Scientific Basis of Use of Humin-Based Stimulants in Cotton

Fayzulla Abdullaev*, *Shuhrat* Abdualimov, and *Sharofiddin* Karimov

Cotton Breeding, Seed Production, and Agrotechnologies Research Institute, Tashkent, Uzbekistan

Abstract. In our republic, biostimulants are important in growing high and quality crops from agricultural crops. Special attention is being paid to uniform harvesting of seeds, improvement of disease tolerance and improvement of cotton growth and development, as well as high and high-quality cotton yield and wide introduction. Humic stimulants are ecologically friendly, economically cheap and innovative. Nowadays, in world practice, the scale of using humus-based stimulants is increasing in order to increase soil fertility and the efficiency of using nitrogen and phosphorus fertilizers, to accelerate the growth and development of plants. In the conditions of typical gray soils of Tashkent region, humic-based stimulators before sowing seeds, when used in the optimal period and norms, the germination of seedlings is accelerated by 10-15%, and when processed in the optimal period and norms of cotton during the 2-3 Chinese leaves, combing and flowering periods, the growth and development of the plant improves, physiological as a result of the acceleration of the processes, it was found that the cotton yield increased by 4.0-6.0 tons/ha. Key words: Uzgumi, Relect, Geogumat, Fitavak and Obereg stimulants, seed germination, plant height, crop branch, cob, flower, boll, leaf, cotton yield.

1 Introduction

Today, 31.8 million cotton crops are grown in the world. 24.9 mln. more than tons of cotton fiber is grown. In 2017-2018, according to the volume of cotton fiber cultivation in the world, India (6205.0 thousand t), China (5987.0 thousand t), USA (4555.0 thousand t), Brazil (1894.0 thousand t), Pakistan (1785, 0 thousand t), Australia (1045.0 thousand t), Turkey (871.0 thousand t) and Uzbekistan (838.0 thousand t) are leading. In these countries, using innovative technologies in the cultivation of cotton, a high and high-quality harvest is achieved [1-4].

In a number of developed countries of the world, in the conditions of global climate change, physiologically active substances-stimulants are widely used in agricultural crops [5-9].

In this case, plant phytohormones ensure healthy germination, rapid growth and development of seedlings, control physiological processes, improve the activity of enzymes, amino acids, nucleic acids, protein biosynthesis, accumulation and distribution of nutrients,

* Corresponding author: abdullayevf80@mail.ru

photosynthesis, respiration, and metabolism, and are positive for growing a high-quality crop. affects [10-12].

Increasing the resistance of cotton to external environmental influences, developing the optimal period and standards for the use of humic-based stimulators in growing high-quality crops is also relevant [13-17].

Sh.Abdualimov [18] concluded that one of the effective and convenient methods of growing high and high-quality crops from cotton in our republic is the use of growth regulators based on many years of scientific research conducted in different soil and natural climate conditions.

F. Kalinin, Yu. Merezhinsky [19] stated that physiologically active substances play an important role in increasing the fertility and germination of agricultural crops, accelerating the ripening of the crop, and increasing the plant's resistance to drought, salt, disease and pests.

2 Materials and methods

Research in field conditions was carried out according to the manual "Methods of conducting field experiments" [20]. The obtained data were analyzed mathematically by the method of B.A. Dospekhov [21].

Also, during the period of use of chemicals, "Brief methodical instructions for state testing of growth regulators" (Moscow, 1984) and "Methodological instructions for testing insecticides, acaricides, biologically active substances and fungicides" [22] were used.

In 2012-2014, the effectiveness of the Uzgumi stimulator in cotton was studied, and tests were conducted on the cotton variety "Andijan-37". In 2018-2020, Geogumat stimulator was studied on the cotton variety "Andijan-37", and Relect stimulator was studied on the UzPITI-103 cotton variety in 2019-2021. The variants of the gumin-based Uzgumi, Relect Geogumat, Fitavak and Obereg stimulators used in the experiments were 25 m long and 2.4 m wide, and were placed in a randomization method in three iterations. different norms were studied. 0.6 per seed with Uzgumi for research; 0.7; and 0.8 l/t, Relect stimulator was treated and planted at the rate of 200-300-400 ml/t and Geogumat stimulator at 1.0 l/t. Cotton was treated with stimulators as follows: 0.3 l/ha during the budding period and 0.4 l/ha during the flowering period. and 400 ml/ha in the period of mass pruning, 1.6 l/ha in the period of 2-3 pine leaves, 1.6 l/ha in the period of pruning and 1.6 l/ha in the period of flowering with a hand-held sprayer. 300 l/ha during the period of 2-3 true leaves, 6-8 true leaves, 400 l/ha during the flowering period and 300-200 ml/ha of Fitavak seed, 300-400 ml/ha during the flowering period and Obereg 1 ,0-1.5 l/t was mixed with water at the rate of 10.0 ml/ha at the rate of 500 l/ha during flowering and sprayed on the cotton in the form of a working solution.

