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Influence of the Immunotropic Stimulant "Fitovac" on Seed Germination and Accumulation of Cotton Fruit Elements at Different Doses and Terms of Application

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Abstract: The article presents data on the use of Fitovak of complex action for seed treatment and spraying of vegetative cotton plants in the period of appearance of 2-4 true leaves, budding at various consumption rates and terms. In a three-year study, it was noted that the 10-option appeared to be the best option. When seeds were soaked with Fitovak at a dose of 200 ml/t and 2-4 true leaves appeared and in budding, they were sprayed at a dose of 300 ml/ha with a preparation of vegetative cotton plants. At the end of the growing season (September), the height of one bush of plants reached an average of 100.6 cm, the number of fruit branches and mature bolls, respectively, was: 16.0-15.8 pieces per bush. The leaf surface area is 3158.7 cm2 per bush, the weight of one bush of raw cotton and a cotton boll, respectively: -108.4 -7.2 g, gross harvest - 50.9 c/ha. The yield increase was correspondingly higher by -5.7-4.1-3.8 c/ha, compared with the control and the standard. The best degree of seed germination (97.3%) turned out to be when seeds were soaked with Fitovak at the rate of 200 ml/t, which is 16.3-7% higher than the control, the reference variant. When applied three times during the growing season by Fitovak, the simultaneous action leads to the destruction of various fungal and bacterial diseases, increases resistance to adverse environmental conditions, accelerates the opening of boxes, shortens the growing season, increases yield, fiber quality and oil content in seeds.

Keywords: Fitovak, Phytoalexins, Seed Germination, Morbidity, Accumulation of Fruit Elements

1. Introduction

The development of science provides more and more new knowledge about the processes and phenomena occurring in plants, we know the specifics of nutrition and the protection of plants from pests, diseases and adverse stress effects. This allows the production and development of easily digestible forms of macro and micro fertilizers and stimulants. In recent years, more and more people are talking about the benefits of stimulating the work of their own immune mechanisms of agricultural crops [1-6, 8-12, 18-21].

Plants, like humans and animals, have their own immunity that protects them from various stressful threats. For the first time this phenomenon was observed in the nineties of the twentieth century, as a manifestation of plant resistance under the influence of certain stress factors. Currently, scientists have carefully studied this issue. In the course of the research, it was possible to identify substances that increase the resistance of plants. The natural resistance of plants to adverse environmental factors is determined by a group of substances called immunostimulants (Fitovak, Rostbisol, Zerox, Zeromix, etc.) and antistressants. They can be both biological and chemical, but physical factors with similar properties are also known [1, 2, 6-9, 12, 13, 16-20, 23, 24].

The work of plant cells begins with a process in which the relevant information is transmitted to the nucleus. This leads to the expression of genes responsible for the production of specific, genetic, informational proteins. As a consequence of these processes, proteins and other substances appear that have antibacterial and antifungal properties. There is also an accumulation of secondary substances (phytoalexins), which makes it possible to strengthen cell walls [1, 2, 6-9, 12, 13,

16-20, 23, 4].

Metabolic processes of protection can be local and complex. The result of these processes is the regulation of the metabolism of the entire plant organism [1, 2, 6-9, 12, 13, 16-20, 23, 24].

Phytohormones are chemical factors that are produced in very small quantities in one part of the plant, transported to another part, and there, in small quantities, they can exert a regulatory effect on the processes of growth and development. It is known that there are three classes of phytohormones that act primarily as stimulants (auxins, gibberellins, cytokinins) and two classes of phytohormones that mainly have an inhibitory effect (abscisic acid, ethylene) [1-6, 25].

The action of the immunotropic stimulant "Fitovak" is based on the regulation of the physiological response of the plant itself and increasing its seasonal resistance until the end of the growing season. It has an ultra-fast penetrating ability and is actively transported through cotton.

When cotton is treated with the Fitovak stimulant, protective mechanisms are activated, which leads to an increase in the activity of the induction of phytoalexins, which are a trigger for the protective reaction of hypersensitivity of infected cells. Due to the formation of various types of phytoalexins, it is regulated by cotton and creates unfavorable conditions for the pathogen.

The drug acts on them as an immunizer even before its contact with the pathogen and promotes temporary physiological stimulation of the genetically determined property of plant resistance.

