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Influence of Plant Growth Stimulants on Sorghum Grain Yield

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Abstract: In the conditions of the Surkhandarya region, the use of growth stimulants Uzgumi and Massuda for obtaining an early and high crop of the repeated culture of sorghum of the Karabash variety was studied. When using the Uzgumi growth stimulator, it is recommended (seed treatment at a rate of 0.6 l/t; spraying the plant in the full-seedling phase of 0.2 l/ha, in the exit phase into the tube 0.3 l/ha, and in the flowering phase 0.4 l/ha) and the use of the Masuda stimulator, seed treatment with a norm of 3.0 l/t; and spraying of the plant in the fullseedling phase of 6.0 l/ha, in the exit phase of the tube 9.0 l/ha) had a positive effect on the growth, development, and yield of sorghum grain.

Keywords: sorghum, stimulant, Uzgumi, Masuda, seed and plant treatment, growth and development, mass of 1000 seeds, yield of sorghum grain.

Global climate change, constant population growth around the globe and industrial development lead to an increase in demand for agricultural products. “Currently, 41.8 million hectares of sorghum are sown in the world, and 66.3 million tons of grain have been harvested.”

However, yields of sorghum under production conditions remain rather low. A high degree of realization of the potential yield of sorghum can be ensured by the introduction of modern scientifically-based technologies for the cultivation of sorghum. One of the most important elements of these technologies is the use of growth regulators - physiologically active substances that affect the vital processes of plants and allow more efficient use of sorghum plants to increase yield, improve product quality, and harvest and storage conditions.

To increase the yield of sorghum, it is necessary to use a growth regulator, which ensures the accelerated appearance of seedlings, an increase in the growth rate of seedlings and plants, and an increase in yield with minimal labor and money. In this regard, the use of physiologically active substances with a wide spectrum of action and ecological purity plays an important role.

The development of cultivation techniques will make it possible to give recommendations on the cultivation of sorghum in the farms of the Surkhandarya region.

The use of growth substances increases the activity of enzymes and the biosynthesis of nucleic acids and proteins, accelerates seed germination, and intensively develops the root system [1] .

K.M.Tadjiev, Sh.Kh.Abdualimov [11] the treatment of sorghum seeds and subsequent spraying of vegetation plants with growth regulators Uzgumi and Matsuda has a stimulating effect on plant growth, increase in dry mass by aboveground organs, and the effect on yield showed a positive effect in comparison with the control.

The use of stimulants for crop development makes it possible in some cases to reduce the amount of applied mineral fertilizers and pesticides, which affects the quality of products [2].

Growth stimulants have a complex effect on the physiological and biochemical processes that occur in the plant. The manifestation of their action in extremely low concentrations allows them to be widely used in agricultural production, and at present their use is of particular relevance [5].

Growth regulators are organic compounds other than nutrients that stimulate or inhibit plant growth. Growth regulators include both natural growth substances and chemical growth preparations used in the processing of agricultural crops [6].

Unfavorable, stressful environmental factors (drought, low and high temperatures) and diseases change the balance of phytohormones in the plant, reduce the intensity of biosynthetic processes, cause various structural and functional changes, which leads to a decrease in the adaptive abilities of plants and their productivity. Treatment with growth regulators increases plant resistance to unfavorable environmental factors, improves the formation of productivity elements, leads to increased yields, improved grain quality and economic indicators of its production [2].

Purpose of the research: - To develop technologies for the use of growth stimulants to obtain an early and high yield of repeated crops of sorghum in the Surkhandarya region. Rational use of land and water resources, increase the volume of food and growing forage grasses, increase economic efficiency by increasing the yield and quality of sorghum seeds.

Research methodology. Experiments studying growth regulators were carried out on takyr - meadow soil of the Surkhandarya experimental station NIISSAVH located in the southern zone of the Surkhandarya region of the Termez region. The soil is non-saline, humus content 0.669-0.597%, total nitrogen 0.059-0.054%, phosphorus 0.124-0.100%, exchangeable potassium 125-125 mg/kg, groundwater occurrence at a depth of 1.5-2.0 m, heavy loamy in texture.

The experiments were carried out in accordance with the recommendations of " Dala Tajribalarini o'tkazish uslublari " (UzPITI Tashkent, 2007) [3], "Methodology of field experiments with cotton" (1981) [9]. Methods of agrochemical , agrophysical and microbiological research in irrigated cotton areas (2005) [10], when using chemicals "Brief guidelines for conducting state tests of plant growth regulators" (1984) [7], "Guidelines for testing insecticides, ascaricides , biologically active substances and fungicides" (1994).

For agrotechnical characteristics of the soil, the content of humus was determined by the Tyurin method, total nitrogen, phosphorus in one sample by burning according to K.E.Ginzburg, M.Sheglova and E.K.Vulfius , the content of nitrate nitrogen by the ionometric method, mobile phosphorus according to B.P.Machigin and exchangeable potassium according to Protasov on a flame photometer.

Statistical processing of experimental data was carried out according to the method of B.A. Dospehova (1985).

