Influence of an Uchkun Preparation to some Agricultural Crops which are Grown under Unfavorable Conditions

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***Abstract*—** The effect of an Uchkun preparation on growth, development and yield of cotton under water deficit and wheat in saline soil conditions were studied. The field experiments showed that the pre-sowing seed treatment by Uchkun at a dose of 1.0 liter per ton of seed contributes to the stimulation of growth and development of cotton in ontogeny and increases the yield of raw cotton to 2.5 quintal per hectare (qu/ha). The harvest increases of 4.7-6.3 qu/ha in the case of treatment of wheat seeds by spraying method in the tillering phase by the same dose, and at pre-plant treatment of seeds the harvest increases of 3.8-5.2 qu/ha depending on the type of wheat. It was found that the plant origin preparation Uchkun improves the adaptation of plants to unfavorable conditions, such as drought, high temperatures, and soil salinity.

***Keywords*— cotton, wheat, biostimulant Uchkun, crop yields, resistance.**

I. INTRODUCTION

In modern global practice, the use of preparations based on natural compounds became topical approach to plant protection against adverse conditions and various diseases. The use of such regulating plant growth preparations lead to a weakening of the damaging effect of adverse factors, they have a stimulating effect on the immune system of plants, which leads to increased resistance of plants under these conditions. On the other side, there is an urgent need in the world to create preparations that allow getting environmentally friendly foods, which serve to provide the population with high-quality agricultural products.

It is known that the use of synthetic and highly toxic pesticides has resulted in important environmental problems and food products, poisoning them for many long years. Then, the time followed to stop the use of most of them, and search for ways to neutralize the residual amounts of these substances [1-3].

Along with the study of theoretical issues of the great attention paid to the creation and implementation of effective preparations on the basis of biologically active substances for solving above mentioned problems.

It is known that on the basis of natural and plant origin compounds created numerous products for agriculture. For example, the preparation Novosil containing triterpene acids as active substance obtained from Siberian fir needles, has a fungicidal action [4, 5]. The preparation Lariksin includes dihydroquercetin from woods of larch dahurica [6]. Appin-extra preparation is produced from rapeseed pollen and it is the sum of brassinosteroids, Zircon is based on the sum of hydroxycinnamic acids from *Echinacea purpurea*, the preparation has high growth-regulatory, immune-stimulating and anti-bacterial and fungi-protective actions [7]. There are published data about the preparations based on polyisoprenoids for livestock [8], medicine [9-11], and agriculture [4].

One of the most promising preparations of this kind is a biostimulant Uchkun which was developed on the basis of plant polyisoprenoids of *Malvaceae* family.

Long-term studies have demonstrated the stimulating effect of a preparation Uchkun on growth, development and yield of crops such as cotton, wheat, corn, cucumbers, and tomatoes. In addition, Uchkun also increases plant resistance to diseases and adverse environmental conditions. The State Chemical Commission of the Republic of Uzbekistan gave permission to use of Uchkun as a plant growth promoter on cotton, cucumbers, and tomatoes [12].

This report provides the results of the field tests of Uchkun as a growth promoter in stress factor water scarcity medium on middle fiber type of cotton in Tashkent region, as well as soil salinity in the Syrdarya region (Gulistan) on wheat.

II. MATERIAL AND METHOD

The active ingredient (a.i.) of biostimulator Uchkun was obtained from the leaves of the plant belonging to *Malvaceae* family as before [13]. The preparation is a standard sum of biological active substances; its chemical composition consists from α-tocopherol, polyisoprenoid alcohols, sterols, and higher aliphatic alcohols.

2.1 The methodology of the field trial on cotton

The experience was carried out on cotton crops in the field of the farm "Oibek-Bessari" Urta-Chirchik district of Tashkent region. Square planting of two hectares. The object of the study was cotton variety "Sultan". The previous crop was wheat.

Plowing to a depth of 40 cm was made in autumn. A tractor «CASE» prepared the field for planting - disking, harrowing in the spring. Sowing and cultivation was carried out by a tractor "Belarus".

