

UO‘T: 635.42

**INFLUENCE OF DIFFERENT SOWING DATES AND SCHEMES ON MANGOLD (BETA VULGARIS SUBSP. VULGARIS) YIELD****O.B. Yunusov<sup>1</sup>, U.I. Akramov<sup>2</sup>,**Researcher of the Andijan institute of agriculture and agrotechnologies<sup>1</sup>,  
Dotsent of Tashkent state agrarian university<sup>2</sup>**Essey**

The highest leaf yield was obtained at sowing dates of February 20 and March 1 (36.2 and 29.3 t/ha), in the schemes (50+20)/2×15 and (50+20)/2×10 cm (55.9 and 40.5 t/ha), the lowest leaf yield was obtained at sowing dates of March 20 and 30 (17.5 and 12.3 t/ha), in the schemes 70×10 and 70×20 cm (27.7 and 23.4 t/ha).

**Keywords**

mangold, variety samples, plant height, number of leaves, leaf length, leaf width, leaf surface area, leaf weight per plant, leaf yield.

**Introduction.** Human health largely requires fresh vegetables for normal life activity and proper nutrition. Such a valuable green vegetable crop is the mangold (*Beta vulgaris* subsp. *vulgaris*). The healing properties of this crop deserve special mention. Its leaves are rich in proteins, vitamins (K, C, E, A, B), macro- (K, Na, Mg, Ca, P), and microelements (Cu, Fe, Se, Zn). Moreover, the shape and colorful leaves of the mangold are not only a vegetable crop, but also an excellent ornamental plant for landscape designers and florists [3]; [4].

In the world, mangold is grown as a vegetable crop in Latin America, Central and Western Europe, North Africa, Mexico, India, the USA, Japan, and many other countries. Therefore, special attention is paid to research work on the selection of new varieties of mangold with variegated leaves and high yields, as well as the development of cultivation technology in open and protected areas [6]; [7]. Nevertheless, the selection of high-yielding varieties rich in vitamins, allowing year-round cultivation, as well as the improvement of certain elements of cultivation technology, is one of the urgent tasks [8].

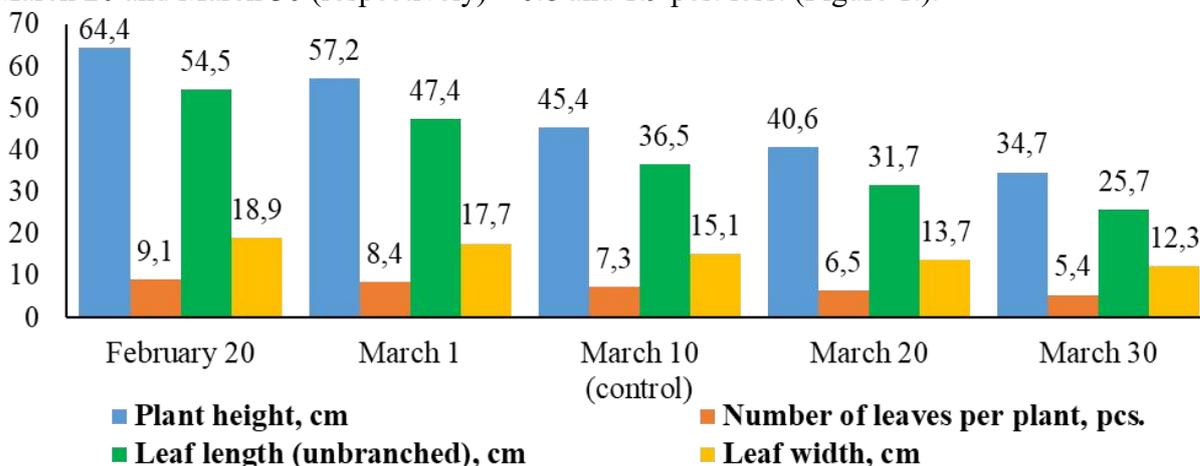
In the Fergana valley, mangold is considered a rare vegetable crop, the reason for which is the absence of regionalized varieties in the republic, as well as the lack of a scientifically based cultivation technology. Therefore, the study of foreign breeding sources and the study of some elements of the cultivation technology of the mangold plant in the republic is required.

