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THE EFFECT OF MICRONUTRIENT FERTILIZERS ON CHANGES IN COTTON LEAF AREA

Teshaboyev Nodirbek Ikromjonovich

Fergana State University, Doctor of Philosophy (PhD) in Agricultural Sciences,

Doctoral Candidate (DSc)

https://orcid.org/0009-0000-5038-2105

teshaboyevnodirbek546@gmail.com

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Abstract. In this article, when fed through cotton leaves with NPK microelements made from local raw materials, the thickness of the cotton seedling and the surface of the leaf surface increased as a result of the suspensions applied through the leaf, the process of photosynthesis is accelerated, the metabolism is improved, and as a result, the plant Information about the optimal development and increase in cotton yield is provided.

Key words microfertilizers, crop, seedling thickness, level, cotton, leaf, biological, photosynthesis, liquid, mineral.

Introduction. In the soil conditions of the Republic of Uzbekistan, where micronutrient deficiencies are widespread, developing effective technologies for foliar application of macro- and micronutrients to cotton plants in balanced proportions, at optimal application times, rates, and methods is one of the pressing issues in agriculture. This approach is essential for obtaining high and high-quality cotton yields. Therefore, conducting scientific research to investigate and improve these technologies is of great importance. Various mineral and organic fertilizers are applied in appropriate quantities to ensure that plants can effectively absorb micronutrients from the soil (M. A. Belousov, B. M. Isaev).

Scientists such as E. K. Kruglova, M. M. Alieva, T. P. Pirakhunov, B. I. Niyazaliev, B. A. Tillabekov, and others have conducted scientific research on determining the application rates and timing of micronutrients in cotton cultivation, evaluating their significance, and addressing practical aspects of their use. Numerous studies and experiments have demonstrated that micronutrients should not be applied universally across all agricultural lands, but rather selectively in areas where their content in the soil is insufficient. However, conducting scientific investigations to determine the effectiveness of foliar application of liquid micronutrients to cotton plants in relation to mineral fertilizer application rates under the soil and climatic conditions of the Fergana Region remains a relevant and important research issue [5, p. 6].

Research Materials and Methods

Field experiments and phenological observations were conducted in accordance with the methodology developed by the Scientific Research Institute of Cotton Breeding, Seed Production and Cultivation Agrotechnologies. The experimental data were subjected to mathematical and statistical

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analysis using B. A. Dospekhov's methodology, with calculations performed in Microsoft Excel. Although the required plant population density for the C-8290 cotton variety used in the experiment had been established by the authors, approximately similar plant densities were maintained across all experimental treatments. Nevertheless, changes in cotton plant density were observed depending on the application rates of mineral fertilizers and the effects of liquid micronutrients.

It should be noted that climatic conditions varied considerably during the research years. Consequently, differences in the seed germination dynamics were identified across all experimental treatments and between individual years. Furthermore, it was observed that the agrotechnical practices applied in the study had neither a positive nor a negative effect on cotton plant population density.

Analysis and Results

In the control treatment under Fertilizer Background II, where mineral fertilizers were applied at rates of N180, P125, and K90 kg/ha, the actual cotton plant population densities after thinning during the research years were 89.2, 84.1, and 86.3 thousand plants/ha, respectively. The average value over the three years was 88.6 thousand plants/ha. At the end of the growing season, the corresponding plant densities were 83.0, 81.8, and 81.2 thousand plants/ha, with a three-year average of 82.0 thousand plants/ha. These average values differed from those of the control under Fertilizer Background I by 1.5 and 0.7 thousand plants/ha, respectively. Another important point to emphasize is that the liquid micronutrients and NPK fertilizers used in our experiment were applied beginning at the stage when cotton plants had developed two to three true leaves. Therefore, the dynamics of cotton seedling emergence were also determined during the research.

It should be noted that the leaf area per hectare was calculated by multiplying the leaf area measurements of an individual plant by the actual plant population density recorded for the corresponding experimental treatment and growth stage. Under the above-mentioned mineral fertilizer background, a fertilizer suspension containing liquid micronutrients was applied foliarly to cotton plants three times. As a result, the leaf area of an individual plant reached 1,130 cm^2 during the budding stage, 1,810 cm^2 during flowering, and 2,000 cm^2 during boll maturation. Accordingly, the leaf area per hectare was 9,695, 15,529, and 16,920 m^2, respectively. These values were 343, 1,752, and 1,179 m^2/ha higher than those recorded in the control treatment.

