varieties studied in the experiment, the highest result for all indicators was recorded in the Batzio variety. Also, when the Batzio variety was planted on July 15, which was taken as a control, the basal leaf size (height) was 29.6 cm, the number of leaves was 29.0 pieces, the leaf

width was 9.1 cm, the leaf length was 20.7 cm, the head diameter was 25.4 cm, and the head weight was 380.7 g. When the Batzio variety was planted in the second planting period, i.e. on July 25, the root leaf size (height) was 30.1 cm, the number of leaves was 29.3, the leaf width was 9.4 cm, the leaf length was 21.1 cm, the head diameter was 24.0 cm, and the head weight was 393.1 g. The highest increase in productivity indicators was observed in the variant planted in the third planting period, i.e. on August 5, when the root leaf size was 30.6 cm, the number of leaves was 29.5, the leaf width was 9.9 cm, the leaf length was 21.9 cm, the head diameter was 23.5 cm, and the head weight was 409.2 g. When this variety was planted on August 15, the indicators decreased relatively and amounted to 28.4 cm, 27.2 grains, 7.4 cm, 17.2 cm, 22.6 cm and 377.1 g. respectively. When the fifth option was planted on August 25, the productivity indicators were at the lowest level, and the indicators were 27.2 cm, 22.1 grains, 6.2 cm, 15.4 cm, 19.1 cm and 303.5 g, respectively. In the Batzio variety of Romaine lettuce, the productivity indicators varied significantly depending on the planting dates and averaged 23.6-30.9 t/ha.

Table 1. Effect of planting dates on productivity and yield of romaine lettuce varieties (planting pattern 60x20 cm, 83333.0 pcs/ha)

Planting dates	1 ha. extant plant		stem leaf length, cm	Number of leaves, pcs.	Leaf width, cm	Leaf length, cm	Salad head diameter, cm	Salad head weight, g
	thousand pcs	%						
Sladkiy Khrust variety								
15.07(c.n)	72,0	86,5	26,9	20,2	7,1	17,2	23,1	345,0
25.07.	73,1	87,8	27,6	21,3	7,5	17,9	22,7	358,5
5.08.	74,8	89,8	27,9	21,8	8,1	18,1	21,6	378,6
15.08.	75,4	90,5	26,2	18,0	6,2	15,8	19,5	337,5
25.08	76,1	91,4	25,0	16,7	5,4	14,1	17,2	291,8
Actina variety								
15.07(c.n)	72,6	87,2	27,8	23,5	7,8	18,9	24,2	360,9
25.07.	74,4	89,3	28,1	24,1	8,3	19,4	23,4	375,4
5.08.	75,3	90,4	28,9	24,6	8,7	19,8	22,8	389,8
15.08.	75,8	91,0	26,8	21,4	6,7	16,1	22,0	345,7
25.08	76,9	92,4	26,0	19,1	6,0	14,9	18,5	295,2
Batsio variety								
15.07(c.n)	73,3	88,1	29,6	29,0	9,1	20,7	25,4	380,7
25.07.	74,7	89,7	30,1	29,3	9,4	21,9	24,0	393,1
5.08.	75,6	90,8	30,6	29,5	9,9	21,1	23,5	409,2
15.08.	76,8	92,2	28,4	27,2	7,4	17,2	22,6	377,1
25.08	77,8	93,4	27,2	22,1	6,2	15,4	19,1	303,5

