The effect of sowing schemes and biostimulant rates on chemical composition of leaves and root fruit of the Uzbekistan-83 variety of fodder beet

Yuldasheva Zulfiya Kamalovna - Professor of Tashkent State Agrarian university, E-mail: zkamalovna@mail.ru, ORCID: orcid.org/0000-0002-4980-8153

Mamatdurdiev Ulugbek Firnafas ugli - Intern teacher at Urgench State University named after Abu Raykhan Beruni: Head of the Department of Agricultural Engineering and Plant Protection of the LCRI Khorezm SRS, E-mail: mamatdurdiyevulugbek@gmail.com, **orcid.org/0009-0004-2455-0485**

Abstract: This article studies the effect of sowing scheme and biostimulant rates on the chemical composition of the root and stem of the Uzbek-83 variety of beetroot. In the experiment, three sowing schemes of 70x15, 70x20, 70x25 were used, and the Tandem biostimulant was used in three different rates, before sowing the seeds were treated and foliar fed twice during the growing season, and the Fitavak biostimulant was used as a standard for this biostimulant. It was observed that the chemical composition of the leaves and root was better in the 70x20 cm sowing scheme and the Tandem biostimulant in the rate of 0.4 + 0.7 + 0.9 than in other options.

Keywords: fodder beet (beetroot), variety, leaf, root crop (root fruit), biostimulant, rate, sowing scheme.

Introduction. 1 kg of sugar beet root contains 0.12 nutrient units, and semi-sweet varieties contain 0.15 nutrient units[1]. Fodder beet was cultivated in Germany in the 16th century, and by the 18th century, this crop had quickly spread to Europe. The chemical composition of the used fodder beet does not differ much from other beet varieties, but its roots contain a large amount of fiber [2].

The object of the study was the Eckendorfskaya Zholtaya variety of sugar beet, which is a mid-season variety, resistant to diseases and has high yields. The shape of the root is sac-shaped and cylindrical. It is widely zoned [3–4] and is grown for fodder. The root crops of sugar beet contain 12–18% dry matter, 1.3% protein, 0.1% fat, 0.7–9% fiber, 9.5% non-nitrogenous substances, and 0.9% ash[5].

Research methods. Field experiments for scientific research were conducted at the experimental farm of Tashkent State Agrarian University during 2023. Field

experiments were conducted in 4 replicates, with 15 variants, 60 plots, and a total area of 0.20 ha. The variants were placed in a rendomized method.

Research results. The composition of the leaves and roots of the beet variety Uzbekistan-83 was determined at the "Zamona Rano" LLC in the Parkent district of the Tashkent region by the Protein - Kjeldahl method (in the same device), Oil - Extraction method (in the Soxhlet apparatus), and Carbohydrate - by refractometer. (Table 1)

In the 70x15-1 sowing scheme, the control variant contained 1.5% protein, 1.8% carbohydrate, 0.1% oil, and 0.12 nutrient units per 100 grams of leaf. In the variant studied with the Fitovak 20% immunostimulant as a standard, it was determined that the protein was 0.4%, the carbohydrate and oil were the same percentage, and the nutrient unit was 0.02% higher.

In the variant where Tandem 10% biostimulant was applied at a rate of 0.4+0.7+0.9 l/ha, protein was 0.71% higher, carbohydrate was 0.34% higher, oil was 0.3% higher, and feed unit was 0.07 higher than in the variant where the biostimulant rate was set at a low rate of 0.3+0.5+0.7 l/ha. In the variant where the biostimulant rate was increased to 0.5+0.9+1.0 l/ha, protein was 0.89% higher, carbohydrate was 0.13% higher, oil was 0.13% higher, and feed unit was 0.03 higher. In this variant, it was found that compared to the control variant, protein was 1.4%, carbohydrate was 0.3%, oil was 0.3%, and nutrient units were 0.06% higher, and compared to the reference variant, protein was 1.0%, 0.3%, oil was 0.3%, and nutrient units were 0.04%.

In the 70x20-1 sowing scheme, it was found that the protein content in 100 grams of leaves in the control variant was 2.1%, carbohydrate was 1.98%, oil was 0.3%, and nutrient units were 0.13. In the variant studied with the Fitovak 20% immunostimulant as the reference, it was found that protein was 0.7%, carbohydrate was 0.32%, oil was 0.1%, and nutrient units were 0.03% higher.

In the variant where Tandem 10% biostimulant was used at a rate of 0.4+0.7+0.9 l/ha, protein was 1.6% higher, carbohydrate was 0.9% higher, oil was 0.4% higher, and feed unit was 0.04 higher than in the variant where the biostimulant rate was set at a low rate of 0.3+0.5+0.7 l/ha. In the variant where the biostimulant rate was increased to 0.5+0.9+1.0 l/ha, protein was 0.4% higher, carbohydrate was 0.53% higher, oil was 0.03% higher, and feed unit was 0.02 higher. In this variant, it was found that compared to the control variant, protein was 1.4%, carbohydrate was 0.52%, oil was 0.3%, and

nutrient units were 0.05% higher, and compared to the reference variant, protein was 0.7%, carbohydrate was 0.2%, oil was 0.2%, and nutrient units were 0.02% higher.

In the 70x25-1 sowing scheme, the control variant contained 1.7% protein, 1.8% carbohydrate, 0.2% oil, and 0.12 nutrient units per 100 grams of leaf. In the variant with the Fitovak 20% immunostimulant as the reference, it was found that protein was 0.4%, carbohydrate was 0.27%, oil was 0.16%, and nutrient units were 0.02% higher.

In the variant where Tandem 10% biostimulant was applied at a rate of 0.4+0.7+0.9 l/ha, protein was 1.44% higher, carbohydrate was 0.37% higher, oil was 0.11% higher, and feed unit was 0.03 higher than in the variant where the biostimulant rate was set at a low rate of 0.3+0.5+0.7 l/ha. In the variant where the biostimulant rate was increased to 0.5+0.9+1.0 l/ha, protein was 0.11% higher, carbohydrate was 0.13% higher, oil was 0.03% higher, and feed unit was 0.01 higher.

Table 1

Chemical composition of leaves and roots of fodder beet

No	Sowing	Name of biostimulators	Rates of biostimulators, l/t, l/ha	In 100 gramm leave				In 1000 gramm root fruit			
				protein,%	carbohydrate %	oil,%	feed unit	protein,%	carbohydrate %	oil,%	feed unit
1	70x15-1	Control	-	1.5	1.8	0.1	0.12	2.5	1.9	0.6	0.12
2		Fitovak 20% (standard)	0.3+0.3+0.4	1.9	1.8	0.1	0.14	2.6	2.1	0.8	0.13
3		Tandem 10%	0.3+0.5+0.7	1.3	1.76	0.1	0.11	2.6	2.2	1.0	0.13
4		Tandem 10%	0.4+0.7+0.9	2.9	2.1	0.4	0.18	2.9	2.6	1.3	0.15
5		Tandem 10%	0.5+0.9+1.0	2.01	1.97	0.27	0.15	2.7	2.4	1.1	0.14
6	70x20-1	Control	-	2.1	1.98	0.3	0.13	3.1	3.3	1.4	0.14
7		Fitovak 20% (standard)	0.3+0.3+0.4	2.8	2.3	0.4	0.16	3.3	3.2	1.5	0.15

8		Tandem 10%	0.3+0.5+0.7	1.9	1.6	0.2	0.14	2.9	2.6	1.2	0.13
9		Tandem 10%	0.4+0.7+0.9	3.5	2.5	0.6	0.18	4.5	3.5	2.6	0.18
10		Tandem 10%	0.5+0.9+1.0	3.1	1.97	0.57	0.16	3.7	3.4	2.2	0.17
11	70x25-1	Control	-	1.7	1.8	0.2	0.12	2.7	2.1	1.1	0.13
12		Fitovak 20% (standard)	0.3+0.3+0.4	2.1	2.07	0.36	0.14	2.3	2.2	1.2	0.14
13		Tandem 10%	0.3+0.5+0.7	1.86	1.73	0.29	0.13	2.2	2.1	1.1	0.13
14		Tandem 10%	0.4+0.7+0.9	3.3	2.1	0.4	0.16	3.2	2.8	1.6	0.15
15		Tandem 10%	0.5+0.9+1.0	3.19	1.97	0.37	0.15	2.6	2.5	1.4	0.14

In this variant, it was found that compared to the control variant, protein was 1.6%, carbohydrate was 0.3%, oil was 0.2%, and nutrient units were 0.04% higher, and compared to the reference variant, protein was 1.2%, carbohydrate was 0.03%, oil was 0.04%, and nutrient units were 0.02%.

In the 70x20-1 sowing scheme, it was found that the protein, carbohydrate, oil, and nutrient units in the leaf were slightly higher than in the sowing schemes with a plant spacing of 15 cm and 25 cm.

