INFLUENCE OF THE COMPLEX COMPOUND OF COBALT ON THE GROWTH, DEVELOPMENT AND YIELD OF COTTON

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Annotation: *The article provides data that soaking seeds before sowing and feeding cotton with cobalt-31 improves its growth and development, increases yield by 5.6-6.4 c/ha . Treatment of seeds before sowing and during top dressing in the phase of the beginning of budding with complex compounds of microelements accelerates the growth of the main stem by 25%. Seed treatment in cobalt-31 solutions had a stimulating effect on the intensity of plant growth processes both at the beginning and in subsequent phases of cotton development.*

According to the results of the appearance of true leaflets, an acceleration in the rate of their formation and an increase in linear dimensions were observed. Under the action of the complex compound, the formation of the first three true leaves is determined by 18-26% and its positive effect is maintained in the subsequent phases of growth and development of cotton, the mass formation of buds occurs 15 days earlier than in the control and leads to early formation of ovaries and opening of bolls. Seed treatment before sowing and top dressing at the beginning of budding contributes to the greatest development of leaf area in cotton ontogenesis. Seed treatment before sowing and fertilizing with cobalt-31 significantly increase the leaf area and contribute to a greater accumulation of cotton biomass.

The yield of cotton, depending on the treatment of seeds before sowing and top dressing in the phase of the beginning of budding with some complex compounds of microelements, increases by 10.6-17.6%. A high yield was obtained in the variant where the seeds were soaked before sowing and fed in the phase of the beginning of butanization with the trace element cobalt-31. At the same time, the increase in yield was 3.8-6.3 c/ha. The results of experiments with the pre-sowing lock of cotton seeds established that the positive effect of the impact of microelements on seeds in many cases persists until the end of the growing season, as evidenced by an increase in the yield of raw cotton.

Keywords: *trace elements, cotton, cobalt, growth , development, harvest*

Introduction. Of the many factors that determine the increase in the value of the beneficial effect of mineral fertilizers, is the participation in the soil of microelements in sufficient quantities for plants.

The researchers note that the distribution areas of typical gray soils of the Republic of Uzbekistan are characterized by large differences in the content of both gross reserves of microelements and their digestible forms, which is associated with the level of agricultural culture and historical soil-forming processes. [1].

Numerous researchers have found that the use of microelements in the composition of mineral fertilizers for cotton shows a low efficiency of inorganic salts of microelements in carbonate soils of cotton regions of Central Asia. Some researchers found that in 50% of cases, flowering under the influence of cobalt chloride occurs 1-4 days earlier than in the control [2]. In recent years, in the physiology and agrochemistry of plant nutrition with microelements and the practice of their use in agriculture, much attention has been paid to intracomplex compounds of microelements called complexones, or chelates . The expediency of using complex compounds of microelements for agricultural crops is determined by the fact that they are characterized by the strength of the metal bond with the chelating agent and the difficulty of replacing it with another metal, the ability to withstand microbiological effects, the stability of hydrolysis and solubility, the lack of ability to precipitate, and good digestibility by the plant [3]. A range of stability in various pH environments was revealed for each chelate compound produced at the Buysky Chemical Plant. And we can confidently recommend to our consumers to use one or another type of chelate in certain conditions, knowing its capabilities. As in the production of water-soluble mineral salts, as well as in the production of chelate compounds, " Buysky Chemical Plant" guarantees the quality of fertilizers produced, the reliability of their use and a high agrochemical effect [4]. Considering the important role in agriculture in different regions of the Republic of Uzbekistan, cobalt for cotton can be important as a microfertilizer.

Purpose of the study. One of the significant reserves for increasing the yield of cotton is the use in the cultivation of this crop of factors that ensure the maximum preservation of fruiting organs in the plant, a large number of which fall off under adverse conditions, causing significant damage to the crop. A cotton bush drops 20 to 40 bolls. It depends on the external and internal characteristics of cotton: the height of plants, the number of buds, the rate of flowering and bolls opening, the number of fallen fruit elements , as well as the intensity of transpiration, the activity of redox enzymes. Increasing productivity remains an extremely urgent problem. As studies have shown, the preservation of even one formed bolus on a bush can lead to a noticeable increase in the yield of raw cotton by 2-4 c/ha.

