Discoveries in Agriculture and Food Sciences - Vol. 12, No. 06
Publication Date: December 25, 2024
DOI:10.14738/tnc.1206.17851.
Latibovna, I. M., Nimatovich, R. B., Bobomurotovich, A. D., Isaevich, M. S., & Chorievich, G. I. (2024). Influence of "Composite Defoliant" on Cotton Crop Yield and The Environment. Discoveries in Agriculture and Food Sciences, 12(06). 89-104.

Influence of "Composite Defoliant" on Cotton Crop Yield and The Environment

Ikramova Makhbuba Latibovna
ORCID: 0000-0001-8880- 131x
Scientific Research Institute for Seed Breeding and Agricultural Texnology of Cotton Growing, Bukhara Scientific Experimental Station, No. 309, B. Nakshband, Bukhara, 200100, Uzbekistan

Rakhmatov Baxtiyor Nimatovich
ORCID: 0000-0002-9669-4451
Scientific Research Institute for Seed Breeding and Agricultural Texnology of Cotton Growing, Bukhara Scientific Experimental Station, No. 309, B. Nakshband, Bukhara, 200100, Uzbekistan

Allaqulov Davlat Bobomurotovich
Scientific Research Institute for Seed Breeding and Agricultural Texnology of Cotton Growing, Bukhara Scientific Experimental Station, No. 309, B. Nakshband, Bukhara, 200100, Uzbekistan

Maxsudov Saidumar Isaevich
Scientific Research Institute for Seed Breeding and Agricultural Texnology of Cotton Growing, Bukhara Scientific Experimental Station, No. 309, B. Nakshband, Bukhara, 200100, Uzbekistan

Gaffarov Inoyat Chorievich
Scientific Research Institute for Seed Breeding and Agricultural Texnology of Cotton Growing, Bukhara Scientific Experimental Station, No. 309, B. Nakshband, Bukhara, 200100, Uzbekistan

ABSTRACT

The data on the use of "composite defoliant" influence on the rate of opening of the boll, leaf fall, the share of the first harvest of raw cotton are presented. The aim of the study is to reduce the doses of the defoliant Mg $(ClO_3)_{2\ Liquid}$ by 50%, by adding Fitovak + Urea + humin, turning it into a mild defoliant, to increase the rate of opening of bolls, the share of the first harvest, the quality of cotton, protecting the soil and the atmosphere of the environment from various harmful salts. The objects of the study were the varieties "Bukhara-8", "Bukhara-10" in the conditions of moderately saline soils of the Bukhara region. Fitovak + Mg $(ClO_3)_{2\ Liquid}$ + urea + humin was comprehensively defoliated, which has a strong effect at different times of opening of bolls by 20-30; 30-40, 40-50%. The conditions, methods of research in saline soils of the Bukhara region, the timing of the application of the "composite defoliant" depending on external factors in field and laboratory conditions were studied. The studied data proved that among the studied 2 varieties, with different

terms of opening of bolls, the best indicators were 10-11-12-variants. In terms of the rate of ripening of bolls, the differences compared to the control for two varieties, respectively, were: by + 29.7-25.5-25.3%; +30.9-29.2-22.8%. The increase in the 1st cotton harvest was respectively: +10.0 +12.3 +10.7 c/ha (Bukhara-8) +6.3 +13.4 +11.7 c/ha (Bukhara-10) and was higher than the control.

Keywords: "composite defoliant", three terms of boll opening, opening rate, share of the first cotton harvest, efficiency, environmental ecology, seed and fiber quality.

INTRODUCTION

Currently, a fundamentally new direction is being formed in agricultural culture in the search and development of pesticides, universally acting, multi-purpose stimulants of protective reactions, growth and development of cotton, which simultaneously perform many functions. Since they form induced resistance to pathogens, stimulate formative processes, increase the activity of photosynthesis, and increase the quantitative and qualitative indicators of the crop yield [1- 3]; [4- 6]; [7-9].

In the Republic of Uzbekistan, for many decades, various pesticides have been used in full-recommended doses of consumption depending on the goals and objectives of agricultural crops to destroy various pests, diseases, weeds and defoliate. In this regard, toxic compounds accumulated in the environment and in the atmosphere from year to year, and the quality of the crop yield decreased. In addition, the use of multiple and high doses of pesticides had a negative impact on the cost of production and the ecology of the environment.

An alternative, complex immune- and growth-stimulating regulator is the immune stimulant - "Fitovak". It is based on the management of the physiological reactions of the plant itself and increasing its seasonal resistance until the end of the vegetation period of plants. [1- 3]; [4- 6].

When treating plants with "Fitovak", protective mechanisms increase, which leads to an increase in the activity of phytoalexin induction, which is a trigger for the protective reaction of hypersensitivity of infected cells.

"Fitovak" acts on cotton as an immunizer even before its contact with the pathogen and promotes temporary physiological regulation of the genetically determined property of cotton resistance. It is especially irreplaceable in years with poor climatic weather conditions, has a rehabilitation capacity on problematic cotton plants, and has a beneficial effect on physiological and biochemical processes, thereby accelerating ripening and increasing the yield and quality of fiber [1- 3]; [4- 6]; [7-9].

The works of P. Kinta [7] determined that many bio regulators exhibit membrane-active properties, due to which the possibility of their use in combination with pesticides opens up. Due to the increase in the permeability of cell membranes caused by the use of bio and immune stimulants, the possibility opens up to reduce the doses of consumption and the number of treatments with chemicals, i.e. to reduce the "pesticide pressure" on the environment.

In the field of biotechnology, Uzbek scientists have conducted a number of important studies, and taking into account the above-mentioned works of Kinta, by adding immune stimulants, holmic substances and mineral fertilizers to defoliants in a complex, which have a positive effect on the growth and development of plants, increase productivity, resistance to various diseases and pests, and have a strong effect. [4]; [7-9]; [10-11].

As a result, the doses of pesticides and defoliants are reduced by 40-50%. These universal composite compounds, which reduce consumption rates and increase the effectiveness of defoliants, have a positive effect on the weight of one boll and the quality of cotton, turning a harsh defoliant into a mild one. Among such stimulants + defoliants include: Mg $(ClO_3)_{2\ Liquid}$ + Hosil; Mg $(ClO_3)_{2\ Liquid}$ + Rostbisol; N-dimethylaminomethyl-N, N-demethylammonium oxalate (DDO) + Mg $(ClO_3)_2$; Mg $(ClO_3)_{2\ Liquid}$+ Fitovac; Mg $(ClO_3)_{2\ Liquid}$. + Fitovak+ Urea + Humin, etc. Complex use of the preparation "Fitovak" with mineral fertilizers, humic acid salts and defoliants, as well as herbicides, pesticides and other chemical preparations makes it possible to reduce the norms used in production by half. This provides savings of 50% without reducing the effect of expensive preparations [4].

