# Impact of composite defoliant on raw cotton yield and the environment

*Makhbuba* Ikramova[1,2], *Bakhtiyor* Rakhmatov[1], *Davlat* Allakulov[1], and *Rustam* Yunusov[2*]

[1]Scientific Research Institute for Seed Breeding and Agricultural Texnology of Cotton Growing, Bukhara Scientific Experimental Station, No.309, B. Nakshband, Bukhara, 200100, Uzbekistan
[2]Bukhara State University, st. M. Iqbol 11, Bukhara 200100, Uzbekistan

**Abstract.** The use of a composite defoliant in various norms of Bukhara-8 cotton in the Bukhara region is considered. Identified from 10 options that had a positive impact on the efficiency of defoliation, productivity were - (Mg $(ClO_3)_{2liq}$. 4 l/ha + Fitovak 75 ml/ha + Urea 6.5 + Humin-1.5 kg/ha). The weight of the bolls, the weight of the 1st collection, the gross yield were higher with the control, the standards were respectively heavier by: 0.7-0.9-0.8 g and 4.5-3.7-2.8 c/ha; 5.9-2.2-3.1 q/ha yield increase. The defoliant rate was reduced by 50%, the accumulation of $Cl^-$, $MgCl_2$ salts in the soil, air up to 50%, the ecological environment was saved from damage to the ozone layer $Cl^-$ by a certain amount, which affected air pollution. Boll burns under the action of the composite defoliant were not observed, due to the formation of a conductive layer between the leaf and stem, which activates the endohormone triggers contained in Fitovak in plants. The flow of nutrients into the stem to the bolls, bypassing the leaf, through the stem leads to an increase in the mass of the 1st, entire crop and the rate of opening of the bolls.

## 1 Introduction

World and Uzbek scientists have carried out a number of important studies in the field of biotechnology, by combining stimulants with defoliants, it positively affects the growth and development of plants, productivity, increases resistance to various diseases and pests, has a strong effect, the application rates of defoliants and other pesticides are reduced by 40-50 %.

They synthesized biochemical compounds of mild and universal action that increase the efficiency of defoliants, pesticides, fungicides, and others by reducing their consumption rates [1-11].

Although liquid magnesium chlorate is a harsh, highly effective defoliant for cotton leaf fall, because of its annual application, it leaves some amount of chlorine salts in the soil and causes an increase in its composition of harmful salts, to one degree or another. Especially in saline and saline-prone soils, this small amount also accumulates in the soil and exerts its effect to a certain extent. In addition, $Cl^-$ ions damage the ozone layer of the atmosphere. Also, Mg $(ClO_3)_{2\ liq}$ has a strong effect, and in the process of defoliation, the leaves shrivel

* Corresponding author: r.yunusov@buxdu.uz

and fall off, causing contamination of the fiber. Burning processes occur in incomplete a boll, which adversely affects the maturity of seeds, and the weight of cotton from one bolus decreases [5-8].

In recent years, scientists have sought to invent new harmless defoliants - chemicals that do not contain pesticides, including the use of hot air. They differ in that hot steam from a steam generator is used to burn the leaves, which turns water into steam. A heat gun is used for drying leaves with hot air. In addition, cryogenic technology is carried out using a cryogenic installation for supplying gas to a nozzle for freezing cotton leaves [9].

In addition to hot air, there is also a harmless way to use a liter of liquid nitrogen, evaporating and heating up to 20 °C; you can get 700 liters of liquid nitrogen. Liquid nitrogen is stored in special open-type vacuum insulated Dewar vessels or special pressure vessels. Use it in defoliation to replace the very harmful pesticide defoliation. Cotton petals vary in thickness by variety and can be steam-steamed, dried in hot air, or frozen. Thus, it is possible to achieve the task without chemicals [9].

In order to avoid such negative situations, the liquid defoliant magnesium chlorate to reduce the negative impact on the weight and quality of cotton bolls and turn the hard defoliant into a soft one and reduce the recommended application doses by 50%, increase the percentage of opening of cotton bolls more effectively than the standard.