In our studies, conducted in laboratory conditions, sorghum seeds of the Karabash variety were treated with complex action growth regulators - Uzgumi and Masuda preparations.

We provide a brief description of the drugs studied. The Uzgumi preparation contains biological active substances, potassium and sodium humates , humic acids and fulvic acids, important amino acids and trace elements, and other natural compounds.

The drug Masuda contains NPK, humic and folic acid salts. The stimulator is liquid, dark-colored light.

Research results. Growth and development are the most important processes in plant life, determining their structure, size and quality of the harvest. Growth is an increase in the size and mass of a plant. Development is qualitative changes in a plant or its individual parts (organs, tissues, cells), which occur during its life.

The growth and development of plants depend on external factors: the intensity and degree of illumination, the length of day and night, the temperature and humidity of the air and soil, the presence of organic and mineral fertilizers.

In our research, observations of plant growth and development were carried out on August 1, September 1, and October 1: plant height was measured, the number of leaves was counted, and the effect of growth regulators on the magnitude of these indicators was studied.

The use of the studied preparations had a positive effect on the growth of sorghum plants (Table 1).

On August 1, September 1, October 1 and November 1, in all variants with the use of preparations, plants with propolis were taller than in variants without treatment. Moreover, the maximum values were noted in variants with the treatment with Uzgumi growth regulators (seed treatment at a rate of 0.6 l/t; spraying plants in the full germination phase 0.2 l/ha, in the tube emergence phase 0.3 l/ha, and in the flowering phase 0.4 l/ha), and in the variant with seed treatment with Masuda stimulant at a rate of 3.0 l/t and spraying plants in the full germination phase 6.0 l/ha, and in the tube emergence phase 9.0 l/ha.

On November 1 , a positive trend was observed. All variants with the use of Uzgumi growth stimulants showed a significant increase in growth. Thus, the maximum height of the plant with rgo was achieved in the Uzgumi variants (seed treatment at a rate of 0.6 l/t; spraying the plant in the phase of full shoots 0.2 l/ha, in the phase of exit into the tube 0.3 l/ha, and in the flowering phase 0.4 l/ha), where it was 221,9 cm, respectively. Whereas, in the control, the growth was 207,2 cm, which is 14,7 see below.

At application of the Uzgumi stimulant (seed treatment at a rate of 0.6 l/t; spraying the plant in the phase of full shoots 0.2 l/ha, in the phase of emergence into the tube 0.3 l/ha) the height of plants with rho reached 214.0 cm , which is 6.8 cm higher than the variant without treatment .

When using the Uzgumi stimulant (seed treatment at a rate of 0.7 l /t; spraying the plant in the full germination phase at 0.2 l/ha, in the tube emergence phase at 0.3 l/ha, and in the flowering phase at 0.4 l/ha), the height of the plants with propolis reached 221.1 cm, which is 13.9 cm higher than the variant without treatment .

When using the Uzgumi stimulant (seed treatment at a rate of 0.7 l/t; spraying the plant in the full germination phase at 0.2 l/ha, in the tube emergence phase at 0.3 l/ha), the height of the plants with rho reached 211.5 cm , which is 4.3 cm higher than the variant without treatment .

When using the Masuda preparation (seed treatment at rates of 2.0; 3.0; 4.0 l/t; spraying the plant in the phase of full shoots 6.0 l/ha, in the phase of emergence into the tube 9.0 l/ha) the height of the plants with rog reached 207.5; 217.9; 211.6 cm, which is higher than the variant without treatment by 0.3; 10.7; 4.4 cm.

Based on the data obtained, it can be concluded that the use of Uzgumi preparations (seed treatment at a rate of 0.6 l/t; spraying the plant in the full germination phase 0.2 l/ha, in the tube

emergence phase 0.3 l/ha, and in the flowering phase 0.4 l/ha) has a stimulating effect on the growth of sorghum plants. It is important to note that not only the use of preparations had an effect, but also the type of preparation itself and its concentration.

Our research has established that treating seeds with growth regulators before sowing, spraying the plant in the phase of full germination, in the phase of tube emergence, and in the flowering phase had a positive effect on the growth, development and yield of sorghum grain.

Table 1. Influence of plant growth stimulators Uzgumi and Masuda on the growth and development of sorghum

No.	Variant of experience	Growth and Development, 1.X I	
		growth height, sm	leaves per plant, pcs.
1	Control without processing	207.2	9.6
2	Uzgumi 0.6 l/t; 0.2; 0.3; 0.4 l/ha	221.9	11.1
3	Uzgumi 0.6 l/t; 0.2; 0.3 l/ha	214.0	11.2
4	Uzgumi 0.7 l/t; 0.2; 0.3; 0.4 l/ha	221.1	11.1
5	Uzgumi 0.7 l/t; 0.2; 0.3 l/ha	211.5	10.8
6	Masuda 2.0 l/t; 6.0; 9.0 l/ha	207.5	10.5
7	Masuda 3.0 l/t; 6.0; 9.0 l/ha	217.9	11.0
8	Masuda 4.0 l/t; 6.0; 9.0 l/ha	211.6	10.3

Grain yield is the main indicator in assessing the studied sorghum cultivation practices (Table 2).