3 Results and discussion

3.1 Germination of the seed

According to K. Tadjiev [23], hairy and hairless seeds were treated with Vitavaks 200 FF at the rate of 5 l/t, the germination of seedlings was accelerated, and it had a positive effect on growth and development.

In the experiment, Uzgumi stimulator had a positive effect on seed germination in field conditions. For example, according to the results of 2013, 76.3% of sprouts germinated in the control option, and 89.2-90.4-86.7% when Uzgumi stimulator was used at 0.6-0.7-0.8 l/t and 10.4-12.9-14.1% acceleration compared to the control was found (Table 1).

Sh. Abdualimov [24] showed high productivity when treated with Uzgumi stimulator at the rates of 0.7-0.8 l/t before planting in the conditions of Tashkent and Jizzakh regions.

In the next experiment, in spite of unfavorable weather conditions, when Relect stimulator was applied to the seed at 300-400 ml/ha before planting, the seed germination was 69.6-70.2%, and it ensured early germination by 10.5-11.1% compared to the control. It can be seen that regardless of how much oil the year is and the air temperature is low, favorable conditions for seed germination were created if Relect stimulator was applied to the seed at 300-400 ml/t.

Table 1. Effect of Uzgumi stimulator on seed germination rate under field conditions, 2013

№	Experience options	Seed processing standard	Germination rate, %				Difference from control, %
			4.05	6.05	8.05	10.05	
1	Control	-	49,8	62,2	71,9	76,3	-
2	An example	-	59,8	73,1	79,1	80,3	4,0
3	Dalbron (benchmark)	6,5 kg/t	52,2	66,3	79,5	79,5	3,2
4	Gumimaks (standard)	0,8 l/t	44,6	69,1	76,7	84,3	8,0
5	An example	0,6 l/t	66,7	81,5	86,3	89,2	12,9
6	An example	0,6 l/t	60,2	70,7	81,1	85,5	9,2
7	An example	0,7 l/t	46,2	62,7	75,9	90,4	14,1
8	An example	0,7 l/t	60,2	75,9	87,6	87,6	11,2
9	An example	0,8 l/t	63,9	72,3	82,3	86,7	10,4
10	An example	0,8 l/t	59,8	79,1	82,7	83,5	7,2
11	Uzgumi+sus-ya (urea)	-	57,0	69,9	66,3	83,5	7,2
12	Grape+insecticide	-	41,8	71,5	75,5	83,5	7,2

When applying 0.7l/t to the seed with Uzgumi stimulator and 200 ml/ha with Relect stimulator, we can see that seed germination was 69.0-68.5% and 9.6-9.9% faster than the control (Fig. 1).

(2021) in the control option, 70.2% sprouts emerged, while in the options where Relect stimulator 300-400 ml/t was used, the germination of sprouts was 78.9-82.5% and provided an increase of 8.7-12.3% compared to the control option.

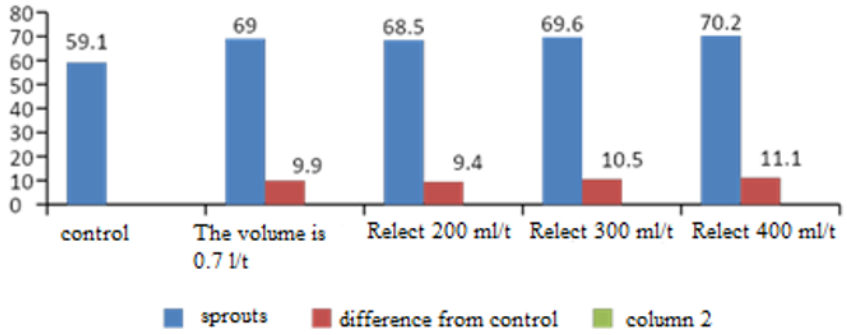

Fig. 1. Germination rate of sprouts when relect stimulator is applied to the seed before planting, cotton variety uzpiti-103, tashkent 2020.