According to numerous researchers, soaking plant seeds before sowing in certain concentrations of solutions of microelement salts stimulates their germination, accelerates the emergence of seedlings, the passage of development phases and increases the yield of various crops, including cotton. In this regard, we set out to study the effect of the cobalt complex compound on the growth, development and yield of cotton [3].

Material and research methods . In order to study the effect of various concentrations of solutions in the form of soaking cotton seeds before sowing cobalt -31, we set up small- plot and vegetation experiments at the experimental station of the Tashkent State Agrarian University (TashSAU) [3]. Cobalt -31 was synthesized at the Department of Inorganic Chemistry of the Tashkent Medical Pediatric Institute by Professor Kh.Kh. Khakimov and Candidate of Chemical Sciences, Associate Professor N.T. The newly synthesized drug differs from the previously existing ones in its high activity and high content of the active substance in the composition of the ligand , due to which it can be widely used in cotton growing to accelerate the ripening and increase the yield of cotton. Under laboratory conditions, the effect of cobalt-31 at a solution concentration of 0.01-0.1% on the germination energy and germination of cotton seeds was studied, the optimal doses were selected for the subsequent study of the growth and development of cotton. The agricultural technique of the experiment was generally accepted. The annual norm of fertilizers: nitrogen-250 kg/ha, phosphorus-175 kg/ha, potash-125 kg/ha of the active principle. The soil of the experimental plot is a typical sierozem, medium-supplied in terms of the content of nutrients [3,5].

results research and discussion. Numerous researchers argue that increasing the yield of cotton remains an urgent problem. As they write earlier experiments, the preservation of even one formed boll on a bush can increase the yield of cotton from 2 to 4 q/ha [6].

The research results show that complex compounds of cobalt by soaking seeds in 0.3% in their solutions and subsequent application at the rate of 6.0 - 8.0 kg /ha contribute to an increase in cotton productivity by 3.2-2.0 c/ha (on average for two years). The use of complex compounds of microelements has a positive effect on the course of physiological and biochemical processes and the yield of cotton varieties [7]. Experimental data from the analyzes show that soaking seeds before sowing in optimal concentrations of cobalt-31 improved the vigor of germination and accelerated the germination of cotton seeds. The best shoots were obtained by soaking cotton seeds in a solution of 0.03% concentration, which exceeds the control by 29% (table 1).

Table 1

The effect of cobalt -31 on the emergence of seedlings and true leaves of cotton (in%).

Indicators	The control	Cobalt-31	
		0.03%	0.12%
Shoots:			
07.05	13.0±3.6	42.6±4.7	10.3±2.7
08.05	52.1±4.2	83.6±4.5	51.0±3.8
12.05	77.8±4.8	100.0±5.4	81.0±4.2
Appearance 1 x sheet			
17.05	32.5±3.2	50.8±4.6	34.4±3.6
18.05	54.3±3.9	80.3±4.8	79.3±4.3
x leaf appearance			
May 23	19.5±4.1	32.8±3.5	24.1±3.6
May 25	45.7±4.5	57.4±4.3	51.8±3.9
May 28	70.2±4.8	90.1±4.4	91.3±4.5
Appearance 5 x leaf			
03.06	10.8±2.8	27.9±3.8	31.0±4.8
05.06	45.6±3.9	69.0±4.3	60.3±5.2

10.06	67.5±4.3	100.0±4.7	90.6±5.6

The data of phenological observations indicate that seed treatment in solutions of cobalt-31 had a stimulating effect on the intensity of the passage of plant growth processes both at the beginning and in subsequent phases of cotton development. According to the results of the appearance of true leaflets, an acceleration in the rate of their formation and an increase in linear dimensions were observed (Table 1). Under the influence of cobalt - 31, the formation of the first three true leaves is determined by 18-26% and its positive effect is preserved in the subsequent phases of growth and development of cotton .