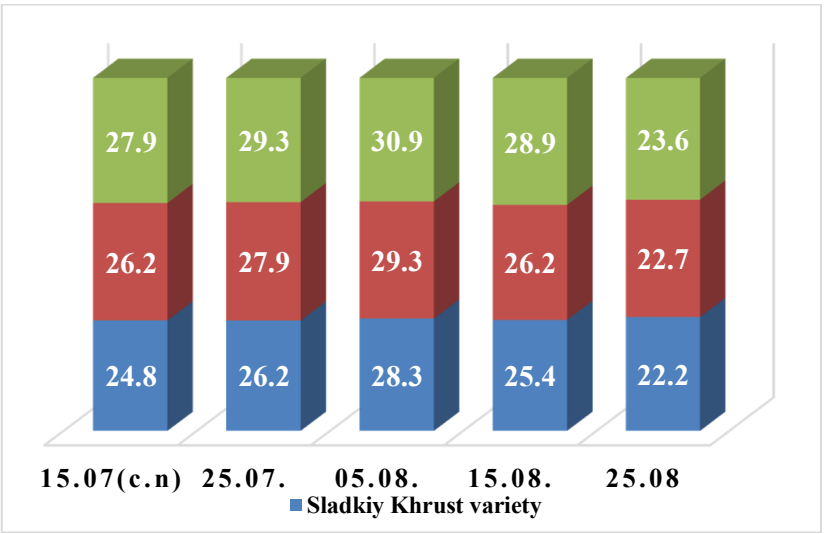

Fig. 1. Effect of planting dates on yield of romaine lettuce varieties (2024).

When the experimentally studied romaine lettuce varieties Sladkiy Khrust, Aktina, and Batzio were planted in a repeated crop with 5 planting dates, the highest commercial yield was recorded in the variant planted on August 5, amounting to 28.3; 29.3, and 30.9 t/ha for the varieties, respectively (Figure 1).

Fig. 2. The appearance of Romaine lettuce in the technical period.

4 Conclusion

In the conditions of the gray soils of the Samarkand region, the repeated planting of the romaine lettuce varieties Sladkiy Khrust, Aktina and Battsio at the optimal planting date, i.e. on August 5, has a positive effect on the formation of their vegetative organs, allowing for high productivity and yield indicators. Also, the repeated planting of the romaine lettuce varieties Sladkiy Khrust, Aktina and Battsio on August 5 ensures the formation of marketable lettuce heads weighing an average of 378.6-409.2 g per plant and a yield of 28.3-30.9 t/ha.

References

1. A.I. Ivanov, Z.A. Ivanova, Methodology of the Agrophysical Institute's Modern System of Field Experiments. In: Mueller, L., Sychev, V.G., Dronin, N.M., Eulenstein,

F. (eds) Exploring and Optimizing Agricultural Landscapes. Innovations in Landscape Research. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-67448-9_26

2. V.I. Kiryushin, Methodology for Integrated Assessment of Agricultural Land. Eurasian Soil Sc. **53**, 960–967 (2020). https://doi.org/10.1134/S1064229320070066
3. M. H. Sellami, A. Lavini, Advancements in Soil and Sustainable Agriculture. Soil Systems, **7(4),** 98 (2023). https://doi.org/10.3390/soilsystems7040098
4. K.R. Anilakumar, et al. Lettuce: A promising leafy vegetable with functional properties. Def. Life Sci. J**. 2,** 178-185 (2017).
5. N.V. Leshchuk, Morpho-biological and Economical Characteristics of Typical Model of Romen Lettuce Variety Lactuca sativa var. longifolia. Plant Varieties Studying and Protection **1(18),** 62-65 (2013). https://doi.org/10.21498/2518-1017.1(18).2013.58759
6. V. B. Kutovenko, N. V. Tyha, K. R. Popko, Comparative Evaluation of Commercially Valuable Characters of Cutting Lettuce Varieties (Lactuca sativa L.) in Kiev Oblast. Plant Varieties Studying and Protection, pp. 83-86 (2015). https://doi.org/10.21498/2518-1017.1-2(26-27).2015.55918
7. Ashaolu Victoria Oladimeji, A. Bharat Kumar. Therapeutic profile of lettuce: Leafy vegetable for moderate consumption (A review). Int. J. Adv. Biochem. Res. **7(2S),** 254-258 (2023). https://doi.org/10.33545/26174693.2023.v7.i2Sd.218
8. Jie Yang, et al., Bioactive Compounds in Lettuce: Highlighting the Benefits to Human Health.Comprehensive Reviews in Food Science and Food Safety **21** (1), 4-45 (2022). https://doi.org/10.1111/1541-4337.12877