(2022) 64.9% of seedlings germinated in the control variant when the oil was applied in March and April, and 76.7-77.5% of the seedlings were germinated in the variants using the Relect stimulator 300-400 ml/t, which is 11.8% compared to the control variant. provided an increase of -12.6%.

When the seeds were treated with another humin-based stimulator Geohumat at the rate of 1.0 l/t, it was found that the sprouts germinated in the field were 68.2-75.7%, which was 8.1% higher than the control option (Table 2).

Table 2. Effect of Geogumat stimulator on seed germination, Andijan-37 variety of cotton, Tashkent 2019

№	Experience options	Rate of application to soil and seed before planting, kg/ha	Germination rate of seedlings, %				Difference from control
			14.05	17.05	20.05	22.05	
1	Control	-	6,0	11,4	55,0	67,6	-
2	An example	0.7 l/t	9,6	16,8	69,1	77,2	9,6
3	Geogumat	1,0 l/t	8,7	15,6	64,9	75,7	8,1
4	Geogumat	1,0 l/t +500 kg/a	8,1	18,6	52,9	68,2	0,6

Therefore, it was observed that the germination rate of seeds treated with humin-based Uzgumi, Geogumat and Relect stimulants in different natural climatic conditions was 10-15% higher and healthy growth of young seedlings.

When Fitavak and Obereg stimulators were applied to the seed before planting, the germination rate of the seeds was 78.7% in the control, this indicator was 94.2 in Sodium humate 30% paste, Obereg' 91.2-94.6 at the rate of 1.0 ml/t, Obereg' 1, It was noted that it was 86.9-88.2 at the rate of 5 ml/t, 88.8-90.4% in Fitovak and 8.2-15.9% higher than the control.

3.2 Growth and development of cotton

G. Kholov [25] 4 with humus preparation for seed in conditions of dark gray soils of the Republic of Tajikistan; 8; When processed at the rate of 12 kg/t, the height of the cotton grew 17.7-23.9 cm, the yield elements were shed 8.6-11.0% less, the number of bolls increased by 2.2-2.9, the opening was 3.6 -5.6% accelerated and a higher yield of 3.3-4.8 t/ha was obtained.

In our experience, the height of the cotton on June 1 is 8.0-10.2 cm according to the options, when the 2013 vintage is treated at the rate of 0.6-0.8 l/t for seed and 0.3-0.4 l/ha during the flowering-flowering period. the number of true leaves is 3.2-3.9 pieces, on July 1, the plant height in the control is 30.1 cm, the yield branch is 5.8 pieces, in the variant treated with Dalbron, the height is 29.1 cm and the number of harvest branches is 5.7 pieces, In the Gumimaks stimulator, the length of the cotton is 30.4 cm and the number of harvest branches is 5.8 pieces. In the 5-12 options treated with Uzgumi at different rates, the length of the cotton is 33.4-34.4 cm, the number of harvest branches is 6.6 pieces, the number of combs is 5, It was equal to 9-6.1 grains. That is, Uzgumi had a positive effect on the growth of cotton, the formation of crop branches and the accumulation of crop elements, and compared to the control, the length of cotton increased by 4.3 cm and the number of crop branches increased by 0.8.

At the end of the growing period of cotton, during the period of boll ripening, the plant height was 73.2 cm in the control, the yield branches were 12.8 pieces, and the number of bolls was 7.9 pieces, while in Dalbron these indicators were 77.8 cm, 13.4 pieces, and 8.5 bolls, respectively. pieces, 79.3 cm, 13.9 and 9.2 pieces in Gumimaks, 79.8-80.2 cm, 13.8-13.9 pieces, 8.7 pieces in variants treated with Uzgumi at different standards. Compared with the parameters of the control option, the height of the plant was 7.0 cm, the yield branches were 1.1 units, and the number of pods was 0.8 units higher.

In the experiments of Sh.Abdualimov, Sh.Karimov [26], when Fitovak, Natriy humat and Obereg' stimulators were tested on large areas, the germination of seedlings accelerated, the height of the cotton was 7.5-9.1 cm, the yield branches were 1.0-1.7 grains , the number of pods increased by 2.1-2.6 pieces, and the additional yield was 4.4-5.4 tons/ha.