Application on meadow-alluvial, saline soils of the Bukhara region based on the prepared "composite defoliant" in a tank mixture, which includes "Fitovak" 75 ml + urea 6.5 kg + humin - 1.5 kg / ha + liquid magnesium chlorate 4 l / ha, various opening (by 20-30; 30-40; 45-50%) of cotton bolls is very relevant.

Simultaneous use of the "composite defoliant" reduces the number of treatments and doses of pesticides, increases the weight of one boll, the rate of opening of bolls, the share of the first harvest and the quality of cotton, and reduces the accumulation of chlorine and other toxic substances in the soil. To prepare a universal and contact-acting “composite defoliant” from “Fitovak”, 75 ml/ha is taken from the recommended dose of 200-300 ml/ha, adding humic compounds (1.5 kg/ha) and urea (6.5 kg/ha) in physical state and liquid magnesium chlorate 4 l/ha). By introducing this solution, we can reduce the recommended rate of magnesium chlorate (8 l/ha) by two times (4 l/ha) and transform a hard-acting defoliant into a soft-acting one. In the conditions of the Bukhara region, spraying defoliants on the Bukhara-8 and Bukhara-10 cotton varieties with the addition of harsh liquid magnesium chlorate and Fitovak stimulants, urea and humic substances in different rates during the period of three terms (20-30; 30-40; 40-50%) of cotton opening is being studied for the first time.

How it affects the early maturity of cotton, the rate of boll opening, what is the proportion of the first harvest, the weight of one boll, the quality of the fiber, the oil content of the seeds and how it affects the environment during the period of using the "composite defoliant" to increase its effectiveness has not been thoroughly studied on a scientific basis and no recommendations for production have been given. Taking this into account, it is very important to conduct scientific work on this topic in the saline meadow-alluvial, soil and climatic conditions of the Bukhara region.

The object and subject of the research were - liquid magnesium chlorate defoliant, immune stimulant Fitovak + Urea + Humin, mid-season Bukhara-8 and early-season Bukhara-10 cotton

varieties, in meadow-alluvial, saline soil conditions with 3 different openings (20-30; 30-40; 40-50%) of cotton bolls.

The purpose and objectives of the study. To determine the optimal timing of the application of the "Composite defoliant" by adding liquid magnesium chlorate in optimal rates of Fitovak + Humin + Urea, which has a strong effect on mid-season Bukhara-8 and early-season Bukhara-10 cotton varieties, on meadow-alluvial soils of the Bukhara region prone to salinization. To determine the rate of boll opening, reduce the rate of defoliant use, increase the efficiency of defoliants and crop quality, and provide recommendations for production.

RESEARCH METHODOLOGIES

The optimal terms of the "Composite defoliant" with a universal property of action in saline, meadow-alluvial soils of the Research Institute of Selection, Seed Production and Cultivation of Agro technology of Cotton of the Bukhara Scientific Experimental Station were studied in field and laboratory conditions.

The study was conducted according to the methodology adopted by the Research Institute of Selection, Seed Production and Cultivation of Agro technology of Cotton "Methodology for conducting field studies" [12].

"Methodological guidelines for state testing of cotton defoliants" [13-15].

The obtained yield data were analyzed by the dispersion method based on the manual "Methodology of Field Experiment" [16] by B. Dospekhov.

Methodology of agrochemical, agrophysical and microbiological studies of field cotton regions [17], the leaf surface, biomass and productivity of photosynthesis were determined during the growing season of cotton: with the appearance of 2-4 true leaves; budding; flowering; and ripening according to the Tretyakov method [18].

A study was conducted on the effectiveness of a composite defoliant in an experimental farm (2021-2023) of the Research Institute of Selection, Seed Production and Cultivation of Cotton Agro technology of the Bukhara Scientific Experimental Station.

In order to reduce the rate of chemical defoliants and increase the effectiveness of the defoliant, increase the share of the 1st harvest, the weight of one cotton bolls, and ultimately improve the ecology, dry mass and productivity of photosynthesis, gross harvest and fiber quality.

The depth of groundwater was 2.0-2.5 m above sea level. The experiment studied 12 variants from each variety. There are 24 varieties in total, with different degrees of opening of cotton bolls (20-30; 30-40; 40-50%) depending on external factors, mid-season varieties Bukhara-8 and early-ripening varieties Bukhara-10.

Irrigation in the experiments was stopped 14 days before the use of defoliants. The effectiveness of the composite mixture was judged by the number of fallen leaves on the 7th

and 14th days after treatment. When conducting the counts, the number of green, dry leaves remaining on the plant was counted. At the same time, the effect of the composite mixture on the intensity of boll opening was determined. Harvesting was carried out manually from the entire area of the plot.

In the experiments, plant spraying was carried out using a manual knapsack sprayer at a working fluid consumption rate of 900-1000 l / ha. The area of each plot is 90 m. The control background was cotton plants untreated with defoliants. The reference variant was a harsh defoliant - Mg $(ClO_3)_{2\ Liquid}$ -8 l / ha; a mild defoliant - Entodefol 150 ml / ha.

The experiment was repeated three times. The size of each variant (3.6 x 20 m) 72 m^2. The total plots for the variants and replicates were 2592 m^2 for mid-season Bukhara-8 and 2592 m^2 for early-season Bukhara-10. In total, the accounting plots were 5184 m^2. The experimental variants are arranged according to the randomization method.

All agro technical measures in the experimental fields were carried out according to the plan developed by the experimental farm. The experimental scheme is given in Table 1.

Table 1: Experiment scheme

	Experiment options	**Cotton varieties**		**application doses, ml/ha, l/ha, kg/ha**	**Boll opening, %**
1	Control (Defoliation is not carried out)	Mid-season Bukhara-8	Early ripening Bukhara-10	0,0	20-30
2					30-40
3					40-50
4	(Standard) Magnesium Chlorate liquid			8 l/ha	20-30
5					30-40
6					40-50
7	(Standard) Entodefol			150 ml/ha	20-30
8					30-40
9					40-50
10	Mg $(ClO_3)_{2\ liquid}$ + Phytovac + Urea + Humin			4 l/ha + 75 ml/ha + 6,5 kg/ ha + 1,5kg/ ha	20-30
11					30-40
12					40-50

According to the generally accepted methodology developed by scientists at the Research Institute of Selection, Seed Production and Cultivation of Cotton Agro technology of the Bukhara Scientific Experimental Station, field germination and seed germination energy were determined, phrenological records were taken, and the growth and development of cotton was observed. Soil samples were taken in two periods - (at the beginning) in spring and (at the end of the growing season) in autumn at the 0-30; 30-60; 70-100 cm soil layer horizons for agrochemical and melioration analyses.