Fitovac is especially indispensable in years with poor climatic conditions, has rehabilitation ability on problematic plants, has a positive effect on physiological and biochemical processes, thereby accelerating maturation and increasing crop yields [6, 7, 13-15].

Fitovac showed high efficiency on cotton, cereals and ears of corn, legumes, vegetables, gourds and other crops. The drug provides friendly germination of seedlings, ripening of fruits, increases their size and increases their content of sugars, proteins, and vitamins. As a result, the presentation and transportability of agricultural products improves [22].

Combining "Fitovak" with pesticides can enhance their toxic properties; increase the duration of action and the number of types of harmful organisms for which they can be destructive. Composite preparation with mineral fertilizers and pesticides enhances the absorption of mineral fertilizers by the plant; the negative effect of pesticides is prevented or weakened. Conditions are being created to reduce the amount of chemicals and chemical treatments of crops and reduce their toxic effects on beneficial organisms, plants and soils.

Thus, it can be concluded that the increase in resistance is accompanied by various factors and largely depends not only on immunostimulants, but also on the soil and climatic conditions of the environment, the type and variety of agricultural crops [1-25].

The purpose of the study is to study the effectiveness of the universal action of the Fitovak immunostimulant, at various doses and terms of application on cotton varieties "Bukhara-6" in moderately saline soils and arid climates of the Bukhara region of the Republic of Uzbekistan.

2. Research Methods

An experimental experiment on the study of the use of various doses and terms of the universal effect on seed germination and the accumulation of the fruit elements of the cotton immunostimulator Fitovac was carried out at the Research Institute of Breeding and Seed.

The experimental experience consisted of 11 options.

Table 1. *Experience Scheme.*

т/р	Experimental Variants	Application of doses and terms, *l*/t; *l*/ha		
		pre-sowing to cotton seed was treated	2 - 4 true leaves	Shading
1.	Control	-	-	-
2.	Vitovaks 200 ff (standard)	5 l/t	-	-
3.	Fitovak	100 ml/t	-	-
4.	Fitovak	200 ml/t	-	-
5.	Fitovak	300 ml/t	-	-
6.	Rostbisol (standard)	-	-	600 ml /ha
7.	Fitovak	-	200 ml /ha	200 ml /ha
8.	Fitovak	-	300 ml /ha	300 ml /ha
9.	Fitovak	-	400 ml /ha	400 ml /ha
10.	Fitovak	200 ml/t	300 ml /ha	300 ml /ha
11.	Fitovak	200 ml/t	-	600 ml /ha

Each option consists of 4 rows, row length - 25m. Accounting area – 90 m^2. The total area according to the variants of the experiment was 990 m^2. The repetition of the experiment is 4 times. Experienced options are located in one tier. The scheme of experience is shown in Table 1.

The preparation Fitovak was studied with two methods of application: a) pre-sowing treatment of cotton seeds with Fitovak; c) suspensions of vegetative plants during the cotton phase with doses from 100 ml/t; l/ha up to 400 ml/ha.

Bare seeds of cotton variety Bukhara-6 were used for testing. Vitovax-200ff 5 l/t was used as a reference, as a fungicide and Rostbisol-600 ml/ha was used as an immunostimulant. Experimental options for repetitions were arranged according to the randomization method.

The study was carried out according to the methodology adopted in Research Institute of Seed Breeding and Agrotechnologies of Cotton Growing "Methodology for conducting field studies" [26]. Methodological testing of

insecticides, acaricides, biologically active substances and fungicides [27]. These yield results were depressively analyzed according to the method of B. Dospekhov "Methodology of the field experiment" [28].

3. Research Results

The purpose of the study is the universally acting immunostimulator "Fitovak" on the effect of seed germination and accumulation of fruit elements, yield and quality of cotton in moderately saline soils of the Bukhara region. The degree of germination of cottonseeds in the field was studied on each variant at 11.1 running meters. after sowing (April 18) after 5 days, and the incidence of root rot and gummosis during the period of appearance of 2-4 true leaves per 1 m^2 according to repetitions of the experiment.

Table 2 shows the data, what is the advantage of the drug "Fitovak" on the degree of germination and incidence against root rot and gummosis.