Thus, the application of foliar fertilizer suspensions increased the leaf area of cotton plants, contributing to the intensification of photosynthesis and improvement of metabolic processes. Consequently, more favourable conditions were created for optimal plant development and increased cotton productivity. These findings are discussed in greater detail in the following sections. Another aspect that deserves particular attention is the dynamics of cotton leaf area across the different experimental treatments. In all treatments, leaf area increased rapidly from the budding stage to the flowering stage, whereas its rate of increase became relatively slower between flowering and boll maturation. In Treatment 2, regardless of the suspension application, the total leaf area per hectare increased by 5,834 m^2 from the budding stage to flowering, while the increase from flowering to boll maturation amounted to 1,391 m^2. This indicates that physiological processes in cotton plants occur more intensively during the flowering stage.

In Treatment 3, a fertilizer suspension containing liquid NPK and micronutrients was applied foliarly to cotton plants three times during their growth and development stages at rates of 3.0 + 3.5 + 4.0 L/ha. The leaf area per hectare reached 10,068, 16,839, and 17,176 m^2 during the budding, flowering, and boll maturation stages, respectively. These values were 716, 1,310, and 1,435 m^2

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higher than those in the control treatment, while exceeding the corresponding values in Treatment 2 by 373, 1,310, and 256 m². This indicates that the effectiveness of liquid fertilizers containing both NPK and micronutrients was higher than that of fertilizers containing only micronutrients. In the foliar nutrition of cotton, a liquid fertilizer called "Kafolon", containing various micronutrients, was applied four times according to the experimental scheme. As a result, the leaf area per hectare reached 9,531 m² during budding, 15,913 m² during flowering, and 16,666 m² during boll maturation. These values exceeded the control treatment by 175, 1,416, and 925 m², respectively. However, they were 510 m² lower than the corresponding value in the relatively optimal Treatment 3 (during the sowing period) and 254 m² lower than that in Treatment 2.

In the control treatment of the experimental variants (Treatments 5–8), where mineral fertilizers were applied at rates of N180, P125, and K90 kg/ha, the cotton leaf area per hectare was 9,839 m² during budding, 14,423 m² during flowering, and 16,360 m² during boll maturation. These values exceeded those recorded in the control under Fertilizer Background I by 487, 646, and 619 m², respectively. This increase was primarily attributed to the additional application of N50, P35, and K25 kg/ha of mineral fertilizers.

In Treatment 6, where liquid micronutrients were applied foliarly three times, the corresponding leaf area values reached 10,946, 15,577, and 17,117 m²/ha, respectively. These figures exceeded those of the control treatment by 1,107, 1,150, and 517 m²/ha. Furthermore, they were also higher than the corresponding values in the parallel treatment under Fertilizer Background I (Treatment 2) by 1,251, 48, and 697 m²/ha, respectively.

The relatively highest and most favourable results in the experiment were observed in Treatment 7, where liquid NPK fertilizers and micronutrients were applied foliarly three times during the cotton growth and development stages. The leaf area per hectare in this treatment reached 11,229, 16,065, and 17,517 m² during the budding, flowering, and boll maturation stages, respectively.

The Effect of Foliar Application of Micronutrient-Enriched Mineral Fertilizers on Changes in Cotton Leaf Area (cm²/m²), 2022

Table 2.