Before and after defoliation (after 7 and 14 days of treatment for up to 3 weeks), biological conditions of cotton were recorded for all variants. The following were counted: plant height,

number of fruit branches, number of leaves, including green, semi-dried, dried and fallen leaves, as well as the number of mature bolls, including open and semi-open ones.

At the end of the growing season, manual collections and records were made to determine the yield of plants. The fiber quality was determined in the «SIFAT» laboratory; the oil content of the seeds was determined by extraction with petroleum ether on a Sox let apparatus.

Scientific novelty of the work: for the first time, the efficiency of the defoliant Liquid Magnesium Chlorate was studied together with Fitovak + urea + humin, in various boll openings of 20-30, 30-40, 40-50% on mid-season Bukhara-8 and early-ripening Bukhara-10 cotton varieties on saline, meadow-alluvial soils of the Bukhara region.

It was also scientifically established that the combined use of the "composite defoliant" had a positive effect on reducing the recommended consumption rate of liquid magnesium chlorate by 50%, turning a harsh defoliant into a mild one. Also, the rate of opening of the capsules, the share of the first harvest, the increase in the weight of one capsule, the mass, quality of the crop and seeds, the ecological situation and its economic efficiency were determined.

RESULTS AND DISCUSSIONS

For many decades, the main defoliant used in Uzbekistan for pre-harvest leaf fall is $Mg(ClO_3)_2$, which is used at consumption rates of 8-12 kg / ha. The defoliant has a "hard nature" of action. In this regard, severe burns of young bolls of the upper tier of cotton are often noted, which leads to losses in cotton yield and consumption rates have a negative impact on the ecological environment of the republic due to more intense chloride salts in the soil and "pesticide pressure" on the external environment.

In recent years, many attempts have been made to "soften" the nature of the action of this defoliant and reduce its negative impact on the environment without reducing the defoliating effect.

The solution to this problem was developed in several directions: replacing another preparative form of defoliants that soften their effect or help reduce the dose of defoliants. As a result of these studies, the following defoliants appeared: Sadaf, Mezon, Sardor, Sihat, etc. [19; 20]. However, all these defoliating compositions, although they softened the effect of the main defoliant, did not reduce or slightly reduced the rate of defoliant consumption per hectare.

The use of this composite defoliant - ($Mg(ClO_3)_{2liquid}$ + Fitovac + Urea + Humin) made it possible to obtain a defoliating effect at the level of using magnesium chlorate (powdered) and liquid magnesium chlorate, applied at a rate of 10-12 kg / ha, 8-10 l / ha, there were no burns of young capsules.

The biological condition of the plant before defoliation (in 2021-2022-2023) at three different times of boll opening (by 20-30; 30-40; 40-50%) in both cotton varieties were sprayed by year in the period: 20.08; 27.08; 4.09 (2021); 10.08; 17.08; 24.08 (2022); 8.08; 16.08; 23.08. (2023).

The average plant height for the variants of the cotton varieties Bukhara-8 and Bukhara-10, respectively, varied within the range: 97.5 - 102.2 cm; (2021); 98.3-105.18 cm; (2022); 101.6-102.8 cm; (2023).

Also the number of leaves is 45-70.4; (2022); 60.5-64.6 pcs./plant. (2023); Fruit branches - 15.2-16.4 pcs./bush (2022); 16.8-16.4 pcs./bush (2023); The number of bolls (15.2-21.4 pcs./bush (2022); 18.3-19.7 pcs./bush (2023), Of which the number of opened bolls by year was respectively: from 4 to 7.5 (Buh-8), 6-9.4 pcs./bush. (Buh-10) in 2022; from 4.5 to 9.2 (Buh-8), 4.7-9.8 pcs./bush. (Buh-8) in 2023 cotton bolls;

Fitovak, which is part of the composite defoliant, is also an immuno- and growth stimulant. And in its structure, it is similar to N-dimethylaminomethyl-N, N-demethylammonium oxalate ("DDO") and Rostbisol, and we decided to conduct research with this drug in this direction. In connection with in view of the above, in 2021-2023 we conducted research to study the possibility of using a composite defoliant (4 l/ha Mg $(ClO_3)_{2liquid}$ +75 ml/ha Fitovak + 6.5 kg/ha Urea + 1.5 kg/ha Humin).

Usually, Mg $(ClO_3)_{2liquid}$ has a “harsh nature” of action, and therefore severe burns of young bolls of the upper tier of cotton are often noted, which leads to yield losses (the weight of one boll and seeds decreases, cotton fibers do not fully ripen).

Adding half the rate (4 l/ha) of Mg $(ClO_3)_{2liquid}$ to the defoliant at the rate of Fitovak 75 ml + Urea 6.5 kg + Humin 1.5 kg/ha in a tank mixture allows you to turn the composite defoliant into a mild one. Although we started defoliating cotton early, when the cotton bolls opened by 20-30, 30-40 and 40-50%, we did not observe severe burns of young and mature bolls of the upper tier of cotton at any time of cotton boll opening.

Based on the results of studies, as an additive to the defoliant Mg $(ClO_3)_{2\ liquid}$ introduction at the rate of Fitovak 75 ml + Urea 6.5 kg + humin 1.5 kg / ha, allows to halve the hectare dose of Mg $(ClO_3)_{2\ liquid}$ 4 l / ha, without reducing the defoliating activity of the tank mixture compared to the use of defoliant at the recommended dose of Mg $(ClO_3)_{2\ liquid}$ 8 l / ha.

This use of a tank mixture (Fitovak 75 ml + Urea 6.5 kg + humin 1.5 kg/ha) will significantly reduce the “pesticide pressure” on the soil and improve the environmental situation in the region.

Where the composite defoliant was used (in variants 10-11-12) in 3 terms of opening of cotton bolls, a completely different picture was observed, i.e. it had a positive effect on the weight of one boll, the quality of the fiber, on the oil content of the seeds and led to a decrease in chloride salts.

The results of the survey (2022), carried out before the use of the "composite defoliant" showed that, in the treated area, the number of leaves on average per plant fluctuated for the Bukhara-8 variety from 43.2.2 to 47.7 pcs, and for the Bukhara-10 cotton variety, respectively, it was: 67.1-75.2 pcs. / bush.

Experimental data (2022) indicate that the defoliating activity of the mildly acting reference variant Entodefol 150 ml / ha two weeks after treatment at different times of capsule opening (Bukhara-8 and Bukhara-10), respectively, leaf fall was on average 86.6-87.2-86.7%; and 85.7-89.2-85.4%.

In these tested composite variants, leaf fall compared to the reference variant, the difference was not very large, but the percentage of acceleration of ripening and increase in capsule weight, yield and quality indicators were greater than the reference, control variants.

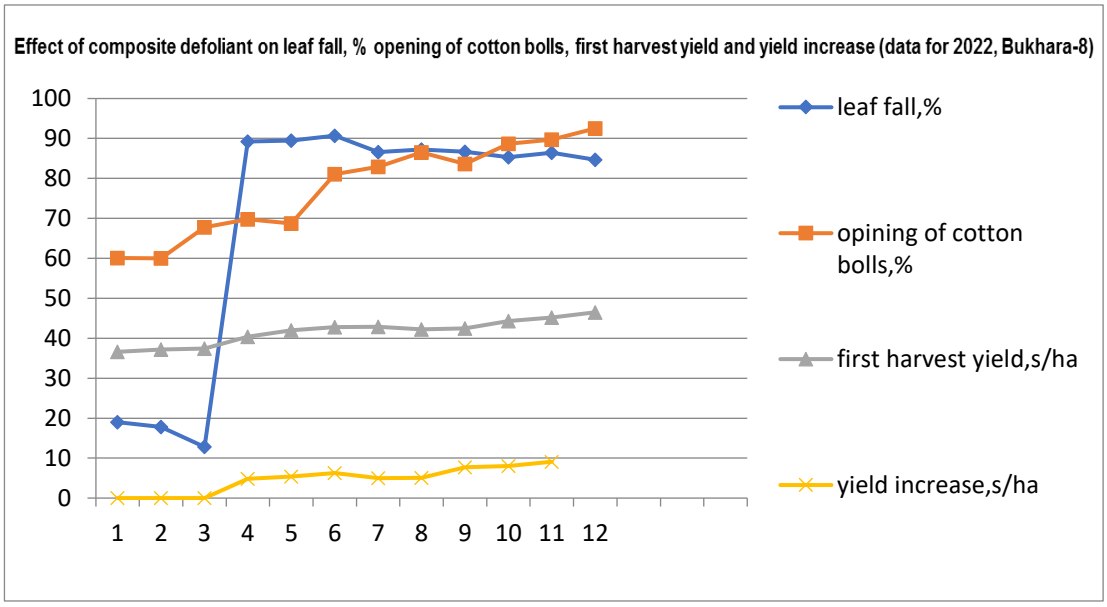
Depending on the application of the "Composite defoliant" at different times of boll opening in each cotton variety (Bukhara-8 and Bukhara-10), 3-year studies showed that the percentage of leaf fall in the 10-11-12 variants by 2022, respectively, was: 85.3-86.4-84.7% (Bukhara-8); 81.6-84.8-83.6% (Bukhara-10). After defoliation (after 14 days), the leaves did not dry out, fell semi-dry, did not cause severe burns to young and immature cotton bolls, and the weed infestation of the crop was less than that of the strictly acting reference (4-5-6) variants.

In addition, leafy plants improved row ventilation, and also had a beneficial effect on the rate of ripening of cotton bolls in two varieties.

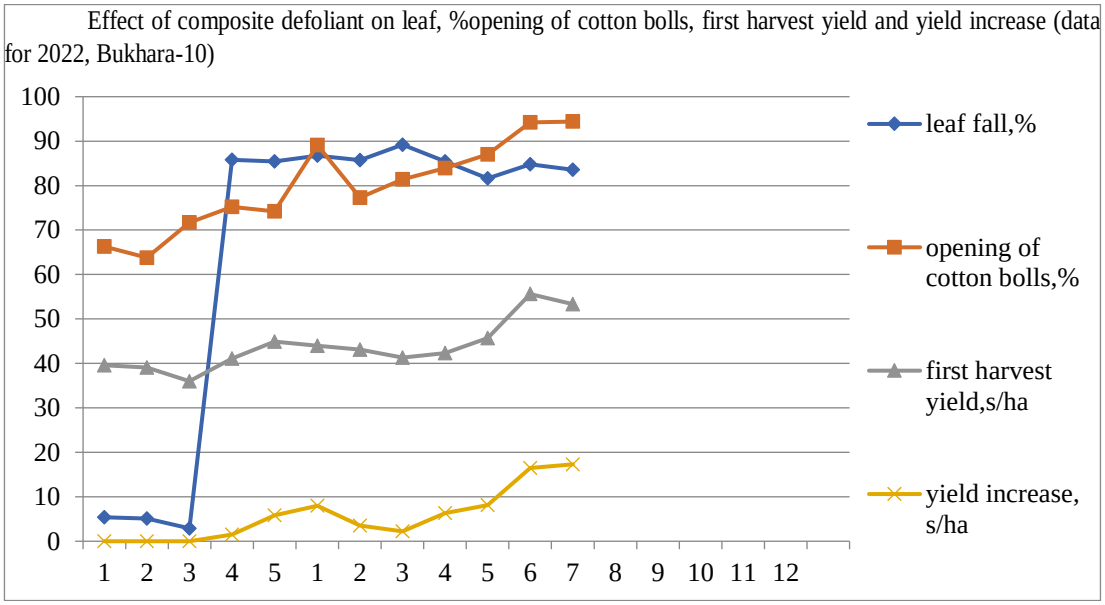
In the 10-11-12 variant of using a composite defoliant at different boll openings, due to leaf fall and, consequently, redistribution of the flow of nutrients and greater access of the sun to the cotton bolls, the latter began to open faster.

Graphs 1 and 2 shows the impact on leaf fall, bolls opening percentage and first harvest share, yield addition of the Bukhara-8 and Bukhara-10 varieties in 2022.

The effect of the composite defoliant on leaf fall in both varieties (2023) is shown in Table 2.



Graph 1



Graph 2

The results of the accounting carried out before the use of the composite mixture showed that in the treated area the number of leaves of one plant on average ranged from 52.2 to 67.7 pcs. (Bukhara-8); 60.1-71.5 pcs/per bush (Bukhara-10), (Table2). As the data in Table 2 show, the defoliating activity of Mg $(ClO_3)_{2liquid}$ -8 l/ha and Entodefol 150 ml/ha throughout the experiment, the indicators were almost identical. Accordingly, the leaf fall for the two varieties was: (88.1-90.8-87.8%; 81.9-80.8-78.5% (Bukhara-8); 81.4-85.4-83.7; 82.5-89.2-95.4% (Bukhara-10).

Addition to half the rate of defoliant in the amount of 4 l/ha Mg $(ClO_3)_{2\ liquid}$ + "Fitovak" 75 ml/ha + Urea (6.5 kg/ha) + Humic substances (1.5 kg/ha) after only 14 days the amount of fallen leaves from plants of both varieties of cotton varied within the range of 80.1-77.6-84.7% (Bukhara-8); 81.0-84.8-80.5% (Bukhara-10).

Table 2: Effect composite defoliant for leaf fall and cotton boll opening in the Bukhara region

	Options	cotton boll opening, %	Average number of leaves, pcs./bush			Number of cot-ton bolls, pcs./ bush	Including opened				
			Before treatment, pcs./ bush	2 weeks after treatment			Before treatment		2 weeks after treatment		
				pcs./ bush	defoliation efficiency, %		pcs./ bush	%	pcs./ bush	%	Rate of disclosure, % (to control).
	Mid-season cotton variety Bukhara-8 (2023)										
1	Control, 00	20-30	52.2	48	8.04	17.3	4.5	26.0	9.6	55.5	0.0
2		30-40	62.0	56	9.77	18.0	6.8	37.0	12.0	66.7	0.0
3		40-50	63.6	58	8.80	17.9	8.5	47.5	12.3	68.7	0.0
4	$Mg(ClO_3)_{2\ liquid}$ - 8 l/ha (standard)	20-30	57.3	6.8	88.1	17.9	4.7	26.3	14.0	78.2	+22.7
5		30-40	57.7	5.7	90.8	18.0	6.4	35.6	14.3	79.4	+12.7
6		40-50	59.2	7.2	87.8	18.4	8.1	44.0	14.7	79.9	+11.2
7	Entodefol, 150 ml/ha, (standard)	20-30	56.4	10.2	81.9	17.6	5.0	28.4	13.0	73.9	+18.4
8		30-40	55.7	10.7	80.8	17.1	6.3	36.8	13.2	77.2	+10.5
9		40-50	65.0	14.0	78.5	17.6	8.3	47.2	14.2	80.7	+12.0

10	$Mg(ClO_3)_{2\ liquid}$ - 4 l +	20-30	64.9	12.9	80.1	18.9	5.0	26.5	16.1	85.2	+29.7
11	Phytovac 75 ml +	30-40	64.7	14.5	77.6	20.5	7.3	35.6	18.9	92.2	+25.5
12	Urea 6.5 kg + Humin 1.5 kg/ha	40-50	67.7	10.0	84.7	20.0	9.2	46.0	18.8	94.0	+25.3
	Early ripening cotton variety Bukhara-10 (2023)										
1		20-30	60.9	56	8.0	18.5	4.7	25.4	11.5	62.2	0.0
2	Control, 00	30-40	64.9	62.0	4.5	19.3	7.3	37.8	12.8	66.3	0.0
3		40-50	68.2	65.0	2.9	19.9	8.7	43.7	14.7	73.9	0.0
4	$Mg(ClO_3)_{2liquid}$ - 8 l/ha	20-30	64.6	12.0	81.4	19.0	5.7	30.0	15.0	78.9	+16.7
5	(standard)	30-40	71.5	15.0	85.4	20.5	7.5	36.6	16.5	80.5	+14.2
6		40-50	60.8	12.0	83.7	18.3	8.6	47.0	15.3	83.6	+9.7
7	Entodefol, 150	20-30	63.0	11.0	82.5	18.7	4.9	26.2	14.0	74.9	+12.7
8	ml/ha, (standard)	30-40	60.7	8.0	89.2	19.0	7.5	39.5	15.7	82.6	+16.3
9		40-50	60.1	7.0	85.4	20.3	9.1	44.8	17.1	84.2	+10.3
10	$Mg(ClO_3)_{2liquid}$ - 4 l +	20-30	61.1	12.0	81.0	20.4	6.0	30.0	19.0	93.1	+30.9
11	Phytovac 75 ml +	30-40	70.6	15.0	84.8	22.2	8.2	36.9	21.2	95.5	+29.2
12	Urea 6.5 kg + Humin 1.5 kg/ha	40-50	68.3	13.3	80.5	20.9	9.8	46.9	20.2	96.7	+22.8

The dynamics of cotton boll opening in the variants of using tank mixtures of "Fitovak" 75 ml / ha + Urea (6.5 kg / ha) + Humic substances (1.5 kg / ha) and half the rate of Mg $(ClO_3)_{2liquid}$ in the amount of 4 l / ha, was identical to the variants of their use at the full rate of consumption (Mg $(ClO_3)_{2liquid}$ - 8 l / ha). Ultimately, after three weeks after defoliation, on average 55.5-68.7% (Bukh-8); 62-73.9% (Bukh-10) of opened bolls was counted on the control plants.

Whereas in the variants of using half doses of 4 l / ha Mg $(ClO_3)_{2liquid}$ and tank mixture "Fitovak" 75 ml / ha, Urea (6.5 kg / ha), Humic substances (1.5 kg / ha) cotton bolls opened by 29.7-25.5% (Bukhara-8); 30.9-29.2% more than the control. The highest percentage of cotton bolls opening and the rate of boll ripening were the most effective (2022-2023) in variants 10-11-12, in both varieties. It amounted to proportionally: 88.7-89.7-92.5%; + 28.6-29.7-24.7% (Bukhara-8, 2022); 87-94.2-94.4%; + 20.7-28.9-22.7% (Bukhara-10, 2022); 85.2-92.2-94.0%; +29.7-25.5-25.3% (Bukhara-8, 2023); 93.1-95.5-96.7%; +30.9-29.2-22.8% (Bukhara-10, 2023). Positive results compared to the control of the boll opening rate were observed in the research years in 10 variants, respectively, for each cotton variety: +29.7% (Bukh-8); +30.9% (Bukh-10) were higher.

Although in the 10th variant the percentage of the boll ripening rate was the highest, it should be taken into account that, in the early time of defoliation, when the bolls opened by 20-30%, at this time most of the fruit elements were still immature, including the seeds and cotton fibers. Therefore, the gross yield was lower compared to variants 11-12. Table 3 shows the data on the effect of the composite defoliant at different boll opening times on the yield indicators in both cotton varieties for 2022-2023.

The yield indicators were determined after defoliation after 21 days, from each harvest and each repetition of the variant, 100 cotton bolls were collected and the weight of one boll, the weight of 1000 seeds, the yield, length and micronaire of the fiber were determined.

Analyzing Table 3, among the tested variants, over the years of research, the most positive results were obtained in variants 10-11-12, which in terms of the share of the first harvest, the

weight of one boll and the increase in yield were significantly greater than the control and reference variants.

When recording the weight of one cotton bolls, it was noted that before the first cotton harvest in the 10-11-12 variants, an increase in the weight of one boll on one plant was observed. Accordingly, it amounted to an average (Bukh-8 and Bukh-10, 2023) in the range from 8.5 g to 8.7 g. While in the control and reference variants there were only 8.0-8.2-7.5 g (control); 7-8 g (reference, magnesium chlorate); 7.7-7.8 g; 7.0-7.2 g (reference, Entodefol), (2022-2023). Among the studied variants, the best quality was in variants - 11-12.

Table 3: Effect of the composite defoliant at different boll opening times on the yield indicators in both cotton varieties (2022-2023)

Options	Number of mature cotton bolls, pcs/plant		Weight of one boll, g		First harvest, c/ha		Total harvest, c/ha		Yield, difference to control, c/ha	
	2022y	2023y	2022y	2023y	2022y	2023y	2022y	2023y	2022y	2023y
Mid-season cotton variety Bukhara-8 (2023)										
1	14,3	17,3	7,9	8,0	36,6	36,8	45,0	42,2	0,0	0,0
2	15,0	18,0	8,0	8,1	37,2	38,2	45,6	46,1	0,0	0,0
3	14,9	17,9	8,0	8,2	37,4	40,5	45,6	47,3	0,0	0,0
4	14,9	17,9	7,6	7,0	40,4	40,2	45,5	44,3	+0,5	+2,1
5	15,0	18,0	7,7	7,5	42,0	43,5	46,3	47,6	+0,7	+1,5
6	15,4	18,4	7,7	8,0	42,8	45,4	46,9	50,5	+1,3	+3,2
7	14,6	17,6	7,7	7,2	42,9	42,7	46,3	46,7	+1,3	+4,5
8	14,1	17,1	7,8	7,2	42,2	43,3	46,5	48,9	+0,9	+2,8
9	14,6	17,6	7,8	7,3	42,5	43,9	46,9	50,2	+1,3	+2,9
10	15,9	18,9	8,4	8,5	44,3	46,8	49,9	52,3	+4,9	+10,1
11	16,5	20,5	8,5	8,5	45,2	50,5	52,5	56,1	+6,9	+10,0
12	16,0	20,0	8,5	8,6	46,5	51,2	50,6	57,3	+5,0	+10,0
Early ripening cotton variety Bukhara-10 (2023)										
1	20,5	18,5	7,8	7,5	39,6	40,5	44,6	44,7	0,0	0,0
2	21,3	19,3	7,9	7,5	39,1	41,2	44,4	44,3	0,0	0,0
3	21,9	19,9	7,9	7,5	36,0	41,1	42,1	43,5	0,0	0,0
4	21,0	19,0	7,5	7,5	41,1	42,0	45,8	46,0	+1,2	+1,3
5	22,5	20,5	7,6	7,8	44,9	42,5	46,5	47,0	+2,1	+2,7
6	19,3	18,3	7,6	7,4	44,0	43,1	46,5	47,1	+4,4	+3,6
7	20,7	18,7	7,6	7,0	43,1	44,3	45,0	45,5	+0,4	+0,8
8	21,0	19,0	7,6	7,2	41,3	42,5	45,8	46,2	+1,4	+1,9
9	22,3	20,3	7,7	8,0	42,3	43,1	46,4	47,3	+4,3	+3,8
10	22,4	20,4	8,3	8,65	45,7	46,8	50,2	51,0	+5,6	+6,3
11	24,2	22,2	8,4	8,65	55,6	54,6	57,0	55,0	+12,6	+10,7
12	19,9	20,9	8,4	8,7	53,3	52,8	55,3	54,8	+13,2	+11,3
(Least Significant Difference) LSD_{05} = 1,5c/ha; LSD_{05} = 4, 9%; 2022.) (LSD_{05} = 1.3c/ha; LSD_{05} =4,89%; 2023										

As a result of accelerated opening of cotton bolls, in variants 10-11-12 of application of half rates of defoliant Mg $(ClO_3)_{2liquid}$ 4 l / ha and a combined mixture (Fitovak 75 ml + Carbamide

6.5 kg + humin 1.5 kg / ha) the yield of raw cotton of the first harvest increased in both varieties, which varied within 45.7-46.8 c / ha; (10 var.); 55.6-54.6 c/ha (11 variants); 53.3 - 52.8 c/ha (12 variants). That compared to the control, the yield increase was respectively: +6.1-6.3 c/ha; +16.5-13.4 c/ha; + 17.3-11.7 c/ha. (Bukhara-10, 2022-2023). And the mid-season variety Bukhara-8 also showed similar data: 44.3-46.8 c/ha (10 variants); 45.2-50.5 c/ha (11 variants); 45.1-46.58 c/ha (12 variants), that the yield increase between the control by years and variants, respectively, was: +7.7-10.0 c/ha; +8.0- 12.3 c/ha; +9.1-10.7 c/ha (Bukhara-8, 2022-2023);

One of the main indicators of the effectiveness of composite plant defoliants, along with their impact on crop yield, can also include their impact on the technological properties of fiber and oil content.

Research by F. Teshaev [21], A. Kadyrov [9], Cothren, J T et al. [22], Rajni S, et al., [23] Gus Shaw et al. [24], Sun Y., Veerabomma S. et al. [25], scientists has proven that plant growth regulators do not reduce the quality indicators of the crop.

Our studies on the impact of composite defoliants on the technological qualities of fiber and seed oil content have shown that the tested (composite defoliant) 11-12- variants ($Mg(ClO_3)_2$ liquid 4 l / ha + Fitovac 75 ml + Urea 6.5 kg + humin 1.5 kg / ha) had a positive impact on these indicators. The results of the analyses are presented in Table 4, from which it is evident that (Fitovak + Urea + Humin) of plants not only improve the quality of the fiber, oil content, but also slightly increase the weight of one boll and cotton seeds.