Table 2. *Influence of the immunostimulator Fitovac 10% w. when used at various times and doses of consumption on seed germination and cotton morbidity.*

№	Experience options	Degree of germination of cotton seeds, pcs. at/11.1 r.m.					Field germination, %	Field germination,% Incidence in cotton, % (during the appearance of 2-4 true leaves)	
		23.04	25.04	27.04	29.04	1.05		root rot	gommosis
1	Control	0.0	18.5	80.0	124.0	135.5	81.0	2.5	-
2	Vitovaks 200 ff (standard) 5 l/t	13.8	81.3	128.0	137.0	146.5	88.0	0.5	-
3	Fitovak 100 ml/t	6.0	42.8	103.0	127.5	140.3	84.0	-	-
4	Fitovak 200 ml/t	13.5	84.0	123.0	147.5	162.0	97.3	-	-
5	Fitovak 300 ml/t	14.0	80.2	118.5	145.0	158.0	95.8	-	-

Analyzing the data, it should be noted that among the studied options, the best degree of seed germination (97.3%) during the observed days (April 23 to May 1) turned out to be when the Fitovak seeds were soaked by 200 ml/t, which is 16.3-7% higher than the control and the reference version.

It should be noted that during the years of research during the sowing season, the weather conditions were favorable. Therefore, the incidence of cotton was invisible. Root rot in the control variant was 2.5%, and in the reference variant - 0.5%. When seeds were soaked with "Fitovak" at 100-200-300 ml/t, the incidence of cotton (root rot and gummosis) did not appear at the beginning of the growing season.

Thus, "Fitovak" allow you to increase the energy of germination and field germination of seeds by 14.8-16.3%. Due to the high stimulating effect, the processing of seed material can significantly enhance the growth and development of the plant's root system, which increases drought resistance, precocity of plants, and also improves quality and increases yield.

Table 3 and diagram 1 show phonological data, depending on the doses used and the timing of the Fitovac immunostimulant, according to the experimental options, during the growing season of cotton (accounts were taken on the first days of each month).

Analyzing the data of Table 3 and Diagram 1, among the studied options for plant growth and the accumulation of the remaining fruit elements at the end of the growing season, the 10th option turned out to be the best option, which was soaked with Fitovac 200 ml/t in pre-sowing treatment and during the growing season vegetative and generative organs of cotton were suspended varieties Bukhara-6, 200-300+300 ml/ha. As a result, in this variant, positive indicators were obtained for all indicators of plants, since the height of plants is 6.7 cm higher; accumulation, the number of fruit elements increased (5.6 pcs per bush) and mature bolls (3.9 pcs/bush), the percentage of opened mature bolls was 19.6% more than the control.

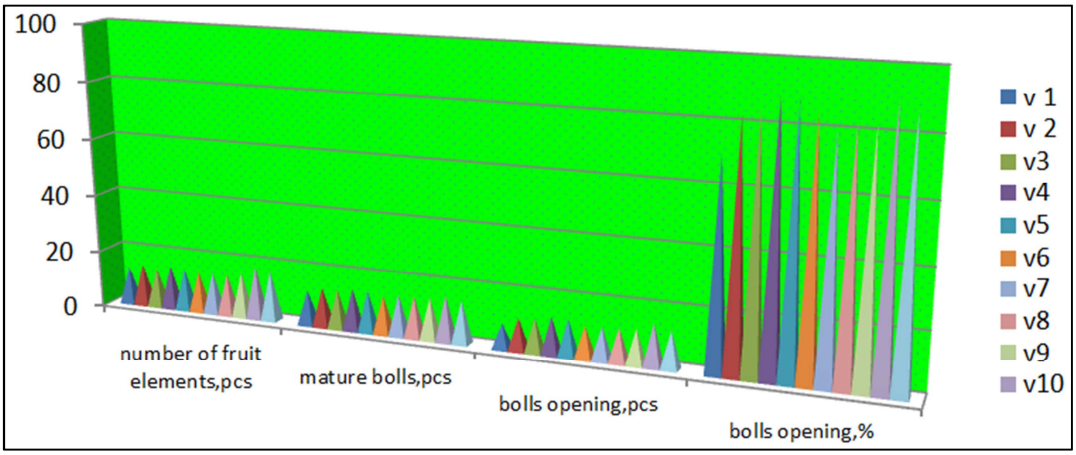

Figure 1. *Effect of Fitovac 10%w. on the accumulation of fruit elements and open bolls.*