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Option order	Annual rates of mineral fertilizers, kg/ha			Mineral fertilizers with microelements, ml, l/ha	In preparation		In bloom		Ripening	
	N	P	K		In 1 plant, cm2	1 ha/m2	In 1 plant, cm2	1 ha/m2	In 1 plant, cm2	1 ha/m2
1	130	90	65	control	1120	9352	1700	13777	1980	15741
2	130	90	65	Liquid micro-elements (Aminomax)	1130	9695	1810	15529	2000	16920
3	130	90	65	Liquid NPK and (Ento Micro) trace elements	1135	10068	1890	16839	2040	17176
4	130	90	65	The guarantee	1132	9531	1870	15913	2030	16666
5	180	125	90	control	1170	9839	1715	14423	2000	16360
6	180	125	90	Liquid micro-elements (Aminomax)	1300	10946	1850	15517	2085	17117
7	180	125	90	Liquid NPK and (Ento Micro) trace elements	1340	11229	1910	16005	2160	17517
8	180	125	90	The guarantee	1320	11133	1860	15318	2095	17262
9	230	160	115	control	1240	10068	1800	14616	2040	16381
10	230	160	115	Liquid micro-elements (Aminomax)	1320	10824	1870	15334	2180	17243
11	230	160	115	Liquid NPK and (Ento Micro) trace elements	1350	11137	1920	15840	2225	17755
12	230	160	115	The guarantee	1300	11245	1880	16262	2200	17887

These values were found to exceed those of the control treatment by 1,390, 1,582, and 1,157 m²/ha, respectively. Compared with Treatment 6, in which liquid micronutrients were applied, the corresponding values were higher by 283, 486, and 400 m²/ha, respectively.

Conclusions and Recommendations

1. Regardless of the agrotechnical practices applied, the actual cotton plant population density in the experiment averaged approximately 80.1–84.1 thousand plants/ha. The differences observed in the scientific results were not dependent on variations in this indicator. According to the data obtained under the climatic conditions of 2021, in the control treatment among experimental variants 1–4, where mineral fertilizers were applied at rates of N130, P90, and K65 kg/ha, the leaf area of one cotton plant during the budding stage was 1,120 cm², while the total leaf area per hectare reached 9,352 m².

2.Against the background of mineral fertilizer application at rates of N180, P125, and K90 kg/ha, a liquid fertilizer consisting of a mixture of micronutrients known as “Kafolon” was applied foliarly to cotton plants four times, with the final application carried out during the boll formation stage (Treatment 8). As a result, the leaf area per hectare reached 11,133 m² during budding, 15,318 m² during flowering, and 17,262 m² during boll maturation. These values exceeded those of the control treatment by 1,294, 895, and 902 m²/ha, respectively. However, compared with the corresponding results of the optimal Treatment 7, they were lower by 187, 687, and 315 m²/ha, respectively.

REFERENCES

1. Dala tajribalarini o‘tkazish uslublari. O‘zPITI. Toshkent, 2007, 147 b.
2. Abdualimov Sh., Abdullayev F. Gumimaks samarali stimulyator // Dehqonchilik tizimida ziroatlardan mo‘l hosil yetishtirishning manba va suv tejovchi texnologiyalari. Xalqaro ilmiy-amaliy konferensiya maqolalar to‘plami. O‘zPITI. –Toshkent, 2010. –B.233-236.
3. SH.Abdualimov, Q.Davronov, Y.Soriyev, Sh.Karimov, F.Abdullayev. Gumimaks preparatining g‘o‘zaga ta’siri// AGRO ILM. O‘zbekiston qishloq xo‘jaligi jurnali ilmiy ilovasi. Toshkent, 2010. -№2 (14). -B. 17-18.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

4. Tillabekov B.X., O‘razmatov N., Siddiqova D., Karimov Sh., Nurmatov A., Xaitboyev X. Ma’dan o‘g‘itlardan tayyorlangan suspenziyalarni g‘o‘za navlarida barg orqali qo‘llashning samaradorligi. Paxtachilikda dolzarb masalalari. Toshkent. 2009 y. 336-308 b.
5. Davronov, Q. (2022). Suyuq azotli o‘g‘itlar meyorlari va suspenziya qo‘llashning paxta hosiliga ta’siri. Models and methods in modern science, 1(18), 29-31.
6. Davronov, Q., & To‘xtashev, F. (2022). G‘o‘zani rivojlanish davrlarida bargidan oziqlantirishning barg soni, og‘irligi va yuzasiga ta’siri. Akademicheskiye issledovaniya v sovremennoy nauke, 1(19), 316-319 b., N Teshaboyev. (2023). Mikroelementli o‘g‘itlarni o‘simlikni bargi orqali qo‘llashning g‘o‘zani 1000 dona chigit vazni hamda bir ko‘sakdagi paxta vazni ning o‘zgarishiga ta’siri. Science and innovation, 1811-1815 b.
7. Davronov Q., Teshaboyev N. