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EFFECTIVENESS OF APPLYING GROWTH REGULATORS TO FINE-FIBER COTTON CULTIVATED UNDER DIFFERENT IRRIGATION REGIMES

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ABSTRACT

The experiment established that when growing under an irrigation regime of 70-75-65%, using the stimulant Uzbiogumin and Immunoactive before sowing seeds and during the growing season, compared to the control, germination increased by 10.5-12.3%, growth and development improved, and the leaf surface area increased during the tillering period by 42.1-49.9-18.6 cm2, flowering - by 136.8-216.2-255.9 cm2, fruiting - by 304.5-414.5-634.5 cm2 depending on the variant.

Introduction

It is well known that in cotton growing, under any soil and climatic conditions, it is essential to develop varieties resistant to various external factors, tolerant to diseases and pests, create a specific agrotechnology for their cultivation, and ensure early, high-yield, and quality harvest.

Currently, in a number of developed countries, under conditions of global climate change, plant growth regulators (PGRs) are widely used in agricultural crops. Plant phytohormones positively influence healthy seedling emergence, intensive growth and development, and regulation of physiological processes by improving enzyme activity, amino acids, nucleic acids, protein biosynthesis, nutrient accumulation and distribution, photosynthesis, respiration, and metabolism, resulting in higher yield and improved fiber quality.

Developing optimal timing and rates for the application of humic-based stimulants to enhance cotton tolerance to environmental stresses and ensure high and quality yields is also considered relevant. Numerous studies worldwide have demonstrated positive effects of stimulants on plants.

According to Garrett Owen W. and Whipker B. [2019. Pp. 245-253], plant growth regulators can accelerate or retard growth, enhance branching, and either hasten or delay flowering.

Plant growth regulators are a group of substances capable of altering plant growth patterns and can be applied to improve plant growth and productivity [Jun L.Y., Feng Z.X., Anjum S.A., Xuan S.L. 2018. Pp. 49-54].

Abiotic stresses are increasing at an alarming rate worldwide [Rupal Sh., Raval K.R., Saraf M., 2020. Pp. 101435-101442; Teboho N., Malebe M., Tugizimana F., 2022. Pp. 2482-2503].

Carlos J. Fernandez [2007. Pp. 965-979] reported that when cotton was irrigated twice by conventional methods and twice by sprinkler irrigation with the application of nitrophenolate and chaperone stimulants, yield increased and fiber quality improved.

A. Dantas, J. Queroz, E. Vieira, V. Almeida [2012. P. 1] found that when gibberellic acid was applied at 3.2 ml/ha and Stimulate biostimulant at 24.0 ml/ha to various crops, plant growth improved, roots became longer and stronger, and dry matter increased.

According to Sh. Karimov [2011; Pp. 140-141], applying new stimulants of different compositions to cotton seeds before planting and during the vegetation period positively influenced the number and surface area of leaves, optimized photosynthesis, enhanced disease resistance, and enabled higher yields.

B. Myrzakhmetova [2012; P. 5] noted that humic acids consist of complex micro and macro elements essential for plants, improving physiological processes and metabolism.

In experiments by K.M. Tadjiev et al. [2025; Pp. 13-15], when fine-fiber cotton seeds were treated with UzGumi stimulant at 0.7 l/t before planting, seedling emergence increased by 9.3–12.1% compared to the control and occurred 1–2 days earlier.

Sh. Karimov [2012; Pp. 156-158] found that applying new stimulants to seeds before planting and during the squaring stage increased dry matter, leaf area, and net photosynthetic productivity compared to the control.

J.C. Firmino et al. [2017; Pp. 270-278] reported that applying various acids at different rates to cotton improved leaf development, photosynthesis, and metabolism.

According to Sh. Karimov [2017; P. 37], pre-sowing seed treatment with new stimulants accelerated germination by 2–3 days and positively influenced leaf area and net photosynthetic productivity.

F. Hasanova, B. Niyazaliev et al. [2014; P. 6] stated that foliar feeding of cotton with humic-based stimulants rich in macro and microelements improved growth and development, increased leaf number and weight, enhanced photosynthesis, and ultimately resulted in higher yields.

F. Teshayev, Sh. Abdualimonov, B. Niyazaliev, F. Hasanova [2019; Pp. 5-6] emphasized the importance of applying biostimulants during the squaring and flowering stages in cotton fields in our Republic, as it accelerates plant development, optimizes water and nutrient use, increases tolerance to external stress factors, and most importantly, enables early maturation of late cotton varieties, increasing yield by 10–20%. Recommended application rates include UzGum (0.3–0.4 l/ha), Fitovak (200–400 ml/ha), Zamin (2.0 l/ha), and Baikal (3.0 l/ha), diluted in 200–300 liters of water for spraying.

Sh. Abdualimonov [2019; pp. 2; 5–6] recommended applying Uzgumi at 0.4 L/ha, Baikal at 3.5 L/ha, and retardants such as Entogen at 90–100 g/ha at the 11–12 fruiting branch stage of cotton to accelerate growth and development, maintain and increase yield, enhance heat tolerance, and reduce fruit shedding.

N. Q. Rajabov [2012; p. 4] reported that under the conditions of typical gray soils in the Tashkent region, the optimal irrigation regime for the S-6541 cotton variety was 70-70-60% of field moisture capacity, which ensured high and quality cotton yield.

Sh. Abdualimonov and F. Shamsitdinov [2019; pp. 39–42] found that when cotton seeds were treated with Albite and Gummi-20 stimulants before sowing and during the growing period, germination accelerated by 3–4 days, producing healthy seedlings. The cotton plants absorbed macro- and microelements better, improved resistance to diseases and pests, and as a result, cotton yield increased by 4.7 centners/ha, with an overall growth improvement of 2.7–11.5%.

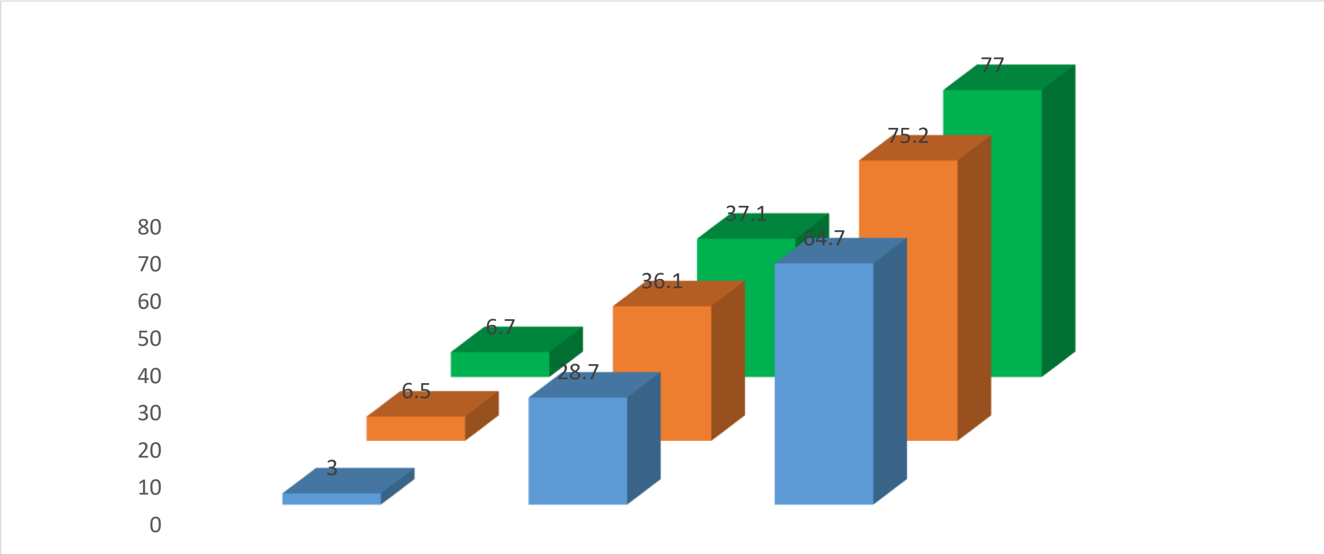
Research methods. Field experiments, laboratory analyses, and phenological observations were conducted based on the "Manual on Conducting Field Experiments." Methodological guidelines for testing insecticides, acaricides, biologically active substances, and fungicides were used, and the net photosynthetic productivity was determined using the N.N.Tretyakov method. Statistical analysis of the obtained results was performed using Microsoft Excel based on the B.A. Dospekhov method.

Research results. In the experiment, the effect of applying plant growth regulators under different irrigation regimes on the germination, growth, development, and leaf area of fine-fiber cotton seedlings was studied.

In the control variant, 64.7% of the seeds germinated, while pre-sowing seed treatment with the Uzbiogumin stimulant at a rate of 0.8 L/t resulted in 75.2% germination, which is 10.5% higher compared to the control. When the seeds were treated with the Immunoactive stimulant at a rate of 30 ml/t before sowing, germination reached 77.0%, which is 12.3% higher than the control.

It was also found that in variants where seeds were treated with stimulants before sowing, germination occurred 1–2 days earlier than in the control (Table).

It can be concluded that pre-sowing seed treatment with stimulants accelerated germination by 10.5–12.3% and ensured earlier emergence by 1–2 days.



Effect of Stimulants on Cotton Seed Germination, in Percentage, 2024

1.16.04. 2.18.04 3.20.04

Field Germination of Cotton Seeds

In our research, fine-fiber cotton was irrigated according to the irrigation schedule of 70–75–65% of ChDNS (Calculated Daily Net Soil Moisture), and the effect of applying plant growth regulators (PGRs) on its growth and development was studied (Table).

When growth and development were evaluated in September, it was observed that when Uzbiogumin stimulant was applied to seeds before sowing and during the squaring, flowering, and boll formation stages, the plant height reached 75.5 cm, the number of fruiting branches was 18.4, and the number of bolls was 17.5. Compared to the control, plant height was 5.3 cm higher, the number of fruiting branches increased by 1.9, and the number of bolls increased by 1.1.