When applying foliar treatment with Fitovak during budding and flowering, 200-300-400 ml/ha (7-8-9-options)

suspended only during flowering, 600 ml/ha (11var) at the end of the growing season, plant height, number of remaining fruit elements, mature bolls, of which plants opened onto a bush and the percentage of bolls opening, respectively, were: 102.2-101.9-99.6-100.2 cm; 14.5-14.6-15.7-17.5 pieces/bush; 14.4-14.5-14.7-14.8 pieces/bush; 11.6-12-12.2-13 pieces/bush; 80.6-82.8-83-87.8%. And only when the Fitovak seeds were soaked for 100-200-300 ml/t (3-4-5-options), these indicators were respectively: 101.5-102.8-101.1cm; 13.9-15.3-14.8 pieces/bush; 13.7-14.4-14.6 pieces/bush; 85.4-90.3-89.0%. That is, both methods of application (seed locking and suspension of vegetative plants) and separately with the Fitovac stimulator showed intermediate results.

Table 3. *Influence of the immunostimulator "Fitovak" 10% w. on the growth and development of cotton variety Bukhara-6.*

VARIANTS	August						September		
	Bush height, cm	Fruit branches, pcs	buds, pcs	Flowers, pcs	mature bolls, pcs	Unripe bolls, pcs	mature bolls, pcs	Of which disclosure, pcs.	Opening percentage,%
1	93.3	14.7	0.5	0.5	11.4	0.8	12.1	8.6	71.0
2	101.0	15.4	0.6	0.8	12.0	0.6	13.6	11.2	82.4
3	101.5	15.3	0.5	0.8	12.0	0.6	13.7	11.7	85.4
4	102.8	15.8	0.6	0.7	14.0	-	14.4	13.0	90.3
5	101.1	15.7	0.6	0.8	13.0	0.4	14.6	13.0	89.0
6	100.1	15.0	0.5	0.7	12.6	0.4	13.3	11.3	85.0
7	102.2	15.6	0.6	0.9	13.0	-	14.4	11.6	80.6
8	101.9	15.7	0.9	0.5	13.0	0.2	14.5	12.0	82.8
9	99.6	15.2	0.7	0.8	13.2	-	14.7	12.2	83.0
10	100.0	16.5	1.0	0.8	15.5	1.5	16.0	14.5	90.6
11	100.2	15.9	0.9	0.8	14.8	1.0	14.8	13.0	87.8

Table 3. *Continued.*

VARIANTS	June			July					
	Bush height, cm	Fruit branches, pcs	buds, pcs	Bush height, cm	Fruit branches, pcs	buds, pcs	Flowers, pcs	Cottonbolls, pcs	Unripe bolls, pcs
1	26.0	6.6	0.5	77.0	12.0	10.0	1.5	1.0	0.6
2	27.8	7.6	0.8	87.6	12.6	11.0	1.7	2.5	0.8
3	26.5	7.3	0.6	98.3	12.1	10.6	1.5	2.3	0.9
4	28.6	7.7	0.9	86.0	12.5	10.9	1.6	2.4	1.0
5	28.0	7.3	0.6	88.5	12.4	11.3	1.8	2.3	1.0
6	27.9	7.3	0.6	88.4	12.4	11.1	1.5	2.2	0.8
7	28.5	7.4	0.9	88.0	12.5	11.0	1.8	2.5	0.7
8	28.6	7.6	0.5	89.7	12.9	10.9	1.9	2.6	0.8
9	29.4	7.7	0.9	86.5	12.4	10.7	1.7	2.2	0.8
10	30.2	7.9	1.0	88.8	13.1	11.8	1.8	2.7	1.5
11	30.0	7 9	0.9	88.0	13.0	11.4	1.7	2.6	1.2

An increase in the number of fruit elements and an improvement in the growth and development of a cotton bush in the 10th variant can be explained by the following mechanism of action: when the Fitovac immunostimulator is exposed as an exogenous hormone (cytokinin, auxin-gibberellin or ethylene) of the endohormones present in the plant, the ratio of the number of phytohormones in the plant tissue changes. At the same time, depending on the methods and applied cost rates and the duration of the optimal use of Fitovak, it can be said that exogenous phytohormones are associated with genes that activate the genetic program of generative development and sex determination, as a result of which it has a positive effect.