On average (over 3 years), the sorghum yield in the control variant without treatment was 1.83 t/ha.

The maximum yield was noted in the variants when using the Uzgumi preparation: seed treatment at doses of 0.6 l/t, in the phases of full shoots 0.2 l/ha, in the phases of booting 0.3 l/ha, and in the flowering phases 0.4 l/ha, where it amounted to 2,19 t/ha, higher than the control variant (1.83 t/ha), which is 0.3 6 t/ha.

Application of the drug Uzgumi seed treatment in doses of 0.6 l/t in the phases of full germination 0.2 l/ha, in the phases of booting 0.3 l/ha, where it amounted to 2.10 t/ha, higher control variant by 0.27 t/ha.

Application of the drug Uzgumi seed treatment in doses of 0.7 l/t, in the phases of full shoots 0.2 l/ha, in the phases of booting 0.3 l/ha, and in the flowering phases 0.4 l/ha, where it amounted to 2.06 t/ha , higher control variant by 0.23 t/ha.

Table 2. The influence of plant growth stimulators Uzgumi and Masuda on crop yield grain sorghum

No.	Variant of experience	Weight of 1000 seeds, g.	Grain yield, t/ha	Control gain, ±
1	Control without processing	14.6	1,83	-
2	Uzgumi 0.6 l/t ; 0.2; 0.3; 0.4 l/ha	16.2	2,19	0,36
3	Uzgumi 0.6 l/t ; 0.2; 0.3 l/ha	15.8	2,10	0,27
4	Uzgumi 0.6 l/t ; 0.2; 0.3; 0.4 l/ha	15.7	2,06	0,23
5	Uzgumi 0.7 l/t ; 0.2; 0.3 l/ha	15.5	2,02	0,19
2	Masuda 2.0 l/t ; 6.0 ; 9.0 l/ha	15.7	2,09	0,26
3	Masuda 3.0 l/t ; 6.0 ; 9.0 l/ha	15.9	2,11	0,28
4	Masuda 4.0 l/t ; 6.0 ; 9.0 l/ha	15.6	2,08	0,25

HCP $_{05}$ = 0.36 s/ha

Sx = 1.77%

Application Uzgumi preparation seed treatment in doses of 0.7 l/t, in the phases of full shoots 0.2 l/ha, in the phases of booting 0.3 l/ha, where it amounted to 2.02 t/ha, above control variant by 0.19 t/ha.

Masuda preparation (seed treatment at a rate of 2.0; 3.0; 4.0 l/t; spraying plants in the phase of full emergence 6.0; 6.0; 6.0 l/ha and in the phase of tube emergence 9.0; 9.0; 9.0 l/ha) the grain yield was 2.09; 2.11; 2.08 t/ha , which is higher than the option without treatment by 0.26; 0.28; 0.25 t/ha.

The use of preparations that stimulate plant growth had a positive effect on the yield of sorghum plants of the Karabash variety.

One of the important indicators of crop yield formation is the seed productivity of plants, namely the weight of 1000 seeds.

Technological indicators of grain quality include the weight of 1000 seeds, which characterizes the fullness and size of the grain. Improving the nutrition of sorghum plants and the use of growth regulators on seeds and vegetative plants contributes to an increase in these quality indicators.

The highest values of 1000 seed weight were noted in variants using Uzgumi seed treatment at doses of 0.6 l/t, in the phases of full emergence 0.2 l/ha, in the phases of booting 0.3 l/ha, and in the flowering phases 0.4 l/ha , where it amounted to 16.2 g, higher than the control variant (14.6 g), by 1.6 g.

Application of the drug Uzgumi seed treatment in doses of 0.6 l/t phases of full shoots 0.2 l/ha, in the booting phases 0.3 l/ha, where it amounted to 15.8 g, higher control variant by 1.2 g.

When using the Uzgumi preparation , seed treatment is done at doses of 0.7 l/t, in the phases of full emergence 0.2 l/ha, in the phases of booting 0.3 l/ha, and in the flowering phases 0.4 l/ha, where it amounted to 15.7 g, higher control variant by 1.1 g.

Application. Uzgumi preparation seed treatment in doses of 0.7 l/t, in the phases of full shoots 0.2 l/ha, in the phases of booting 0.3 l/ha, where it amounted to 15.5 g, higher control variant by 0.9 g.

When using the Masuda preparation (seed treatment at a rate of 2.0; 3.0; 4.0 l/t; spraying plants in the phase of full emergence 6.0; 6.0; 6.0 l/ha and in the phase of exit into the tube 9.0; 9.0; 9.0 l/ha) the weight of 1000 seeds was 15.7; 15.9; 15.6 g., which is higher than the untreated variant by 1.1; 1.3; 1.0 g.

Conclusions. Treatment of sorghum seeds and subsequent spraying during the growing season of plants with growth regulators Uzgumi and Masuda has a stimulating effect on plant growth, the increase in dry mass of aboveground organs, and the effect on yield showed a positive effect compared to the control.

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