Sowing was conducted on April 15, 2015 on an area of two hectares. Action of the preparation was studied by soaking cotton seeds before sowing. The seeds were soaked in concrete pits for 6-8 hours. However, sowing process was combined by usage of fertilizer Ammophos $(NH_4)_3PO_4$ - 500 kg/ha. Plant density was 100 thousand units per 1 hectare. Row spacing was 90 cm. During the growing season in the experimental plot there were Running two watering: first in the June 20 with the introduction of ammonium nitrate, and the second in July 23.

In the Republic of Uzbekistan year 2015 was characterized by extreme weather conditions: freezing in the first half of April, followed by a sharp rise in temperature, hot and dry summer. Temperature conditions from June through August were higher than the average long-term values at 2-5°C.

The morphological parameters of the plant were investigated in accordance with conventional methods [14]. The height of plants and number of leaves per stem were measured every 7 days.

The phenological surveys data on the growth of the plants treated with mathematical method of variance analysis on the computer program [15]. The accounting data of cotton crop were processed by mathematical variance analysis for Dospechov and others [14].

The experimental setup consisted of the following options:

- Control (without treating);
- Vitavacks (etalon) 5 l/t;
- Uchkun 1 l/t.

2.2 The methodology of the field trial on wheat

Preparation of the soil and care for the crops carried out in accordance with the recommendations of the wheat crop. Soft wheat (*Triticum aestivum*) of different varieties such as Dustlik, Vostorg, Tanya, and Chillaki are selected as the test subjects. Seeds were provided from JSC "Oq oltin don".

Field trials were conducted in the experimental area of Gulistan State University and Water Consumer Associations "Navbakhor". Surface for each experiment was 2 x 2.5 m.

The experimental setup consisted of the following options:

- Control (without treating);
- Verva (etalon) 1 l/t;
- Uchkun 1 l/t.

Application of preparation Uchkun carried out in two ways: pre-sowing seed treatment and spraying of vegetating plants. All experiments were conducted in fourfold repeating.

III. RESULTS AND DISCUSSION

It is known that the temperature and water regime of the Republic of Uzbekistan for the cultivation of cotton is stressful. In summer there is an acute shortage of water. Cotton is the most demanding in the water, especially in a phase of flowering and

fruit, that the long-term adverse effects when the plant undergoes dehydration and overheating, there are significant violations of metabolism and physiological functions, which is the main reason for the decrease of harvest and it is reflected in the quality of raw cotton.

Pre-sowing treatment of cotton seeds by 1% aqueous emulsion of preparation Uchkun at a dose of 1 l / t.s. shows that in terms of vigor and germination of cotton seeds superior control and are not inferior to the etalon version.

Thus, if the energy of germination in the test version was 72.1%, its value in the control variant was 66.5%. In fact, etalon Vitavacks showed the same growth activity at a dose of 5 l / t.s., where the seed germination of cotton was 71.5%.

TABLE 1
INFLUENCE OF GROWTH REGULATOR UCHKUN TO ENERGY GERMINATION, GERMINATION AND GROWTH OF COTTON

Treatments	Dose, l/t.s.	Germination energy of on the 7th day, %	The germination on the 14th day, %	The height of the plants on 21th day, cm
Control	Without treatment	66.5	85.3	11.2
Uchkun	1.0	72.1	92.2	13.8
Vitavacks (etalon)	5.0	71.5	91.5	13.2

As the results of research, application of a preparation Uchkun improved the germination of seeds in the field area. This made it possible to obtain high-grade shoots. Furthermore, the effectiveness of the growth and development on the weight of the vegetation period is more intense than in the control variant.

Further the dynamics of growth of the main stem and the appearance of true leaves in the early period of ontogenesis were studied. During the period of May 20 until June 10, the growth of the test plants was 35.3 cm, while in the control variants 24.0 cm (Fig. 1), the emergence of true leaves, during this period increased by 7 units in the experimental variant, while 5 in the control, respectively (Fig. 2).