When treated with the Relectstimulator tested by us at the rate of 300-400 ml/t per seed, 200 ml/ha during the leaf period and 400 ml/ha during the tillering period, the length of the cotton was 10.8-11.3 cm according to the options on June 1, the number of true leaves was 3.7- 3.6 pieces, on July 1 plant height in control is 22.1 cm, harvest branch 4.5 pieces, in 3-4 options treated with Relect at the rates of 300-400 ml/t, cotton height is 27.2-28.6 cm, harvest branches the number was 5.1-6.0 pieces, the combs were equal to 3.2-4.3 pieces. That is, the Relect stimulator had a positive effect on the growth of cotton, the formation of crop branches and the accumulation of crop elements, and compared to the control, the height of the plant increased by 5.1-6.5 cm, and the crop branches increased by 0.6-1.5 pieces.

At the end of the cotton growth period, during the ripening period of bolls (1.09), the plant height is 60.6 cm in the control, the yield branches are 9.6 pieces, the number of bolls is 6.7 pieces. ha and when used at the rate of 400 ml/ha during the flowering period, the height of the plant was 68.5 cm, the yield was 11.2 pieces, and the pods were 8.3 pieces. Compared with the parameters of the control option, the height of the plant was 7.9 cm, the number of seeds was 1.6, and the number of pods was 1.6.

According to Sh.Kh.Abdualimov, S.Sh.Rashidova, Kh.D.Akhmedova [27], when cotton seeds of the Okdarya-5 variety are treated with T-86, Nitrolin, Tj-85 and XS-2 substances, field fertility increases, growth and development accelerated, positive effects on leaf surface, cotton yield and fiber quality were determined.

F. Khasanova, Sh. Abdualimov, B. Niyazaliev [28] combined with moistening of seeds before planting, Gumimax stimulator 0.8-1.0 l/t, Uzgumi 0.7-0.8 l/t, Fitavak 200-300 ml /t, when Albit is processed at the rate of 50-75 ml/t, its tolerance to extreme conditions such as drought, low temperature, and heat is increased, it grows if it is mixed with urea mineral fertilizer at the rate of 5-7 kg/ha during the budding and flowering periods of cotton and sprinkled as a suspension development improves, productivity increases by 10-15%.

Also, when treated with Geohumat stimulator at the rate of 1.0 l/t before planting the seed and Bactofert 500 kg/ha before planting the soil, the height of cotton on June 1 is 7.3-8 according to the options ,3 cm, the number of true leaves is 2.1-2.3 pcs., on July 1, the plant height in the control is 32.7 cm, and the yield branch is 4.6 pcs. when 1.6 l/ha was applied during the budding and flowering periods, the height of the plant was 33.9 cm, the number of branches of the crop was 4.6 pieces, and the combs were equal to 4.6 pieces.

At the end of the growing period of cotton, during the ripening period of bolls, the plant height was 98.1 cm, the yield branches were 15.6 pcs., and the number of bolls was 8.8 pcs. Geogumat and Baktofert stimulants were applied to the seed before planting, 1.0 l/t, 500 kg/soil ha, when cotton was used at the rate of 1.6 l/ha during the growing season, the plant height was 102.8 cm, the number of branches was 16.4, and the number of bolls was 9.8. Compared with the parameters of the control variant, the height of the plant was 4.7 cm, the yield was 0.8 pieces, and the number of pods was 1.0 pieces higher.

3.3. Effects of humin-based stimulants on cotton yield

Sh.Abdualimov [29] conducted studies in adverse natural climatic conditions when treated with physiologically active substances such as T-86, Roslin, Nitrolin, TJ-85, XS-2, Oxygumat, Vitavaks 200FF, germination and growth of seedlings, found that the number and surface of leaves, photosynthesis productivity and productivity increased. Sh.Karimov, Sh.Abdualimov [30] Obereg 1.0 ml/t and 10.0 ml/ha, Fitovak 200 ml/t and 400 ml/ha, Sodium humate stimulator 2.2 kg for seeding and cotton during the flowering and flowering periods When /t was used in the norms, germination of seedlings was accelerated and the number of bolls increased by 1.0-2.0 pieces, cotton yield and economic efficiency were achieved.

Sh.Karimov [31] stated that Obereg, Sodium humate and Fitovak stimulants increased the number of leaves and their surface in cotton, and as a result had a positive effect on the optimal course of photosynthesis. This increased resistance to wilt disease and resulted in 7.3-13% higher cotton yield. When Uzgumi stimulator is applied to the seed in different rates before planting, it has a positive effect on the cotton yield as a result of the acceleration of germination of seedlings and the improvement of plant growth when applied at the rate of 0.3-0.4 l/ha during the budding-flowering period. For example, 38.1 t/ha of cotton was obtained in the control option, 39.6 t/ha in the option treated with Dalbron, 42.3 t/ha when Gumimax was used, and 42.9-43.1 when treated with Uzgumi at different rates and periods. ts/ha crop was grown. Cotton yield increased by 1.5 t/ha in Dalbron, 4.2 t/ha in Gumimax, and 4.8-5.0 t/ha in Uzgumi compared to the control. It was observed when cotton was treated at the rates of 0.3-0.4 l/ha during the flowering period (Table 3).

Table 3. Effect of grape stimulator on boll weight and cotton yield, 2013 year

№	Experience options	Standard for seed and cotton processing	Bag weight, g	Cotton yield according to returns, ts/ha			Average cotton yield, ts/ha	Additional yield compared to the control, ts/ha
				I	II	III		
1	Control	-	5,7	38,7	37,7	38,0	38,1	-
2	Uzgumi	0,3-0,4 l/ha	5,9	42,3	40,7	40,0	41,0	2,9
3	Dalbron	6,5 kg/t	5,8	39,7	39,0	40,1	39,6	1,5
4	Gumimaks	0,8 l/t, 0,3-0,3 l/ha	6,1	41,3	42,7	43,0	42,3	4,2
5	Uzgumi	0,6 l/t	6,0	41,7	40,7	40,0	40,8	2,7
6	Uzgumi	0,6 l/t, 0,3-0,4 l/ha	5,9	41,0	41,3	42,6	41,6	3,6
7	Uzgumi	0,7 l/t	6,0	40,8	41,3	42,0	41,4	3,3
8	Uzgumi	0,7 l/t, 0,3-0,4 l/ha	6,1	42,4	43,3	43,6	43,1	5,0
9	Uzgumi	0,8 l/t	5,9	42,0	41.7	42,8	42,2	4,1
10	Uzgumi	0,8 l/t, 0,3-0,4 l/ha	6,1	43,7	42,7	42,3	42,9	4,8
11	Uzgumi	-	5,9	40,3	41,0	42,0	41,1	3,0
12	Uzgumi	-	5,9	41,0	39,3	42,0	40,8	2,7
HCP_{05}=1,39 ts/ga, HCP_{05}=3,36 %								

300-400 ml/ha was applied to the seed with a relect stimulator, 200 ml/ha during the 2-3 leaf period and 400 ml/ha during the tillering period, and the soil moisture was 65-70-65% relative to ChDNS. was 0.3 g heavier than the control. When cotton was irrigated in the order of 70-75-65%, it was found that boll weight increased by 0.2 g in the variant where the Relect stimulator was used (Table 4).

In the 2020 experiment, when Relect stimulator was applied at the rate of 300-400 ml/ha before sowing, 200 ml/ha during the 2-3 leaf period and 400 ml/ha during the tillering period, the soil moisture was 65-70-65% compared to ChDNS, and control when cotton was watered. in the option, the yield was 26.4 t/ha, in the options where the Relect stimulator was used, the cotton yield was 30.8-32.6 t/ha, compared to the control option, in the options where the Relect stimulator was used, the yield was 4.4-6.2 t/ha more received.

When cotton soil moisture is irrigated in the order of 70-75-65% in relation to ChDNS, the cotton yield is 35.0 in the options where the Relect stimulator is used at the rate of 300-400 ml/ha before planting, 200 ml/ha during the 2-3 leaf period, and 400 ml/ha during the tillering period. -35.5 ts/ha, in the control variant it was 29.4 ts/ha, and in the variants using the Relect stimulator, an additional yield of 5.6-6.1 ts/ha was achieved. In 2021, an additional yield of 4.1-5.4 t/ha was obtained in the Relect stimulator, and 3.1 t/ha in Uzgumi compared to the control variant. In the conditions of the Surkhandarya region, 6.3 t/ha in 2020, 4.2 t/ha in 2021 additional yield was achieved.

Table 4. Effect of relect stimulant on cotton weight per bag and cotton yield, UzPITI-103 cotton variety, 2020