Analyzing the data of Table 4, positive data on the weight of 100 capsules and 1000 seeds were obtained when spraying was performed at the time of capsule opening by 30-40 and 40-50%. In the experimental variants of both varieties, these indicators varied within the range: from 700g to 870g; from 132g to 144g (Bukhara-10); 700-860g; 132-140g (Bukhara-8).

Among the tested variants, the highest indicators were in variants 11-12 in both varieties, which were 865-870g; 850-860g; 140-144g; 140-140g. (Table4.)

Table 4: Effects of composite defoliant on technological qualities of fiber and oil content of seeds (2023)

Options	Weight of 100 boll, g	Weight of 1000 pcs. seeds, g	Fiber yield, %	Fiber length, mm	Microneedle indicators	Oil content of seeds, %
Early ripening cotton variety Bukhara-10						
1	750	136	38,5	35,6	4,5	20,8
2	750	137	38,5	35,5	4,3	20,9
3	750	138	38,7	35,6	4,2	21,1
4	750	134	37,7	35,3	4,5	20,7
5	780	136	38,1	35,6	4,2	21,1
6	740	138	37,8	35,5	4,2	21,2
7	700	132	37,1	35,8	4,5	20,8
8	720	138	36,7	35,5	4,1	21,0

9	800	138	37,8	35,5	4,1	21,2
10	865	140	38,2	35,9	4,3	21,8
11	865	140	38,7	36,0	4,1	22,3
12	870	144	38,5	36,0	4,1	22,4
Mid-season cotton variety Bukhara-8						
1	800	135	37,5	34,8	4,5	20,5
2	810	136	37,7	34,6	4,3	20,6
3	820	138	37,8	34,7	4,3	20,8
4	700	132	38,3	34,6	4,5	20,4
5	750	135	37,7	34,4	4,4	20,8
6	800	136	38,1	34,9	4,4	20,9
7	720	133	37,9	34,8	4,5	20,5
8	720	133	38,2	34,7	4,4	20,7
9	730	134	38,4	35,0	4,2	20,9
10	850	139	38,1	34,9	4,2	21,5
11	850	140	38,3	35,0	4,1	22,0
12	860	140	38,4	35,0	4,1	22,1

According to the yield indicators and fiber length, Mic., and seed oil content, similar data were also obtained in variants 11-12, and, respectively, amounted to: 38.3-38.4%; 35-35 mm; 4.1-4.1; 22-22.1% (Bukhara-8); 38.7-38.5%; 36-36 mm; 4.1-4.1; 22.3-22.4% (Bukhara-10).

If we pay attention to the above data, why exactly with the combined mixture (Fitovak 75 ml + Urea 6.5 kg + humin 1.5 kg / ha) with Mg $(ClO_3)_{2\ liquid}$ 4 l / ha increases the weight of one cotton bolls, 1000 pcs of seeds improves the technological properties of raw cotton, and in two reference variants, on the contrary, decreases?

These phenomena are explained by the following physiological mechanism of action: each vegetative and generative organ of the plant growth point has meristematic tissues.

Phytohormones are located in them. When combined tank mixtures were used in the process of defoliation at different times of opening of cotton bolls, under the action of these composite mixtures (Fitovak) they are activated by phytohormones, with the help of enzymes. In the composition of humic substances, which contain proteins, in urea, nitrogen compounds and other substances, all these compositions in the process of biochemical reactions with the help of enzymes break down proteins into amino and nucleic acids and others, i.e. nutrients are transformed into an easily digestible form of plants.

As a result, the digestible form of nutrients has a positive effect on the weight of one boll and the quality of fiber and seeds. And also the use of a composite defoliant for 3 weeks, in the process of falling of cotton leaves; hormones control auxin - ethylene balances. The defoliant surrounds the auxin hormone and at the same time the growth of plants stops, and the development process, on the contrary (ethylene) is activated. The aging process is underway. The nutrients (which are present in the composite mixture Fitovak + urea and humins) are redistributed on the conducting layer of cotton. Due to fallen leaves, all nutrients penetrate into the cotton bolls more than in the control variants, the amount of ethylene increases, and auxin

decreases, in connection with this, the rate of boll ripening accelerates, the weight of one boll increases due to urea and humins, as well as other yield indicators, technological properties improve.

CONCLUSIONS

Based on the studied data, it can be concluded that when using as a defoliant, composite tank mixtures of Mg (ClO_3) $_{2\ liquid}$ 4 / ha, immune stimulant "Fitovak" 75 ml / ha, urea 6.5 kg / ha and humin salt 1.5 kg / ha, turned out to be the most effective preparations.

The recommended rate of combined mixtures reduces the consumption rates of Mg (ClO_3)$_{2\ liquid}$ and other pesticides by 50% per hectare. At the same time, the "hard-acting" defoliant manifests itself as a "soft-acting".

Due to the use of a composite defoliant, a separating layer is formed between the shoots and leaves of cotton. Nutrients (Fitovak + urea + humin) penetrate through the conductive systems not into the leaves, but into the cotton bolls.

The amount of ethylene in the organs increases. Auxin decreases, due to this, the rate of boll ripening accelerates, the weight of one boll increases, the rate of boll ripening accelerates, as well as other yield indicators, the technological properties of the fiber improve.

The highest yield of raw cotton of the first harvest of both varieties, respectively, were: 45.2-46.5 c / ha (11-12 var. Bukh-8, 2022); 50.5-51.2 c / ha (11-12 var. Bukh-8, 2023); 55.6-53.3 c / ha (11-12 var. Bukhara-10, 2022); 57.0-55.3 c / ha (11-12 var. Bukhara-10, 2023); yield increase (+16.5-13.4 c/ha; + 17.3-11.7 c/ha), (Bukhara-10); +8.0- 12.3 c/ha; +9.1-10.7 c/ha (Bukhara-8) was higher than the control.

The rates of boll opening were respectively: 57.6-57.3-46.6% (Bukhara-10) 46.6%; 61.2-51.2-45.5% (Bukhara-8), higher than the control (data - 2023). The percentage of boll opening in varieties in variants 10-11-12, respectively: 87-94.2-94.4%; 88.7-89.7-92.5%.

