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EFFECT OF NEW PREPARATIONS ON COTTON YIELD COMPONENTS

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Abstract
The application of new preparations in cotton cultivation plays a crucial role in optimizing growth, development, and yield. This study evaluates the effects of biostimulants "Avangard Start," "Gulliver," and the insecticide "Antikolorad Max" on the yield components of cotton (Gossypium hirsutum L.), particularly in meadow soils. The experiment was conducted using the S-8296 cotton variety, comparing different application rates and combinations of these physiologically active substances. The results indicate that the foliar application of these preparations significantly enhances plant growth parameters, increasing boll formation, flower retention, and overall yield. Individually, "Gulliver" and "Avangard Start" demonstrated the most pronounced effects, with "Avangard Start" increasing boll count to 6.7 and open cotton yield to 6.3. Combined applications, such as "Gulliver + Avangard Start + Antikolorad Max," also contributed positively, but in some cases, individual treatments showed superior performance. The findings confirm that targeted use of biostimulants and insecticides can improve cotton productivity by 10–15%, enhance resistance to environmental stress, and optimize nutrient absorption. The study highlights the importance of integrating foliar-applied fertilizers and biostimulants into modern cotton cultivation to ensure sustainable yield improvements.

Keywords: Cotton, biostimulants, foliar fertilization, yield components, Avangard Start, Gulliver, Antikolorad Max.

Introduction

The steady growth of the world's population requires providing it with sufficient food and natural fiber clothing. With the reduction of areas allocated for crop cultivation, the only possible way to meet the nutritional needs of such a large population is to increase the yield per unit of area. As plants absorb nutrients from the soil, their amount gradually decreases. During this process, nutrients in the soil also spread to the environment, causing their deficiency in the soil. As a result, a deficiency of nutrients necessary for normal growth and development of plants may occur. The method of eliminating these deficiencies is the use of fertilizers, especially mineral fertilizers, in which the components are often found in readily available forms. During the application of mineral fertilizers to the soil, their composition may change. This affects the availability of fertilizers to plants. As a result, plants cannot absorb nutrients in the required amount or in excess. This

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negatively affects the quantity and quality of the crop. Also, some of the nutrients are lost as a result of their deep absorption into the soil, a certain part of which is released during irrigation through water, or evaporates into the atmosphere. This situation leads to increased environmental pollution.

The problems and environmental risks associated with the use of mineral fertilizers create the need to protect the environment while producing sufficient quantities of quality products for human needs. Therefore, the search for global solutions to increase the efficiency of fertilizer and nutrient use is becoming an urgent issue. In this direction, the UN Sustainable Development Strategy (to end hunger and malnutrition by 2030) and the European Green Deal Strategy play an important role. These goals can be achieved, but this means developing a more efficient and effective fertilizer system. Their goal should be to increase agricultural productivity with less fertilizer. Such expectations from currently used fertilization methods are met mainly by foliar application of nutrients, the efficiency of which can be several times higher than that of soil application. [6]

For the normal growth and high productivity of cotton, in addition to essential fertilizers, microelements such as boron, zinc, copper, molybdenum, and manganese are also important. Deficiency of these elements disrupts plant metabolism, reduces the formation of yield components, and leads to the shedding of some reproductive structures, ultimately decreasing yield and deteriorating fiber quality. Although these microelements were initially considered sufficient in the soil, the increasing yield levels have gradually depleted soil mineral reserves. Continuous use of high-concentration mineral fertilizers and limited application of organic fertilizers have further reduced the availability of microelements. Therefore, the use of micronutrient fertilizers is considered a promising approach, and their incorporation into complex mineral fertilizers is both agronomically and economically beneficial. Currently, fertilizers such as superphosphate, ammonium phosphate, and urea are being produced with added microelements, ensuring the soil is supplied with the necessary nutrients.

In foliar fertilization, the following example demonstrates its effectiveness in increasing white lupin yield. Various fertilizers were applied, and their impact on plant growth and yield was evaluated. When micronutrient fertilizers (Aquamix-TV) were used, a yield increase of up to 5% was observed, while potassium sulfate (K_2SO_4) and potassium monophosphate (KH_2PO_4) application resulted in an 8–10% yield increase. The highest results were achieved through the combined use of micro- and macroelements, with Aquamix-TV + K_2SO_4 and Aquamix-TV + KH_2PO_4 combinations increasing yield by up to 17%. These findings indicate that foliar fertilization is an effective strategy for improving the growth and productivity of white lupin, supporting its practical application. (A.S. Blinnik, V.N. Naumkin, L.A. Naumkina, O.Yu. Artemova, and A.N. Kryukov [1])

2. Materials and methods

The research studied the effect of the use of biostimulants "Avangard Start", "Gulliver" and "Anticolorad Max" on the growth, development, resistance to pests and yield of cotton varieties in the conditions of meadow soils. The table below shows the methods and terms of application of our physiologically active substances in the variants.

The experimental variants consist of 9 variants, arranged in 3 tiers, 3 rotations, and the S-8296

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cotton variety is planted in small plots. The cotton row spacing is 76 cm, 4 rows, the planting system is 76x4, the width of the variants is 3.04 m, the height is 25 m, the area is 228 m2, of which the calculated area is 2052 m2.