№	Experience options	The rate of application to the seed and during the growing season	Weight of one bag, g	On returns, ts/ha			Average yield, ts/ha	Additional crop	
				I	II	III		ts/ha	%
Watering procedure according to ChDNS 65-70-65%									
1	Control	-	4,6	25,6	27,0	26,4	26,4	-	-
2	Uzgumi	0,7 л/т, 0,3-0,4 л/га	4,9	28,6	29,3	29,6	29,2	2,8	110,6
3	Relect	200мл/т, 200-200-400мл/га	4,5	30,6	29,0	29,3	29,3	3,1	110,9
4	Relect	300 мл/т, 200-200-400 мл/га	4,6	31,9	30,6	30,3	30,8	4,4	116,7
5	Relect	400 мл/т, 200-200-400 мл/га	4,9	33,2	32,0	32,6	32,6	6,2	123,4
Суғориш тартиби ЧДНС нисбатан70-75-65%									
6	Control	-	4,8	29,3	29,3	29,7	29,4	-	-
7	Uzgumi	0,7 л/т, 0,3-0,4 л/га	4,9	31,6	31,3	31,3	31,4	2,0	106,8
8	Relect	200мл/т, 200-200-400мл/га	4,9	33,9	34,3	35,0	34,4	4,7	117,0
9	Relect	300 мл/т, 200-200-400 мл/га	4,8	35,0	34,9	35,3	35,0	6,2	119,0
10	Relect	400 мл/т, 200-200-400 мл/га	5,0	35,3	36,0	35,0	35,5	6,1	120,7
HCP_{05}=1,03 ts/ga, HCP_{05}=3,26%									

300-400 ml/ha of relect stimulator before sowing, 200 ml/ha after 2-3 ginseng leaves and 400 ml/ha during the tillering period, and when soil moisture is 65-70-65% relative to ChDNS, the weight of cotton in one sack is 0.3 g ha and provided an additional yield increase of 4.4-6.2 ts/ha.

In the order of 70-75-65% of irrigation, the Relect stimulator, when used in the optimal period and norms, made it possible to increase the weight of one pod by 0.2 g and the additional yield by 5.6-6.1 t/ha.

In the research of Sh. Abdualimov, Sh. Karimov [32], when the Biodux stimulator was applied at the rate of 3.0 ml/t before planting the seed and 2.0 ml/ha during the development period during the flowering and flowering periods, the germination of seedlings was accelerated by 10.1-13.3% , the growth and development of the plant accelerated, 44.0 tons of cotton per hectare were grown, and an additional yield of 4.7 tons/ha was achieved compared to the control.

In the experiment with geohumate, the cotton yield of 23.9-30.8 t/ha was obtained in the first harvest according to the options, while the weight of the second harvest was 9.3-10.1 t/ha. In this case, it should be noted that in the options where Geogumat and Uzgumi stimulators were used, 4.3-6.9 t/ha more cotton was harvested in the first harvest and 0.3-0.8 t/ha in the second harvest and (Table 5).

Table 5. Effect on cotton yield when Geohumat stimulator is used, Andijan-37 variety, Tashkent 2019

№	Options	Application rate to the soil before planting, kg/ha	Harvest by terms		Total yield, ц/га	Additional yield, ts/ha
			1	2		
1	Control		23,9	9,3	33,2	-
2	Uzgumi	0,7 l/t, 0,3-0,4 l/ga	28,2	9,6	37,8	4,6
3	Geogumat	1,0 l/t, 1,6-1,6-1,6 l/ga	30,8	9,0	39,8	6,6
4	Bactofert	500 kg/ga	29,5	9,7	39,3	6,1
5	Geogumat + Bactofert	1,0 l/t, 1,6-1,6-1,6 l/ga+500 kg/ga	28,5	10,1	38,6	5,4
HCP_{05}=2,2 ts/ga, HCP_{05}=5,1%						

In the experimental options, the total cotton yield was 33.2 t/ha in the control option, 37.8 t/ha when Uzgumi stimulator was used, 38.6-39.8 t in the options used when Geogumat and Baktofert were applied to the seed and soil, and in the tillering-flowering periods. /ha, an additional 5.4-6.6 ts/ha yield was achieved compared to the control option. In the variant where the crop stimulator was used, an additional yield of 4.6 t/ha was obtained compared to the control. 1.5 ml/t on the seed with Obereg, 30.4 t/ha when treated with 10 ml/ha during the planing period, 31.9 t/ha when sprayed with Fitovak 200 ml/t on the seed and 400 ml/ha during the planing period.

4 Conclusion

0.7-0.8 l/t before sowing seeds with Uzgumi and 0.3-0.4 l/ha during the flowering-flowering periods, 300-400 ml/ha before sowing seeds with Relect stimulator. t, 200 ml/ha during the budding period and 400 ml/ha during the tillering period, 1.0 l/t with Geohumat to the seed, 1.6 l/ha during the tillering, tillering and flowering periods of cotton, the germination of

seedlings is accelerated by 10-15%, the growth and development of the plant accelerated, the crop elements formed more and the number of bolls increased by 1.0-2.0 grains, the yield was higher than cotton by 4.0-6.0 t/ha. Based on this, it is recommended to farmers and cotton agroclusters to use Gumin-based stimulants in the above-mentioned norms for seeding and during cotton vegetation in order to grow high quality cotton crop in the conditions of Tashkent region.