Table 4. *Influence on the yield of cotton when using the Fitovak immunotrope at different times and consumption rates.*

№	variants	Norms and terms of application, ml/t; ml/ha			Quantity of a bolls, piece/bush	Weight of one bolls, g (before1-harvest)
		Presowing treatment of seeds, ml/t	At the appearance of 2-4 true leaves, ml/ha	In budding, ml/ha		
1	Control	-	-	-	12.1	5.9
2	Vitovaks standard	5 л/т	-	-	13.6	6.1
3	Fitovac	100	-	-	13.7	6.0
4	Fitovac	200	-	-	14.4	6.1
5	Fitovac	300	-	-	14.6	6.1
6	Rostbisol standard	-	-	600	13.3	6.0
7	Fitovac	-	200	200	14.4	6.0
8	Fitovac	-	300	300	14.5	6.1
9	Fitovac	-	400	400	14.7	6.1
10	Fitovac	200	300	300	16.0	6.3
11	Fitovac	200	-	600	14.8	6.2

Table 4. *Continued.*

№	variants	1-harvest, c/ha;	Gross yield c/ha	Differences from control go and reference variant		At the end of the growing season, plant density thousand pcs/ha;
				Productivity, c/ha	Weight of one bolls, g	
1	Control	34.1	44.5	0.0	± 0	74.3
2	Vitovaks standard	39.6	47.2	+2.7 +0.0	+0.2 +0.0	74.3
3	Fitovac	36	46.8	+2.3 -0.4	+0.1 -0.1	74.6
4	Fitovac	39.8	48.6	+4.1 +1.4	+0.2 +0.0	74.5
5	Fitovac	37.8	47.2	+2.7 +0.0	+0.2 +0.0	74.1
6	Rostbisol standard	37.8	46.9	+2.4 +0.0	+0.1 -0.1	73.9
7	Fitovac	38.7	47.0	+2.5 +0.1	+0.1 -0.1	74.3
8	Fitovac	39.9	47.2	+2.7 +0.3	+0.2 +0.0	73.8
9	Fitovac	35.9	46.0	+1.5 -0.9	+0.2 +0.0	74.3
10	Fitovac	44.3	50.0	+5.5 +2.8 +3.1 +4.2	+0.4 +0.2 +0.3 +0.3	74.1
11	Fitovac	42.6	48.7	+1.5 +1.8	+0.1 +0.2	74.2

LSD $_{05}$ = 2.7 c/ha; % Error $_{05}$ = 4.96%.

Optimal use in pre-sowing seed treatment and foliar treatment of vegetative plants with Fitovak stimulates the growth and development of plants, enhances the process of photosynthesis in plant leaves. Complex foliar treatments can increase the yield and quality of cotton. The weight of one bolls and 1000 seeds increases. The percentage of oil content, the length and output of the fiber increases. Growth and development is accelerated, the growing season is shortened, and yields are increased.

Table 4 shows data on the impact on the yield of raw cotton when using the Fitovac immunotrope at different times and consumption rates.

Analyzing the data of Table 4, with optimal use in pre-sowing seed treatment (200 l / t) and foliar treatments (300 + 300 ml / ha) of vegetative plants by Fitovak, yield indicators among the studied options were the best options, such as: the number of bolls from one bush, weight one pod (before 1-harvest) and yield, quality (length and yield) of fiber, seed oil content and percentage of bolls opening, respectively, were: 3.9 pcs/bush; 0.4g; 5.5 q/ha: 1.3 mm; one%; 0.6%, 19.6% higher than the control.

As a result, according to the yield of cotton according to the use of the Fitovak immunotrope at different times and consumption rates compared to the control, with the criterion of mathematical accuracy in the studies, it was found that there is a significant difference between them.

4. Conclusions

Based on the above scientific material, it can be concluded that when using the universally acting immunostimulant "Fitovak" in pre-sowing seed treatment (200 l / t) and foliar treatment (300 + 300 ml / ha) of vegetative plants, simultaneous action leads to the destruction of various fungal and bacterial diseases, increases resistance to adverse conditions (salinity, drought and harmsilya) of the environment, accelerates the rate of opening of the bolls, shortens the growing season (at least 3 days), increases yield, fiber quality and seed oil content. Optimal application of Fitovac immunostimulator on cotton can be said that exogenous and endogenous phytohormones fill each other. Associated with genes that activate the genetic program of generative development and sex determination. As a result, it has a positive effect in all life processes of plants.

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