When cotton is processed by Fitovak, a protective mechanism, which leads to an increase in the activity of induction of phytoalexins, which are the trigger for the hypersensitivity defense reaction infected cells. Formation of various types of phytoalexins, are stimulated by cotton and create unfavorable for temporary physiological regulation of genetically determined property plant sustainability. The immunostimulant acts on cotton as immunizer even before its contact with the pathogen and contributes to the temporary physiological regulation of a genetically determined property plant sustainability. "Fitovak" is especially indispensable in years with bad climatic weather conditions, has a rehabilitation ability on problematic plants, has a beneficial effect on physiological and biochemical processes, thereby accelerating maturation and increases the productivity of agricultural products [1,2,5-8,12-15,17].

The combination of "Fitovak" with mineral, organic fertilizers and various pesticides enhances the absorption of mineral and organic fertilizers by the plant, chemistry and chemical treatments of crops and reduces their toxic effect on beneficial organisms, plants and soil. By following these regulations, it is possible to prevent the accumulation of pesticides in the environment and the human and animal organisms. The drug "Fitovak" is absolutely harmless to beneficial insects and microorganisms and, in general, to flora and fauna. Low cost, lack of toxicity, high efficiency makes the drug extremely promising and cost-effective for use in agriculture. Since "Fitovak" is a universally effective agent, it can also be used in combination with magnesium chlorate as a mild defoliant. By reducing the consumption rate of the latter from 12 kg to 6 kg/ha [1, 7].

In order for the liquid magnesium chlorate defoliant to have the property of universality, to use it at half the recommended rate and turn it into a mild and environmentally friendly one, it must be used together with the composition Fitovak + Urea and Gumin. The result is a mild, harmless composite defoliant. Scientists of the Research Institute of Agricultural Technology of Seed and Cotton Growing of the Bukhara Scientific Experimental Station have achieved positive results in the conditions of saline soils in the Bukhara region.

Due to the fact that for the first time the combined use of Fitovak, Carbamide and Gumin in different norms for liquid Mg $(ClO_3)_{2\ liq}$ is being studied. - a defoliant that has a harsh effect on the cotton variety Bukhara-8, the effectiveness of the defoliant, the yield grown, the weight of the crop, the weight of one cotton boll, its quality, the impact on the ecological environment, has not been studied in detail on a scientific basis and recommendations for production have not been given. Given this, it is very important to

carry out scientific work on this topic on the soil-climatic saline soils of the Bukhara region. *Object of study:* Mg $(ClO_3)_{2\ liq}$., Fitovak, Carbamide, Gumin, cotton variety "Bukhara-8", meadow-alluvial moderately saline soil.

Subject of study: determination of the effectiveness of defoliation when combined with Mg $(ClO_3)_{2\ liq}$ well, carbamide and humic fertilizers with Fitovak.

*Purpose and objectives of the research*: The main goal of the research is to add magnesium chlorate + Fitovak + Humin + Carbamide to the liquid defoliant in various proportions, which have a pronounced effect on the medium fiber cotton variety Bukhara-8. To reduce the consumption rate of the defoliant magnesium chlorate on saline meadow-alluvial soils of the Bukhara region by 50%. To increase the effectiveness of defoliants and the quality of the crop, to protect the ecological environment from harmful salts, to give recommendations for the production. The studies were carried out on moderately saline meadow-alluvial soils of the Scientific Research Institute for Seed Breeding and Agricultural Texnology of Cotton Growing, Bukhara Scientific Experimental Station in three repetitions with a length of 25 m, each variant consists of four rows, and the plot consisted of 90 m2 x 3 repetitions. = 270 m2.

## 2 Methods

The following were used: “Methodology of field experiments with cotton adopted at the Research Institute of Cotton Growing for scientific research [18, 19].

The obtained scientific data on productivity were analyzed on the basis of B. Dospekhov's manual "Methodology of field experience" [20].

Defoliation was carried out on the basis of the manuals "Methodological guidelines for conducting state tests of cotton defoliants" [21], "Guidelines for laboratory testing of synthetic plant growth regulators" [22], "List of chemical and biological plant protection agents approved for use in the Republic of Uzbekistan" [23].

Experimental experience consisted of 10 variants. An experienced option consists of three tiers and 3-repetitions. The scheme of experience is shown in Table 1. Experimental options for repetitions were arranged according to the randomization method.

## 3 Results and discussions

One of the measures that allow you to harvest in a short time, quickly and efficiently without precipitation, reduce the amount of various harmful salts in the environment and achieve high economic efficiency, is the combination of the immunostimulant Fitovak + Carbamide + humic substances) Mg $(ClO_3)_{2\ liq}$

This composite defoliant, when used together, has a positive effect on yield, opening of bolls and accelerating the speed of their opening, as well as increasing the weight of the boll. In addition, the Fitovac immunostimulator itself is not a defoliant.

In table 2 shows data on the effect of the composite defoliant on the weight of the first harvest and the yield of cotton.

In the experiments, the first collection was carried out on the 20th day after defoliation. Before each harvest, 50 cotton bolls were selected from III repetitions and I and the average weight of one cotton boll was determined. Cotton yield was determined by variation and repetition. According to the 3-year results, it can be seen that the highest cotton yield in the study year was obtained with options 7-8-6, which were used together with Mg $(ClO_3)_{2liq}$ + Fitovak + Urea + Humin in different norms compared to all tested, control and standard options.

Analyzing the data of Table 2, where composite mixtures were used together with the hard defoliant Mg $(ClO_3)_{2liq}$ 8 l/ha (reference) and carbamide - 6.5 kg/ha (4-var) and Mg $(ClO_3)_{2liq}$ 8 l/ha (standard) + humin 1.5 kg/ha (5-var) in comparison with the control and reference 2-3 options in terms of the weight of one bolls and the weight of the 1st collection were respectively higher by: 0.3-0.5-0.4 G; 4.5-3.7-2.8 q/ha; 5.9-2.2-3.1 q/ha.

**Table 1.** Locations of experimental variants, repetition, by fields.

| № | 1 tier,1 repetitions | 2 tier, 2repetitions | 3 tier, 3repetitions |
|---|---|---|---|
| 1 var | Control | 10 var | 5 var |
| 2 var | Mg $(ClO_3)_{2\ liq}$ 8 l/ha (reference) | 9 var | 6 var |
| 3 var | Sadaf 7 l/ha (reference) | 8 var | 7 var |
| 4 var | Mg $(ClO_3)_{2\ liq}$ 8 l/ha + Urea 6.5 kg/ha | 7 var | 8 var |
| 5 var | Mg $(ClO_3)_{2\ liq}$ 8l/ha + Humin-1.5 kg/ha | 6 var | 9 var |
| 6 var | Mg $(ClO_3)_{2\ liq}$ 4 l/ha + Fitovak 75ml/ha + Carbamide 7.5 kg/ha + Humin 2.5kg/ha | 5 var | 10 var |
| 7 var | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75 ml/ha + Urea 6.5 + Humin-1.5kg/ha | 4 var | 1 var |
| 8 var | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75ml/ha + Urea 5.5 kg/ha + Humin-0.5 kg/ha | 3 var | 2 var |
| 9 var | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75 ml/ha + Urea 4.5kg/ha + Humin-0.25 kg/ha | 2 var | 3 var |
| 10 var | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75 ml/ha + Urea 3.5 kg/ha + Humin-0.125 kg/ha | 1 var | 4 var |

Among the studied options, in terms of the weight of one boll, 1-harvest and the best gross yield exceeded 6-7-8 options, and the yield indicators were, respectively: 8.8-8.9-8.7g; 44.4-48.2-46.5c/ha; 55.6-56.9-55.7c/ha.

Among the ten options studied, the best option was the seventh option. Containing in the composition: Mg $(ClO_3)_{2\ liquid}$ 4.0 l/ha + Fitovak 75 ml/ha + Carbamide 6.5 + Humin-1.5 kg/ha - composite defoliant, that the weight of one boll, the weight of the 1st harvest and the gross yield, respectively, were 0.7 g; 12.7 q/ha; 13.3 q/ha above control.