The results of the analyzes show that seed treatment before sowing and top dressing at the beginning of budding contribute to the greatest development of leaf area and, accordingly, the greatest accumulation of dry matter in cotton ontogenesis (table 2).

Table 2

The effect of cobalt-31 on the formation of the surface of cotton leaves (in cm ^{2})

Options	Date of analysis					
	9.06	24.06	04.07	19.07	03.08	18.08
The control	124.8± 5.8	413.6± 5.7	656.2± 6.7	1076.3±7. 8	1865.4±1 2.6	1880.4±1 1.4
0.03% Co-31	129.3± 3.2	440.8± 4.8	679.5± 6.9	1363.6±7. 4	2453.7±1 4.3	2456.9±6. 2
0.12% Co-31	133.9± 2.8	421.7± 5.2	670.7± 5.4	1102.7±1 1.7	1933.1±1 7.6	1937.9±7. 4

With an increase in the size of the leaf area, the accumulation of biomass increases. Dry matter gains also correspond to changes in leaf area (Table 2). In the initial phases of cotton development, when the leaf area slightly exceeds the control, the increase in dry matter is more by 1.7-2.3 g per plant. As the leaf area increases, the increase in dry mass increases and reaches a maximum during fruit formation . Seed treatment before sowing and during feeding with cobalt-31 significantly increases the leaf area and contributes to a greater accumulation of cotton biomass.

At the beginning of the growing season, the biomass products of photosynthesis are intensively used for the growth of leaves and stems, i.e. to vegetative organs. With the onset of the generative phase, a

significant part of the plastic substances formed in the plant organism goes to the formation of reproductive organs. The productivity of photosynthesis in the variants treated with cobalt-31, from the initial phases of growth and development, increases by 3.6-4.9 g/m ^{2} per day compared with the control and reaches a maximum in the phase of the beginning of flowering. The greatest accumulation of dry matter of the generative organs is observed in the variant where the seeds were treated before sowing with a 0.03% solution concentration and at the beginning of budding the plants were fed with cobalt -31 mixed with basic fertilizers. The height of the main stem of cotton varies markedly depending on the use of inorganic and coordination compounds of trace elements. (Table 3). Coordination compounds of the trace element cobalt promote the growth of the main stem to a greater extent than inorganic salts. By 01.06, in the variants with the use of inorganic cobalt salts, the length of the stem increased by 1.8-2.3 cm compared to the control, while with the coordination compounds of trace elements - by 2.5-5.0. [2]. When inorganic salts of cobalt were introduced, by 01, 08 ovaries were formed by 0.6-0.8 pieces, and in variants with coordination compounds - by 1.3-1.8 more compared to control plants (Table 3) .

Table 3

Influence of inorganic and coordination compounds of trace elements on the growth and development of cotton fruit elements

Options	Main stem height cm				The number of fruit elements per 1 plant, pcs.		
	01.06	01.07	01.08	01.09	buds 01.07	ovaries 01.08	boxes 01.09
The control	23.1±1.8	40.2±1.6	60.3±4.9	87.2±1.4	5.2±1.5	6.5±1.2	10.3±0.6
With oSO_4 (inorganic connection)	25.4 ± 1.1	42.9 ± 1.8	63.2 ± 2.0	89.5 ± 1.4	6.0 ± 1.4	7.8 ± 1.4	11.4 ± 0.6
Co31 (short connection)	29.3±1.9	44.4±1.6	66.7±1.4	91.6±1.2	8.5±1.3	9.7±1.2	13.2±0.7
Co-12 (coord .	27.6±1.6	43.5±1.1	65.0±1.3	90.6±0.8	7.6±0.6	8.2±1.3	12.5±0.5

connection)							

Annual rate of fertilizers N = 250 kg/ha, P_2O_5 = 175, K_2O = 125.