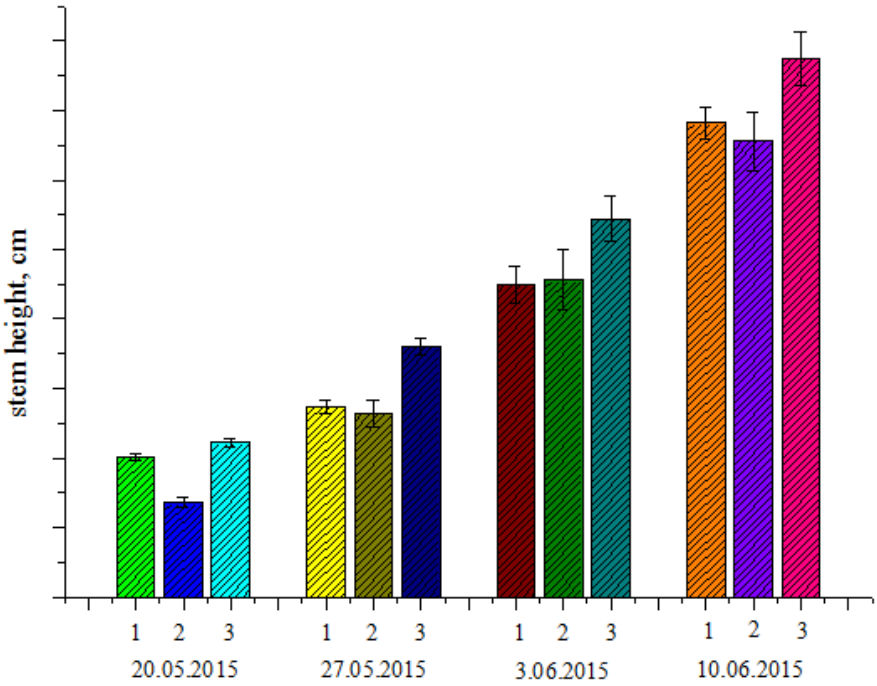

FIG.1. THE DYNAMICS OF GROWTH OF THE MAIN STEM OF COTTON.
1 – CONTROL; 2 – VITAVACKS; 3 – UCHKUN

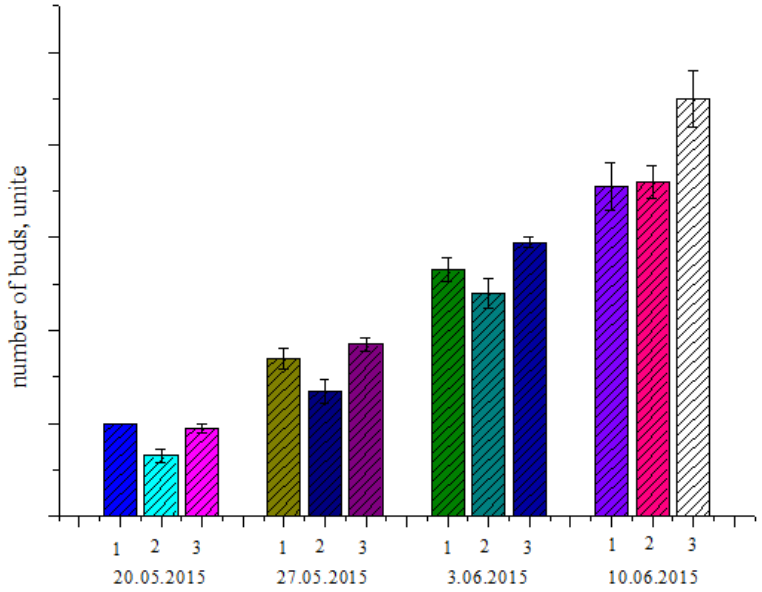

FIG.2. DYNAMICS OF ACCUMULATION OF COTTON LEAVES. 1 – CONTROL; 2 – VITAVACKS; 3 – UCHKUN

Thus, it was found that this period (about 20 days), the test plants ahead control for 4-5 days.

Subsequent surveys showed that the growth and development of experimental plants in the next phase is more intense than in the control variant. The formation and accumulation of fruiting bodies were ahead of control. Thus, by accounting day (19 June 2015) the number of buds was 6.7 pieces per plant, whereas in the control 5.1 pieces per plant by 24 July total number of fruits in the test variant was 17.8 pieces, whereas in the control 14.5 units, and etalon 17.0 units (Tab. 2).

TABLE 2
INFLUENCE OF PREPARATION UCHKUN ON GROWTH AND DEVELOPMENT OF COTTON PLANTS

	June 19	**July 24**				**September 4**		
	Number of buds	**Number of buds**	**Number of flowers, unites per plant**	**Number of boxes, upp**	**Total number, upp**	**Green boxes, upp**	**Opened boxes, upp**	**Total number, upp**
Control	5.1	10.6	2.0	1.9	14.5	5.5	8.2	13.7
Uchkun	6.7	12.2	3.2	2.4	17.8	7.1	9.6	16.7
Vitavacks	6.9	12.8	2.1	2.1	17.0	5.8	10.4	16.2

Positive effect on the preparation Uchkun for formation of generative organs is observed, which resulted in the number of opened boxes compared with the control increased by 1.4 units, and the green boxes to 1.6 units. The bulk boxes better form in the first half of August, from which to a large extent depends on the proportion of the first collection of high-quality cotton crop. The total number of boxes in a test version for the period September 4 was 16.7 units per plant (upp), and in the version with etalon - 16.2 upp, against 13.7 upp - in control.

Uchkun effects positively on the yield increasing of cotton, which reaches up to 2.5 qu/ha. The average yield in the test version reached 30.8 qu/ha, using Vitavacks, taken as an etalon yield of raw cotton amounted to 30.5 qu/ha (tab. 3), and in control to 28.3 qu/ha.

TABLE 3
INFLUENCE OF A PREPARATION UCHKUN ON THE YIELD OF COTTON

№	Treatments	Dose, l/t.s.	Harvest of repeated, qu/ha				The average yield, qu/ha	Deviation from control, ±
			I	II	III	IV		
1	Control	Without treatment	28.3	28.1	29.0	28.1	28.3	-
2	Uchkun	1	30.9	31.5	30.8	30.3	30.8	2.5
3	Vitavacks	5	30.7	29.3	31.4	30.8	30.5	2.2
HCP_{05}=1,01 S_x=0,33								

Thus, it was found that the plant origin preparation increases the adaptation to drought and high temperatures. The high efficiency of a preparation Uchkun was shown, which was comparable with the effect of an etalon preparation Vitavacks. The positive impact of the developed preparation Uchkun observed throughout the experiment. Pre-sowing moisturizing of cotton seeds by preparation Uchkun increases seed germination, accelerates the emergence of true leaves, stimulates the growth of the main stem.

The preparation activates the processes of formation of buds and fruit, thereby increasing the yield of cotton. Average growth of cotton under the influence of the preparation Uchkun was 2.5 qu/ha, the average yield was 30.8 qu/ha.

In order to expand the scope and study of effectiveness of the preparation was carried out on wheat field trial of Uchkun. The experiments were performed on the experimental plot of Gulistan State University and association "Navbakhor" on four varieties of wheat: Tanya, Vostorg, Chillaki, and Dustlik, which are planted in saline soil. The optimum application rate for the wheat was usage of a preparation Uchkun at a dose of 1 l / t.s. The stimulatory effect was observed in all cases for the entire period of plant development.

The treatment by the preparation was carried out in two ways: pre-sowing seed treatment and spraying of vegetating plants. For preparation Uchkun spraying method was the most effective in the case of pre-sowing treatment and the yield increase was 3.8-5.2 qu/ha depending on the variety of wheat.

The observations showed that the preparation Uchkun effects positively on the growth and development of wheat (Tab. 4).