**Research methodology.** For the Mangold variety "Raduga," 5 planting dates (20 February, 1 March, 10 March, 20 March, 30 March) and 6 planting schemes (70×10 cm, 70×15 (control) cm; 70×20 cm; 50+20/2×10 cm; 50+20/2×15 cm; 50+20/3×20 cm), the growth dynamics of plants, the leaf system, and leaf yield were calculated.

Field experiments were conducted on the basis of the methodological manuals "Methodology for Conducting Experiments in Vegetable Growing, Melon Growing, and Potato Growing" [1], "Methodology of Field Experiments in Vegetable and Melon Growing" [2], statistical analysis of the research results was carried out in the computer program "Excel 2010" and "Statistica 7.0 for Windows", with a confidence interval of 0.95% using the dispersion method "Methodology of Field Experiments" [5]. Phenological observations, biometric and yield measurements were carried out in the experiments.

**Research results.** In the early spring sowing of the Mangold variety "Raduga", the average plant height in the control variant for 2021-2023 years was 45.4 cm at the sowing date of March 10, compared to the sowing date of February 20 – 19.0 cm and March 1 – 11.8 cm, and the sowing dates of March 20 and March 30 (respectively): 4.8 and 10.7 cm. The number of

leaves per bush in the control planting period of March 10 was 7.3 pcs., compared to the control planting period of February 20 – 1.8 pcs., and March 1 – 1.1 pcs., and in the planting periods of March 20 and March 30 (respectively) – 0.8 and 1.9 pcs. less. (Figure 1.).



**Figure 1. Plant height and leaf size of the “Raduga” mangold variety at different planting dates in early spring sowing (2021-2023 years).**

In the early spring sowing period, the length of the sessile leaves of the Mangold variety “Raduga” in the control sowing date of March 10 was 36.5 cm. Compared to it, at sowing dates of February 20 – 18.0 cm and March 1 – 10.9 cm longer, at sowing dates of March 20 - 4.8 cm and March 30 - 10.8 cm shorter. When sown in early spring, the widest leaves were formed in the sowing dates of February 20 (18.9 cm) and March 1 (17.7 cm), and, conversely, compared to the control sowing date of March 10, the width of the leaves on March 20 was 1.4 cm and on March 30 – 2.8 cm less.

In the early spring sowing of the Mangold variety “Raduga”, at the control sowing date of March 10, the leaf area of one leaf was 275.7 cm<sup>2</sup>, compared to it, at the sowing date of February 20 – 240.1 cm<sup>2</sup>, at the sowing date of March 1 – 142.8 cm<sup>2</sup>, at the sowing date of March 20 – 59.0 cm<sup>2</sup>, and at the sowing date of March 30 – 117.5 cm<sup>2</sup>, the leaf area was smaller. The greatest leaf area on one bush was observed in the sowing dates of February 20 (4715.8 cm<sup>2</sup>) and March 1 (3514.2 cm<sup>2</sup>), while in the control, compared to the sowing date of March 10 (2015.8 cm<sup>2</sup>), the leaf area was 596.3 cm<sup>2</sup> at the sowing date of March 20 and 1152.2 cm<sup>2</sup> at the sowing date of March 30. In the early spring sowing of the Mangold variety “Raduga” at the control sowing date of March 10, the leaf surface area per unit area was 19.2 thousand m<sup>2</sup>, compared to this, at the sowing date of February 20 – 25.7 thousand m<sup>2</sup>, at the sowing date of March 1 - 14.3 thousand m<sup>2</sup>, at the sowing date of March 20 – 5.7 thousand m<sup>2</sup>, and at the sowing date of March 30 – 11.0 thousand m<sup>2</sup>, a smaller leaf surface was formed.

In the early spring sowing of the Mangold variety “Raduga”, the average leaf mass of one bush in the control variant for 2021-2023 was 233.3 g at the sowing date of March 10, compared to the sowing date of February 20 - 146.6 g and the sowing date of March 1 – 74.0 g. On the contrary, it was found that on March 20 – 49.8 g and on March 30 – 104.3 g had a small leaf mass (Table 1).