Although there were differences from 1.3-1.4-1.7-1.9 to 2.0-2.1-2.2-2.5 pieces/bush in terms of the number of bolls in all variants on one bush, different amounts of raw cotton were harvested by crop weight. Since, in the 7th variant, the number of boxes was 13.2 pieces / bush. The difference between 1-2-3 and 4 variants were greater by 0.8-2.2-0.7-0.2 pieces/bush. And the addition of raw cotton yield, respectively, amounted to: 13.3-10.4-9.9-7.0c/ha.

Obtaining the largest yield additions in the 7th variant is explained by the fact that the addition of liquid Mg $(ClO_3)_2$ to the defoliant at half the rate of consumption 4l/ha + Fitovac 75 ml/ha + Urea 6.5 + Humin-1.5 kg/ha were the most optimal doses of the composition. It was in this variant that synergy was better between the universal immunostimulant Fitovak (75 ml/ha), urea (6.5 kg/ha), humin (1.5 kg/ha) compared to other used other compositions.

**Table 2.** Influence of composite defoliant on the weight of the 1st harvest and cotton yield.

| № | Variants | Quantity of cotton bolls, pcs | Weight of one bolls, g | Weight of the 1st harvest c/ha | Difference with control, c/ha | Yield, c/ha |
|---|---|---|---|---|---|---|
| 1 | Control | 12.4 | 8.2 | 35.5 | +0.0 | 43.6 |
| 2 | Mg $(ClO_3)_{2\ liq}$ 8 l/ha (reference) | 11.0 | 8.0 | 39.2 | +3,7 | 46.5 |
| 3 | Sadaf 7 l/ha (reference) | 12.3 | 8.1 | 38.3 | +2.8 | 47.0 |
| 4 | Mg $(ClO_3)_{2\ liq}$ 8 l/ha + Urea 6.5 kg/ha | 13.0 | 8.5 | 40.0 | +4.5 | 49.9 |
| 5 | Mg $(ClO_3)_{2\ liq}$ 8l/ha + Humin-1.5 kg/ha | 12.9 | 8.5 | 41.4 | +5.9 | 50.3 |
| 6 | Mg $(ClO_3)_{2\ liq}$ 4 l/ha + Fitovak 75ml/ha + Carbamide 7.5 kg/ha + Humin 2.5kg/ha | 12.4 | 8.8 | 44.4 | +8.9 | 55.6 |
| 7 | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75 ml/ha + Urea 6.5 + Humin-1.5kg/ha | 13.2 | 8.9 | 48.2 | +12.7 | 56.9 |
| 8 | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75ml/ha + Urea 5.5 kg/ha + Humin-0.5 kg/ha | 13.5 | 8.7 | 46.5 | +11.0 | 55.7 |
| 9 | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75 ml/ha + Urea 4.5kg/ha + Humin-0.25 kg/ha | 12.7 | 8.6 | 43.5 | +8.0 | 52.9 |
| 10 | Mg $(ClO_3)_{2\ liq}$ 4.0 l/ha + Fitovak 75 ml/ha + Urea 3.5 kg/ha + Humin-0.125 kg/ha | 13.1 | 8.9 | 44.6 | +9.1 | 53.7 |

(Least significant difference) $LSD_{05}$ = 2.3c/ha; (Error percentage) Er = 4.8 %.

Surprisingly, the boll opening rate was highest in variants 4-5, as well as in variants 6 to 10, where urea with liquid Mg $(ClO_3)_2$ liquid or humin with liquid Mg $(ClO_3)_2$ liquid were used together, and also there was an increase in the weight of one box in these options. As a result, the weight of the first crop and the gross harvest in these variants were higher, which led to higher yields.

## 4 Conclusion

Based on the given data, it can be concluded that within 20 days after defoliation, with the correct management of the balance of phytohormones (auxin-ethylene) using the Fitovac stimulator, due to the activating trigger contained in it, a conductive layer is formed. Due to this, all nutrients, passing through the leaves and leaf strip, reach the bolls in moderation. It can be said what leads them to enlargement of the bolls and an increase in the mass of the first crop and the gross cotton harvest. [5, 7]

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