When Immunoaktiv stimulant was applied to seeds before sowing and during the squaring, flowering, and boll formation stages, plant height reached 75.5 cm, the number of fruiting branches was 18.7, and the number of bolls was 17.8. Compared to the control, plant height increased by 5.8 cm, fruiting branches by 2.2, and bolls by 2.4.

When stimulants such as Foral BMO, Ekosil, and Brentax KCA were applied to seeds before sowing and during the squaring, flowering, and boll formation stages, plant height reached 75.7 cm, the number of fruiting branches was 19.0, and the number of bolls was 17.7. Compared to the control, plant height increased by 6.0 cm, fruiting branches by 2.5, and bolls by 1.3 (Table 1).

(1 table)

Effect of Plant Growth Regulators on the Growth and Development of Fine-Fiber Cotton (September 2024))

№	Experimental Variants	Heigh, cm	Fruiting branch, pcs	Number of bolls, pcs
1	Control	69,7	16,5	15,4

2	Uzbiogumin 0.8 L/t, 0.4–0.5–0.6 L/ha	75,0	18,4	17,5
3	Immunoactive 30 mL/t, 30–30–30 mL/ha	75,5	18,7	17,8
4	Foral BMO, Ekosil, Brentax KSA 1.0+1.0 L/ha, 1.0+1.0 L/ha, 0.5+1.0 L/ha	75,7	19,0	17,7

In the experiment, the effect of applying plant growth regulators (PGRs) on the photosynthetic activity of fine-fiber cotton was determined.

It was found that under different irrigation regimes, the application of PGRs during the development stages of cotton positively influenced the change in the number and weight of leaves per plant.

When cotton was irrigated at 70–75–65% of ChDNS (Calculated Daily Net Soil Moisture) and no stimulants were applied (control), the number of leaves per plant during the squaring stage was 8.6. In contrast, when treated with Uzbiogumin, the number of leaves reached 10.5; with Immunoactive, 10.8; and with the combined application of Foral BMO, Ekosil, and Brentax KCA, it was 9.5.

Compared to the control, the number of leaves per plant during the squaring stage increased by 1.9 with Uzbiogumin, by 2.2 with Immunoactive, and by 0.9 with Foral BMO, Ekosil, and Brentax KCA.

The effect of pre-sowing seed treatment and in-season application of stimulants on changes in leaf area was also determined under irrigation at 70–75–65% of ChDNS (Table).

In the control variant (without stimulants), the leaf area during the squaring stage was 196.4 cm², during flowering 2285.3 cm², and during boll formation 3047.9 cm².

When Uzbiogumin was applied before sowing and during the vegetative stages, the leaf area was 238.5 cm² during squaring, 2422.1 cm² during flowering, and 3352.4 cm² during boll formation, which is 42.1 cm², 136.8 cm², and 304.5 cm² greater than the control, respectively.

When Immunoactive was applied before sowing and during the vegetative stages, the leaf area was 246.3 cm² during squaring, 2501.5 cm² during flowering, and 3462.4 cm² during boll formation, exceeding the control by 49.9 cm², 216.2 cm², and 414.5 cm², respectively.

2-table

Effect of Stimulants on Leaf Area of Fine-Fiber Cotton

№	Experimental Variants	Flower Bud Formation Stage			Flowering Stage			Boll Formation Stage		
		Leaf Area per Cotton Plant, см^2	Number of Leaves per Cotton Plant, pcs	Weight of One Leaf, g	Leaf Area per Cotton Plant, см^2	Number of Leaves per Cotton Plant, pcs	Weight of One Leaf, g	Leaf Area per Cotton Plant, см^2	Number of Leaves per Cotton Plant, pcs	Weight of One Leaf, g
1	Control	196,4	8,6	0,8	2285,3	21,4	1,3	3047,9	25,2	1,5
2	Uzbiogumin	238,5	10,5	1	2422,1	26,1	1,6	3352,4	30,7	1,8
3	Immunoactive	246,3	10,8	1	2501,5	27	1,6	3462,4	31,8	1,9
4	Foral BMO, Ekosil, and Brentax KCA	215	9,5	0,9	2541,2	27,4	1,6	3682,2	33,8	2

When cotton was irrigated at 70–75–65% of ChDNS and treated with Foral BMO, Ekosil, and Brentax KCA during the squaring and boll formation stages, the leaf area per plant was 215.0 cm² at the squaring stage, 2541.2 cm² at flowering, and 3682.2 cm² at boll formation, which exceeded the control by 18.6 cm², 255.9 cm², and 634.5 cm², respectively. In conclusion, it can be stated that pre-sowing treatment of fine-fiber cotton seeds with Uzbiogumin at a rate of 0.8 L/t and Immunoactive at 30 mL/t accelerated seedling emergence by 10.5–12.3% compared to the control, improved growth and development, and significantly increased leaf area during the growth stages. Specifically, compared to the control, the increase in leaf area ranged from 42.1–49.9–18.6 cm² at squaring, 136.8–216.2–255.9 cm² at flowering, and 304.5–414.5–634.5 cm² at boll formation, depending on the variant.

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