References

1. B.A. Voronin, I.P. Chupina, Ya.V. Voronina, V.S. Kukhar, N.N. Simachkova. About agricultural products, raw materials and food with improved characteristics (scientific commentary on the Federal Law). IOP Conference Series: Earth and Environmental Science, **949(1)**, 2022.
2. V. Ya. Ismailov, M. V. Pushnya, A. A. Komantsev, K. G. Snesareva, I. V. Balakhnina, I. N. Makarova. Using pheromones to control the population of cotton bollworm on soybeans in the central zone of the Krasnodar territory.Journal of Entomological Research. **46(2)**, 229-233 (2022). doi: 10.5958/0974-4576.2022.00041.X
3. A.Kochorov, Y. Utelbayev, A. Tuleeva, A. Kharitonova, B. Bazarbayev, V. Davydova, T. Nelis, A. Aldabergenov. Effect of seed protectants on fungal disease pathogens when using different technologies of oilseed flax, Linum usitatissimum cultivation. Caspian Journal of Environmental Sciences. **21(4)**, 827-839 (2023). doi: 10.22124/cjes.2023.7132
4. A.Bugubaeva, A. Kuprijanov, V. Chashkov, S. Kuanyshbaev, K. Valiev, S. Mamikhin, A. Shcheglov, A. Nugmanov, A. Bulaev G. Sultangazina, K. Kunanbayev, O. Chernyavskaya, G. Baubekova, G. Ruchkina, O. Safronova, M. Uxikbayeva, Y. Sokharev. Productivity assessment of various plant communities at uranium mine sites in Central Kazakhstan. SABRAO J. Breed. Genet. **55(3)**, 864-876 (2023). doi: 10.54910/sabrao2023.55.3.21.
5. A.A. Rumyantsev, L.A. Minukhin, V.A. Aleksandrov, V.S. Kukhar. Research of operations in the production strategy of mini-lines for the grain processing of cereal crops. Journal of Engineering and Applied Sciences, **13(12)**, 4387-4390 (2018).
6. T. V. Luzina, E. A. Dudareva, N. A. Prodanova, Y. S. Berdova, G.E. Emaletdinova. International legal format for trans regionalisation of trade and economic partnership within BRICS in global development. Space and Culture, India, **7(3)**, 76-85 (2019). doi:10.20896/saci.v7i3.508
7. O. Y. Voronkova, E. M. Akhmetshin, I. N. Sycheva, R. N. Shpakova, E. Y. Pashkova, A. L. Poltarykhin. Economic mechanism of regulating land relations in the agricultural sector of russia. European Research Studies Journal, **21(4)**, 280-291(2018). doi:10.35808/ersj/1120
8. G. Singh, N. Kalra, N. Yadav, A. Sharma, M. Saini. Smart agriculture: a review. Siberian Journal of Life Sciences and Agriculture, **14(6)**, 423-454 (2022). doi: 10.12731/2658-6649-2022-14-6-423-454
9. Z. Adilbayeva, B. Maisupova, K. Abayeva, A. Utebekova, R. Akhmetov. The Effect of Stimulants on the Seed Germination and Growth of Schrenk's Spruce Seedlings. OnLine Journal of Biological Sciences, **21(2)**, 354-364 (2021). doi: 10.3844/ojbsci.2021.354.364
10. K. Barmuta, R. Shichiyakh, A. Malkhasyan. Features of Innovative Activities of Agricultural Organizations in the Conditions of Macroeconomic Instability. E3S Web of Conferences, **396**, (2023).