**Table 1**

**Leaf mass and yield of the Mangold variety “Raduga” at different planting dates in early spring sowing. (2021-2023 years)**

Planting dates	Leaf weight per bush, g	Leaf productivity, t/ha				
		2021 year	2022 year	2023 year	average	relative to control, %
February 20	379,9	34,7	40,6	33,3	36,2	163,0
March 1	307,3	27,7	31,3	28,9	29,3	131,8

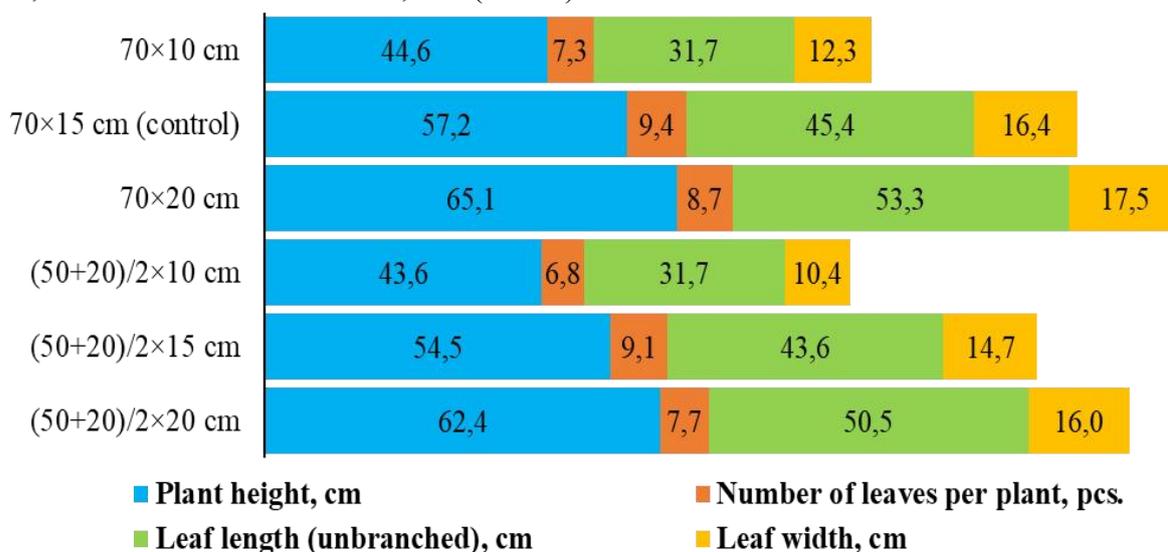
March 10 (control)	233,3	21,9	21,0	23,7	22,2	100,0
March 20	183,5	16,8	19,3	16,4	17,5	78,7
March 30	129,0	11,5	11,8	13,5	12,3	55,4
ESR <sub>05</sub>	6,2	0,6	0,6	0,8	0,6	–
Sx%	2,5	2,9	2,3	3,3	2,5	–

When sowing the Mangold variety “Raduga” in early spring, the highest average leaf yield per unit area for 2021-2023 years was determined in the sowing dates of February 20 (36.2 t/ha) and March 1 (29.3 t/ha). On the contrary, compared to the control sowing date on March 10 (22.2 t/ha), the leaf yield on March 20 (17.5 t/ha) was 4.7 t/ha less, and on March 30 (12.3 t/ha) - 9.9 t/ha less.

In the early spring sowing of the Mangold variety “Raduga” in 2021-2023 years, the average plant height (with petioles) was 57.2 cm with a control planting scheme of 70×15 cm, compared to this, the plant height was 7.9 cm with a planting scheme of 70×20 cm and 5.2 cm with a planting scheme of (50+20)/2×20 cm. On the contrary, in the (50+20)/2×15 cm scheme – 2.7 cm, in the 70×10 cm scheme – 12.6 cm, and in the (50+20)/2×10 cm scheme – 13.6 cm, the height of small plants was determined.

When sowing the Mangold variety “Raduga” in early spring, the number of leaves per bush in the control 70×15 cm planting scheme was 9.4 pieces, compared to this, the (50+20)/2×15 cm scheme formed 0.3 pieces, the 70×20 cm scheme – 0.7 pieces, the (50+20)/2×20 cm scheme – 1.7 pieces, the 70×10 cm scheme – 2.1 pieces, and the (50+20)/2×10 cm scheme – 2.6 pieces less leaves. In the early spring sowing period, the length of the sessile leaves of the Mangold variety “Raduga” was 45.4 cm in the control 70×15 cm sowing scheme. Compared to it, the 70×20 cm scheme – 7.9 cm and the (50+20)/2×20 cm scheme – 5.1 cm long leaves were formed, on the contrary, the (50+20)/2×15 cm scheme – 1.8 cm, the 70×10 cm scheme – 13.7 cm and the (50+20)/2×10 cm scheme – 13.7 cm small leaf length (2-rasm).