The introduction of trace elements in the composition of ammophos has a positive effect on the fruiting of cotton [8]. Fruit elements (buds, ovaries and capsules) are more formed in variants with the introduction of microelements. It should be noted that under the influence of the cobalt-31 coordination compound, the formation of fruit elements (buds, ovaries and boxes) is enhanced. At the same time, the mass appearance of buds occurs approximately two weeks earlier than in the control variants and the influence of the inorganic salt variant, which contributes to the early formation of ovaries and the opening of boxes (table 4 , 5).

Table 4

Influence of complex compounds of cobalt -31 on the number of buds and ovaries of one plant, (in pcs.)

Dates	The control	Cobalt-31	
		0.03%	0.12%
24.0 6	4.8±2.9	8.3±2.2	5.5±1.4
04.07	7.3±1.2	10.0±3.4	8.4±1.9
19.07	12.5 ± 1.0 _	18.0±2.2	16.2±2.2
03.08	17.0±2.7	25.1±1.7	22.2±1.8

Table 5

Influence of complex compounds of cobalt -31 on the formation of ovaries and opening of cotton bolls, (in %)

Dates	The control	Cobalt-31	
		0.03%	0.12%
Accounting for the formation of ovaries			
14.07	11.7±2.6	38.0±2.0	28.6±1.8
16.07	26.0±3.4	40.3±1.8	46.0±2.4
18.07	41.3±3.8	70.0±9.4	62.4±2.9
20.07	65.4±3.7	98.7±3.7	91.3±3.6
22.07	80.5±4.1	100.0±4.1	100.0±3.5
Accounting for the opening of boxes			
25.08	3.6±1.8	35.3±3.2	11.2±2.4
28.08	42.9±3.6	53.9±3.9	44.5±3.8
31.08	50.0±4.1	82.1±4.3	58.4±4.2
02.09	78.4±5.2	97.6±4.6	81.3±4.9
05.09	95.7±5.6	100.0±4.7	97.3±5.4

Under the action of complex compounds of microelements, an increase in cotton yield from 36.5 to 42.9 q/ha was observed. A high yield was obtained in the variant where cotton seeds were treated with a 0.03% solution of cobalt-31 before sowing. The increase in yield from the use of complex compounds of cobalt-31 ranged from 5.6 to 6.4 q/ha. There are more fully formed bolls in variants with the use of coordination compounds of microelements for cotton. At the same time, in the variant with the introduction of cobalt sulphate , there were 0.6-0.8 less bolls per 1 plant than with the introduction of coordination compounds. With the introduction of inorganic salts of cobalt sulphate, the yield of raw cotton increased by an average of 3.2 q/ha over three years. At the same time, the increase in the yield of raw cotton of the first harvest in the variant with cobalt sulfate was 6.2%. The greatest increase in cotton yield was observed in the variant with cobalt coordination compounds - by 5.8 q/ha. The significance of the microelement cobalt -31 in increasing the coefficient of use of fertilizer nitrogen by cotton plants and in reducing its unproductive losses was revealed. The use of the coordination compound of cobalt by soaking the seeds in 0.3% solutions and subsequent application at the rate of 6.0-8.0 kg/ha increased the yield of plants by an average of 10-15% over 3 years. The use of cobalt complexones, in comparison with their inorganic salts, accelerates the processes of growth and development.

Findings. It was found that soaking cotton seeds with a 0.03% solution of cobalt-31 accelerates the germination of seeds, the appearance of true leaves, an increase in their area and in the productivity of cotton photosynthesis. Same way, the use of coordinating compounds of the microelement cobalt-31 by soaking the seeds in 0.3% in their solutions and subsequent application at the rate of 6.0-8.0 kg/ha increases the productivity of cotton on an average of 3.2-2.0 q/ha over two years . The use of coordination compounds of microelements has a positive effect on the course of physiological and biochemical processes and the yield of various varieties of cotton. At the same time, the difference in the yield increase obtained by introducing the coordination compounds of microelements, depending on the varietal characteristics of cotton, is not significant. On average, over three years, the yield increase ranged from 12.4 to 17.7 %, depending on the cotton variety.

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