In the 70x15-1 sowing scheme, it was found that the protein content in 1000 grams of root vegetables in the control variant was 2.5%, carbohydrate was 1.9%, oil was 0.6%, and nutrient units were 0.12. In the variant where the Fitovak 20% immunostimulant was used as a standard, it was found that the protein content was 0.2%, carbohydrate content was 0.2%, oil content was 0.2% in the same percentage, and the feed unit content was 0.02% higher.

In the variant where the Tandem 10% biostimulant was used at a rate of 0.4+0.7+0.9 l/ha, compared to the variant with a lower biostimulant rate of 0.3+0.5+0.7 l/ha, protein content was 0.71%, carbohydrate content was 0.34%, oil content was 0.3%, and feed unit content was 0.07 higher, while in the variant with a higher biostimulant rate of 0.5+0.9+1.0 l/ha, protein content was 0.89%, carbohydrate content was 0.13%, oil

content was 0.13%, and feed unit content was 0.03 higher. In this variant, compared to the control variant, it was found that protein was 1.4% higher, carbohydrate was 0.3% higher, oil was 0.3% higher, and nutrient units were 0.06% higher, and protein was 1.0% higher, 0.3% higher, oil was 0.3% higher, and nutrient units were 0.04% higher than the reference variant.

In the 70x20-1 sowing scheme, the protein content in 1000 grams of root crops in the control variant was 3.1% higher, carbohydrate was 3.3% higher, oil was 1.4% higher, and nutrient units were 0.14. In the reference variant, it was found that protein was 0.2% higher, carbohydrate was 0.1% lower, oil was 0.1% higher, and nutrient units were 0.01% higher than the control variant.

In the variant where Tandem 10% biostimulant was used at a rate of 0.4+0.7+0.9 l/ha, protein was 1.6% higher, carbohydrate was 0.9% higher, oil was 1.4% higher, and feed unit was 0.05 higher than in the variant where the biostimulant rate was used less, while in the variant where the biostimulant rate was increased to 0.5+0.9+1.0 l/ha, protein was 0.8% higher, carbohydrate was 0.1% higher, oil was 0.4% higher, and feed unit was 0.01 higher. In this variant, it was found that compared to the control variant, protein was 1.4% higher, carbohydrates were 0.2% higher, oil was 1.2% higher, and nutrient units were 0.04% higher, and compared to the reference variant, protein was 1.2% higher, 0.3% higher, oil was 1.1% higher, and nutrient units were 0.03%.

In the 70x25-1 sowing scheme, the protein content in 1000 grams of root crops in the control variant was 2.7% higher, carbohydrates were 2.1% higher, oil was 1.1% higher, and nutrient units were 0.13. In the reference variant, protein was 0.4% higher, carbohydrates were 0.1% higher, oil was 0.1% higher, and nutrient units were 0.01% higher than the control variant.

In the variant where Tandem 10% biostimulant was used at a rate of 0.4+0.7+0.9 l/ha, protein was 1.0% higher, carbohydrate was 0.7% higher, oil was 0.5% higher, and feed unit was 0.02 higher than in the variant where the biostimulant rate was used less, while in the variant where the biostimulant rate was increased to 0.5+0.9+1.0 l/ha, protein was 0.6% higher, carbohydrate was 0.3% higher, oil was 0.2% higher, and feed unit was 0.01 higher. In this variant, it was found that protein was 0.5% higher than the control variant, carbohydrate was 0.7% higher than the oil variant, and protein was 0.9% higher than the reference variant, 0.6% higher than the oil variant, and nutrient unit was 0.4% higher than the protein variant.

In all variants of the 70x20-1 sowing scheme, it was found that protein, carbohydrate, oil, and nutrient unit content of root vegetables were higher than those of the 70x15-1

and 70x25-1 sowing schemes. Compared to the 70x15-1 and 70x25-1 sowing schemes at the acceptable rate of 0.4+0.7+0.9 l/ha, protein was 1.6% and 1.3% higher, carbohydrates were 0.9 and 0.7% higher, oil was 1.3 and 1.0% higher, and feed units were 0.03 units higher.

Conclusion. It was found that the protein, carbohydrate, oil, and nutrient content in leaves and roots was higher in the variant where Tandem 10% biostimulant was applied at a rate of 0.4+0.7+0.9 l/ha in the 70x20-1 sowing scheme.

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