TABLE 4
INFLUENCE OF A PREPARATION UCHKUN ON THE GROWTH AND DEVELOPMENT OF THE 4 VARIETIES OF WHEAT

Treatments	Dose, l /t.s.	Height, cm	Number of ears of corn (unite / %)	The average mass of 1000 grains	
				g	%
Dustlik					
Control	Without treatment	106±0.13	3.9±1.11/100	43.3±1.11	100
Uchkun	1.0	93.2±0.01	4.9±0.67/125.6	53.9±0.06	124.5
Verva	1.0	97.2±0.2	4.7±0.87/120.5	48.7±0.04	108.5
Vostorg					
Control	Without treatment	101.0±0.31	3.6±0.32/100	43.5±0.83	100
Uchkun	1.0	83.5±0.56	4.1±0.06/113.9	46.6±0.75	107.1
Verva	1.0	91.5±0.66	3.9±0.08/108.3	44.2±0.25	101.6
Tanya					
Control	Without treatment	100±0.31	3.2±0.32/100	43.5±0.83	100
Uchkun	1.0	87.5±0.56	4.1±0.06/128.1	46.9±0.75	107.8
Verva	1.0	91.5±0.26	3.8±0.33/118.8	44.2± 0.14	101. 6
Chillaki					
Control	Without treatment	80.0±0.78	3.9±2.08/100	46.0±2.83	100
Uchkun	1.0	83.1±0.29	4.2±0.39/107.8	49.6±1.07	107.1
Verva	1.0	83.0±0.29	4.2±0.39/107.8	48.2±1.00	104.8

As shown in Table 5, the treatment by spraying method at a dose of 1.0 l / t.s. by a preparation Uchkun the number of heads is increased by 4.8-28.1%, and the average weight of 1000 grains increased by 7.1 -24.5% relative to the control, depending on the variety of wheat.

Furthermore, the experiments by using a dose of 1.0 l / t.s. (1.0% aqueous emulsion) by spraying method in the tillering phase by a preparation Uchkun the yield increased for 4.7-6.3 qu/ha depending on the variety of wheat (Tab. 5).

TABLE 5
INFLUENCE OF A PREPARATION UCHKUN ON WHEAT YIELD

Treatments	Dose, l/t.s.	Control, without treatment	Etalon Verva	Uchkun	Yield increase, hundredweight	
					qu/ha	%
Pre-plant treatment						
Dustlik	1.0	42.1±0.33	46.6±0.55	47.3±0.56	5.2	112.4
Vostorg	1.0	38.8±1.097	43.1±1.01	42.6±1.01	3.8	109.8
Tanya	1.0	39.1±1.56	43.0±2.50	43.5±2.56	4.4	111.3
Chillaki	1.0	40.6±1.042	44.8±2.042	44.9±2.042	4.3	110.6
Treatment by spraying						
Dustlik	1.0	49.6±0.33	52.4±0.52	55.6±0.56	**0.6**	112.4
Vostorg	1.0	40.4±1.097	**45.6**±1.15	46.1±1.01	**5.7**	109.8
Tanya	1.0	47.9±1.56	**51.8**±1.42	54.2±1.56	**6.3**	111.3
Chillaki	1.0	48.5±1.042	**50.9**±2.04	53.2±2.24	**4.7**	110.6

IV. CONCLUSION

The results of the investigations which have been reported here show the influence of a preparation Uchkun on growth and development, the cotton yield under water deficit conditions and wheat in saline soils. As a result of field experience it was shown that the use of the preparation at a dose of 1.0 liters per ton of seeds (1.0% aqueous emulsion) contributes to the stimulation of growth and development of cotton in ontogeny and increases cotton yields for 2.5 qu/ha, while the preparation is not inferior etalon Vitavacks.

In the case of wheat treatment at a dose of 1.0 liters per ton of seeds by a preparation Uchkun the wheat yield increases for 4.7-6.3 qu/ha (spraying method), and for pre-plant treatment of seeds the yield increases for 3.8-5.2 qu/ha which depends on the variety of wheat. In addition, the use of Uchkun resulted to increasing of the plant resistance to unfavorable conditions, such as drought, soil salinity.

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