Foliage coverage of both cotton varieties, respectively: 81.6-84.8-83.65; 85.3-86.4-84.7% were closer to the standard, and was achieved with half the consumption rate of Mg (ClO_3) $_{2\ liquid}$ (4 l / ha), in a tank mixture with "Fitovak" (75 ml / ha), urea (6.5 kg / ha) and humic acid derivatives (1.5 kg / ha). Also, the technological properties of fiber and seeds are improved when using a composite defoliant at boll openings of 30-40 and 40-50%. The use of a composite defoliant at 30-40% boll opening allows cotton growers to quickly harvest raw cotton from the field without damaging.

ACKNOWLEDGMENTS

We sincerely express our gratitude to the head of the experimental farm of the Bukhara Scientific Experimental Station, located in the city of Bukhara, for allowing us to conduct laboratory and field research. We also sincerely thank the members of the editorial boards for publishing in the journals "African Journal of Biological Sciences".

References

[1]. Avazkhodzhaev M. Kh., Zhalilov O. Zh. et al. (1994). Defoliating composition // Preliminary patent of the Republic of Uzbekistan. No. 1887, dated 12.07. (In Russ.).

[2]. Akhunov Sh (2009). "Fitovak" 20% aqueous solution. Recommendation - Tashkent, P.13(In Russ.).

[3]. Ikramova M L, Rakhmatov BN (2022). Influence of the Immunotropic Stimulant "Fitovac" on Seed Germination and Accumulation of Cotton Fruit Elements at Different Doses and Terms of Application. International Journal of Applied Agricultural Sciences Volume 8, Issue 6, November, Pages: 212-217 Received: Sep. 15, 2022; Accepted: Nov. 4, 2022; Published: Nov. 16, 2022. Views 12 Downloads 2. http://www.sciencepg.org/journal/paperinfo?journalid=343&doi=10.11648/j.ijaas.20220806.13

[4]. Ikramova M.L., Rakhmatov B N. Allakulov D B, Yunusov R (2023) Influence on the basis of the prepared Fitovak-composite defoliant on the yield of raw cotton and the environmental environment «E3S Web of Conferences», April. 9. https://www.universitetam.ru/ojs/index.php/e3swebofconferences/authorDashboard/submission/473

[5]. Ikramova M L, Atoeva R O, Rakhmatov B (2020). Influence of Zerox immunostimulant on cotton production. Scientific Research Publishing. htpps//www scirp.org/journal ajips. ISSN Online2158-2750 ISSN Print 2158-2742 January 2020. Pp. 564-568.American Journal of Plants Sciences 11(04) DOI:10.4236/ajips 2020.114041.

[6]. Ikramova M L, Rakhmatov B, Atoeva R O (2021). Application of the immunostimulant zerox for determination of leaf surface, dry mass and net productivity of photosynthesis of cotton plant. Indian Journal of Poultry Science, Volume: 10, Issue: 9, 244-250 Pp. https://www.indianjournals.com/ijor.aspx?target=ijor:ajmr&volume=10&issue=9&article=037

[7]. Kintya P K (1991). Natural bio regulators and harvest// Plant protection. -№1.-P.14-15.

[8]. Kodirov A K (2009). Study and development of technology for application of immune and growth stimulant Rostbisol on cotton in Bukhara region. Dis.cand.sci. - Tashkent: - 123p. (In Russ.).

[9]. A. Kodirov (2009). Study and development of technology for the use of the immuno- and growth stimulator Rostbisol on cotton in the conditions of the Bukhara region Abstract of diss. for diss. academic degree of candidate of agricultural sciences. Tashkent: 22 p. (In Russ.).

[10]. New technologies for the production and application of complex-action bio preparations (2010). Monograph edited by Zavalin A.A., Kozhemyakova A.P. – KHIMIZDAT– 64 p. (In Russ.).

[11]. Bondarenko AN, Zvolinsky V P (2012) Study of bio preparations based on associative nitrogen-fixing microorganisms in the cultivation of spring grain crops in the Astrakhan region// Agrochemical Bulletin. -№2.-P.22-23. (In Russ.).

[12]. Guidelines for testing defoliants on cotton (2004) Tashkent: «State Agro chemistry» -12p. (In Russ.).

[13]. Methods of Passing Field Experiments. UzCSRI, Toshkent: 2007. - P. 147. (InUz.).

[14]. Methodical recommendations for conducting laboratory tests of synthetic plant growth regulators of the All-Russian Research Institute of Plant Protection (1990) Cherkassy, p.34. (In Russ.).

[15]. Methodological guidelines for testing insecticides, acaricides, biologically active substances and fungicides, Tashkent: 1994. -P. 102 (InUz.).

[16]. Dospekhov B A (1989). Methodology for conducting field experiments. Moscow: Kolos, - 416 p. (In Russ.).

[17]. Methods of agrochemical, agrophysical and microbiological studies of field cotton regions (1973). Tashkent: «SOYUZNIXI» - 126 p. (In Russ.).

[18]. Physiology and biochemistry of agricultural plants / ed. N. N. Tretyakov. Moscow: Kolos, 2000. - 225-435 p. (In Russ.).

[19]. Aliev N A (1990). Defoliants and desiccants of cotton. Handbook. - Tashkent: FAN, -48 p. (In Russ.).

[20]. List of chemical and biological plant protection products. (2003). Permitted for use in the Republic of Uzbekistan Tashkent: - 184-186 pp. (In Russ.).

[21]. Teshaev FJ (2018). Effective use of new preparations used for cotton defoliation. Monograph. Tashkent: «Navruz» Publishing House, 236 p. (InUz.).

[22]. Cothren, J T, Gwathmey C O and Ames R B (2001). Physiology of cotton defoliation and desiccation. p.21-50. In J R. Supak and C E Snipes(ed) Cotton Harvest Management: Use and Influence of Harvest Aids. Ref. Book Series № 5. Cotton Foundation, Memphis, TN. http://www.griffin.uga.edu/caes/cotton.

[23]. Rajni S, Deol J S, Brar A S (2011). Effect of chemical defoliation on boll opening percentage, yield and quality parameters of Bt Cotton (Gossypium hirsutum) Indian journal of Agronomy., Volume: 56, Issue:1, p.74-77/ http://www.indianjournals.com.

[24]. Gus Shaw (2011). Cotton defoliation NSW Agriculture Dryland Cotton Production p.86-91. Australia. http://www.greenbook.net/Searech/QuickSearech.

[25]. Sun Y., Veerabomma S., Abdel - Mageed H. A., Fokar M., Asami T., Yoshida S., et al. Brassinosteroid regulates fiber development on cultured cotton ovules. Plant Cell Physiology, 2005. №46, – 1384-1391 p.