When sowing the Mangold variety “Raduga” in early spring, the widest leaf was formed according to the 70×20 cm planting scheme (17.5 cm), and, conversely, compared to the control 70×15 cm planting scheme (50+20)/2×20 cm scheme – 0.4 cm, (50+20)/2×15 cm scheme – 1.7 cm, 70×10 cm scheme – 4.1 cm, and (50+20)/2×10 cm scheme – 6.0 cm.



**Figure 2. Plant height and leaf size of the "Raduga" mangold variety in various planting schemes during early spring sowing (2021-2023 years)**

In the early spring sowing of the Mangold variety “Raduga” according to the control sowing scheme 70×15 cm, the average leaf area for 2021-2023 years was 371.9 cm<sup>2</sup>, compared

to this, the 70×20 cm scheme showed a larger leaf area of 93.6 cm<sup>2</sup>, and the (50+20)/2×20 cm scheme showed a larger leaf area of 33.5 cm<sup>2</sup>. On the contrary, the leaf surface area was 52.4 cm<sup>2</sup> for the (50+20)/2×15 cm scheme, 177.1 cm<sup>2</sup> for the 70×10 cm scheme, and 207.0 cm<sup>2</sup> for the (50+20)/2×10 cm scheme.

When sowing the Mangold variety “Raduga” in early spring, the largest leaf area on one bush was 4047.3 cm<sup>2</sup> with a 70×20 cm scheme, compared to the control 70×15 cm (3490.6 cm<sup>2</sup>) planting scheme – 351.9 cm<sup>2</sup> with a (50+20) /2×20 cm scheme, 572.7 cm<sup>2</sup> with a (50+20)/2×15 cm scheme, 2057.8 cm<sup>2</sup> with a 70×10 cm scheme, and 2361.4 cm<sup>2</sup> with a (50+20)/2×10 cm scheme.

In the early spring sowing of the Mangold variety “Raduga” with a control sowing scheme of 70×15 cm, the leaf area per unit area was 33.2 thousand m<sup>2</sup>, compared to this, the scheme (50+20)/2×15 cm – 22.4 thousand m<sup>2</sup>, and the scheme (50+20)/2×20 cm – 11.6 thousand m<sup>2</sup> more leaf area. On the contrary, it was established that in the (50+20)/2×10 cm scheme – 0.9 thousand m<sup>2</sup>, in the 70×20 cm scheme – 4.3 thousand m<sup>2</sup>, and in the 70×10 cm scheme – 12.7 thousand m<sup>2</sup>, the surface area of small leaves was formed.

When sowing the Mangold variety “Raduga” in early spring with different planting schemes, the leaf mass of the control planting scheme 70×15 cm was 337.6 g, compared to it, the 70×20 cm scheme was 10.7 g, the (50+20)/2×15 cm scheme – 44.2 g, the (50+20)/2×20 cm scheme – 133.2 g, the 70×10 cm scheme – 143.9 g, and the (50+20)/2×10 cm scheme – 195.8 g less (Table 2).

When sowing the Mangold variety “Raduga” in early spring, the highest average leaf yield per unit area for 2021-2023 was determined in the sowing schemes (50+20)/2×15 cm (55.9 t/ha) and (50+20)/2×10 cm (40.5 t/ha). On the contrary, compared to the control 70×15 cm scheme (32.2 t/ha), the leaf yield of the (50+20)/2×20 cm scheme was – 3.0 t/ha, the 70×10 cm scheme – 4.5 t/ha, the 70×20 cm scheme – 8.8 t/ha less.