11. K. Barmuta, N. Tuguz. Organizational and Managerial Mechanism for Risk Management of Agricultural Enterprises. E3S Web of Conferences, **273,** 08005(2021).
12. P. Kuzmin, T. Skoblikova, S. Gorovoy, O. Otto. Research of the state of woody and brushwood plants under anthropogenic stress conditions. Siberian Journal of Life Sciences and Agriculture, **15(1)**, 141-163 (2023). doi: 10.12731/2658-6649-2023-15-1-141-163
13. I.S. Abdullaev, P. A. Gurbanov, R. A. Aleshko, Y. Yu. Finogenov. Improvement of the organizational and economic mechanism of innovative development of the food and processing industry. Siberian Journal of Life Sciences and Agriculture, 2023, **15(3)**, 357-386(2023). doi: 10.12731/2658-6649-2023-15-3-357-386
14. M. K. Barcho, O. V. Otto, H. A. Hajiyev, V. O. Samusenkov, L. N. Korshunova, N. O. Vikhrova, N. N. Nikulin. Basic directions for forming perspective forms of agricultural integration. Entrepreneurship and Sustainability Issues, **8(1)**, 960-971(2020). doi:10.9770/jesi.2020.8.1(64)
15. I. G. Kuznetsova, O. Yu. Voronkova, S. Y. Bakhvalov, I. R. Ruiga, G. N. Zhuruli, V. E. Levichev. Formation of Human Capital as a Key Factor in Ensuring the National Security of Agriculture in the Digital Economy. European Research Studies Journal, **21(3)**, 73-83(2018).
16. S. Suwarni, E. Akhmetshin, H. Okagbue, E. Lydia, K. Shankar. Digital economic challenges and economic growth in environmental revolution 4.0. Journal of Environmental Treatment Techniques, **8(1)**, 546-550(2020).
17. V. Ya. Ismailov, M. V. Pushnya, E. G. Snesareva, A. A. Komantsev, A. A. Tsygichko. Evaluating a newer nuclear polyhedrosis virus strain against the cotton moth Helicoverpa armigera on soybean (Glycine max). Research on Crops. **23(2)**. 442-448 (2022). doi: 10.31830/2348-7542.2022.059
18. Sh. Kh. Abdualimov. Technologies of application of growth regulators in the conditions of Uzbekistan. Introduction of new cost-effective agrotechnologies in agriculture. UzPITI collection of articles. Tashkent, 2011. p. 127-129.
19. F. L. Kalinin, Yu. G. Merezhinsky. Regulatory plant. Kiev, 1965. p. 405.
20. Methods of conducting field experiments. UzPITI. Tashkent, 2007. p. 147.
21. B. A. Dospekhov. Methodology polevogo opyta. 5-oe izd. dope i pererab. Moscow. Agropromizdat, 1985. p. 248-256.
22. Methodological guidelines for testing insecticides, acaricides, biologically active substances and fungicides. T:. 1994, p. 102.
23. K. M. Tadjiev. The effect of methods of seed preparation for planting and treatment with seeders on germination. Scientific basis of cotton and grain development on farms. A collection of international conference articles. UzPITI. Tashkent, 2006. p. 273-276.
24. Sh. Abdualimov. Effect of grape stimulator on seed germination. Improvement of agrotechnologies of cotton and cotton complex crop care UzPITI collection of articles. Tashkent, 2013. p. 113-116.
25. G. Kholov. Humusovy preparation uskoritel rosta i razvitiya khlopchatnika. Agricultural Journal of Tajikistan. Kishovarz. **1**, 19-21 (2000).
26. Sh. Kh. Abdualimov, Sh. Karimov. Effect of new stimulators on cotton care. Prospects of development of cotton production in Uzbekistan. PSUEAITI Paper Collection Part II. (Tashkent, 2014) 256-259.

27. Sh. Kh. Abdualimov, D. Kh. Akhmedova, S. Sh. Rashidova. Effect of different growth agents on seed germination, growth, development and productivity. Biologically active polymers: synthesis, properties and application. Collection of theses. (T:.2003) 30-31.
28. F. Khasanova, Sh. Abdualimov, B. Niyazaliev. Planting the seed in an optimal period and obtaining an even sprout is a guarantee of an abundant and high-quality harvest. Agriculture of Uzbekistan. Tashkent. **3,** 4-5 (2015).
29. Sh. Abdualimov. The Effect of Plant Growth Regulators on the Growth and Development of Cotton in Calcareous Soil of Uzbekistan. The Asian and Australasian Journal of Plant Science and Biotechnology. Global Science Books. **7(2)**, 58-60 (2013).
30. Sh. A. Karimov, Sh. Kh. Abdualimov. Vliyanie novykh stimulyatorov rosta rastenii na razvitie i urozaynost hlopchatnika. Aktualnye voprosy sovremennoy nauki. Scientific journal. Russia. Moscow. **3(15)**, 29-32 (2017).
31. Sh. Karimov. Effect of new stimulants on cotton leaf surface changes. Introduction of new cost-effective agrotechnologies in agriculture. UzPITI collection of articles. (Tashkent, 2011) 140-141.
32. Sh. Kh. Abdualimov, Sh. A. Karimov. Influence of stimulator Bioduks on the appearance of growths and fertility of men. Actual problems of modern science. **4,** 262-266 (2017).