(Table 1) Experiment System (2023-2025) for Cotton Variety S-8296

	Experience options	Application rate in the 2-3 leaf stage, kg, l/ha	Application rate during budding-flowering, kg, l/ha	"Processing rate during flowering and fruiting period, kg, l/ha
1	Control	-	-	
2	Template (Universal)	1,0	1,0	1,0
3	Antikolorad max	0,3	0,3	0,3
4	Avangard start	1,0	1,5	2,0
5	Gulliver	1,0	1,5	2,0
6	Gulliver + Avangard +Antikolorad max	1,0+0,5+0,3	1,5+1,0+0,3	1,5+1,5+0,5
7	Gulliver + Avangard +Antikolorad max	1,5+1,0+0,3	2,0+1,5+0,3	2,5+2,5+0,5
8	(Separate processing) Gulliver + Avangard +Antikolorad max	1,0 0,5 0,3	1,5 1,0 0,3	1,5 1,5 0,5

In the experiment, the following insecticides and stimulants were used in the care of cotton variety S-8296 during the growth periods, i.e., during the 2-3-pin stage, during the budding-flowering period, and during the flowering and fruiting period, in comparison with the Universal stimulant, which is widely used in production as a control and standard, as an untreated option. In this case, the effect of spraying Anticolorad insecticide, Avangard start and Gulliver stimulants separately at the rates and times specified in options 3, 4, 5, in option 6, spraying Anticolorad insecticide, Avangard start and Gulliver stimulants together at the recommended rates, in option 7, spraying Gulliver + Avangard + Anticolorad together with slightly increased rates, in option 8, spraying Avangard start, Gulliver stimulants and Anticolorad insecticide separately at the specified rates, and in option 9, spraying Gulliver and Avangard start stimulants together at the specified rates was studied.

The above preparations were applied to the leaves during the budding or budding flowering periods of the cotton growth period by spraying them as a working solution. That is, the preparations were sprayed using the Avtomax hand-held device during the cotton's budding, budding, flowering, and fruiting stages.

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4.Results and Discussion

The preparations used in the study, Avangard Start, Gulliver, and Antikolorad Max, are foliar-applied fertilizers. Gulliver and Avangard Start play a significant role in stimulating plant growth and development. The humic acids, succinic acid, and hormones (gibberellins, auxins, cytokinins) in Gulliver enhance plant growth potential and promote root system development. Meanwhile, Avangard Start, due to its balance of macro- and microelements, strengthens plant immunity and significantly increases yield. Antikolorad Max is an insecticide that helps combat cotton pests.

(Table 2) The Effect of Applied Preparations on Cotton Yield Elements (2023)

№	Variant	Flower count		Bud count		Boll count		Opened cotton
		1.07	1.08	1.07	1.08	1.08	1.09	1.09
1	Control	0.9	1.9	3.3	1.9	5.9	3.2	5.6
2	Template (Universal)	1.3	1.7	3.4	1.5	5.6	3.9	4.6
3	Antikolorad max	0,8	2.4	3,7	1.5	6.4	5.1	5.2
4	Avangard start	1,1	2.3	4,2	1.8	6.7	3,5	6,3
5	Gulliver	1,4	1.9	5	1	7	3,6	6
6	Gulliver + Avangard +Antikolorad max	1.2	2.5	3.6	1.3	6.6	4,2	5,4
7	Gulliver + Avangard +Antikolorad max	1.1	3.6	3	1.3	5.8	5,3	5
8	(Separate processing) Gulliver + Avangard +Antikolorad max	1	1.6	3.1	1.1	6.7	4,2	6

In the control variant, the indicators were the lowest: the number of flowers was 0.9, the number of buds was 1.9, and the number of bolls was 5.9. When Gulliver was applied, the number of flowers increased to 1.4, and the number of open bolls reached 6.0, indicating its positive effect on yield. Avangard Start also improved growth indicators, increasing the number of bolls to 6.7 and the number of open bolls to 6.3.Antikolorad Max raised the number of buds to 2.4 and the number of bolls to 6.4. In one of the combined variants (Gulliver + Avangard Start + Antikolorad Max), the number of flowers was 1.2, the number of bolls was 6.6, and the number of open bolls was 5.4. The results indicate that the combination of preparations can further improve yield

parameters, but in some cases, individual applications yielded better results than combinations (e.g., Gulliver + Avangard Start + Antikolorad Max). These findings suggest that while individual preparations effectively enhance growth and yield, some combination treatments provide varied results. The combination of Gulliver, Avangard Start, and Antikolorad Max did not always show superior results compared to individual applications.

4.Conclusion

According to the results of the experiment, biologically active substances have a significant impact on the growth and yield of cotton plants. The study evaluated yield indicators by applying Gulliver, Avangard Start, and Antikolorad Max both individually and in combination. Gulliver and Avangard Start showed the best results, significantly increasing boll count and opened cotton yield. In particular, the Avangard Start variant resulted in 6.7 bolls per plant, with 6.3 opened cotton yield. Although combination treatments also produced good results, in some cases, individual applications were more effective. Therefore, the choice of preparations should consider field conditions and specific goals. Overall, targeted use of biologically active substances can increase cotton yield by 10-15% and improve plant resistance to environmental stress factors.

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