**Table 2**

**The weight and yield of leaves on one bush of the “Raduga” mangold variety under different planting schemes in early spring sowing (2021-2023 years)**

Planting schemes	Leaf weight per bush, g	Leaf productivity, t/ha				
		2021 year	2022 year	2023 year	average	relative to control, %
70×10 cm	193,7	26,5	31,1	25,4	27,7	85,9
70×15 cm (control)	337,6	30,4	34,3	31,7	32,2	100,0
70×20 cm	326,9	23,0	22,1	24,9	23,4	72,5
(50+20)/2×10 cm	141,8	38,9	44,7	38,1	40,5	125,9
(50+20)/2×15 cm	293,4	52,5	53,6	61,6	55,9	173,6
(50+20)/2×20 cm	204,4	27,4	28,0	32,2	29,2	90,7
ESR <sub>05</sub>	6,1	1,0	0,8	1,3	1,0	–
Sx%	2,4	3,0	2,2	3,6	2,8	–

When cultivating the Mangold variety “Raduga” in early spring sowing, the highest net profit was obtained with sowing dates of February 20 (135.6 million soums), March 1 (102.9 million soums), as well as with sowing schemes (50+20)/2×15 cm (223.4 million soums) and (50+20)/2×10 cm (157.4 million soums), on the contrary, the lowest net profit was obtained with sowing dates of March 20 (46.9 million soums), March 30 (22.2 million soums), as well as with sowing schemes 70×10 cm (95.3 million soums) and 70×20 cm (75.5 million soums).

When cultivating the Mangold variety “Raduga” in early spring sowing, the highest profitability was observed with sowing dates of February 20 (298.9%), March 1 (235.8%), as well as sowing schemes (50+20) /2×15 cm (424.8%) and (50+20) /2×10 cm (314.0%), while, conversely, sowing dates of March 20 (115.4%), March 30 (56.5%), as well as sowing schemes of 70×10 cm (220.5%) and 70×20 cm (182.2%) showed low profitability.

**Summary:** 1. The heaviest leaf mass on one plant was determined at sowing dates of February 20 and March 1 (379.9 and 307.3 g), according to the 70×15 cm scheme (337.6 g), the lightest leaf mass was determined at sowing dates of March 20 and 30 (183.5 and 129.0 g), according to the 70×10 and (50+20) /2×10 cm (193.7 and 141.8 g) schemes.

2. The highest leaf yield was obtained at sowing dates of February 20 and March 1 (36.2 and 29.3 t/ha), in the schemes (50+20) /2×15 and (50+20) /2×10 cm (55.9 and 40.5 t/ha), the lowest leaf yield was obtained at sowing dates of March 20 and 30 (17.5 and 12.3 t/ha), in the schemes 70×10 and 70×20 cm (27.7 and 23.4 t/ha).

3. The highest net profit and profitability of early spring sowing was observed on February 20 (135.6 million soums; 298.9%), March 1 (102.9 million soums; 235.8%), (50+20) /2×15 cm (223.4 million soums; 424.8%), (50+20) /2×10 cm (157.4 million soums; 314.0%), the lowest net profit and profitability were observed on March 20 (46.9 million soums; 115.4%), March 30 (22.2 million soums; 56.5%), 70×10 cm (95.3 million soums; 220.5%) and 70×20 cm (75.5 million soums; 182.2%) were identified in the sowing schemes.

### List of sources used

1. Azimov B.J., Azimov B.B. Methodology for Conducting Experiments in Vegetable Growing, Melon Growing, and Potato Growing. - Tashkent, 2022. – P. 121-152.

2. Belik V.F. Methods of experimental work in vegetable and melon growing. – Moscow: Agropromizdat, 1992. – 224 p.

3. Berson G.Z. Vegetables for every taste. – Yekaterinburg: Wednesday. – Ural. kN. ed. 1993. – 240 p.

4. Borisov V.A., Litvinov S.S., Romanova A.V. Quality and lezhkost vegetables. – Moscow, 2003. – 625 p.

5. Dospekhov B.A. Methodology of field experience (with the basics of statistical processing of research results). - 5th ed., additional and pererab. - M.: Agropromizdat, 1985. – 351 p.

6. Grinberg E.G., Gubko V. N., Vitchenko E. F., Meleshkina T. N. Vegetable crops in Siberia. - Novosibirsk: Sib. Univ. Publishing house, 2004. – 400 p.

7. Litvinov S.S. Vegetable growing in Russia and its scientific support (State, priorities, prospects). – Moscow: RASKHN-VNIIO, 2003. – 35 p.

8. Paponov A.N. Vegetables are a source of health. - Edition 2-e pererab. I DOP. – Perm: Publishing house pgsha, 2009. – 159 p.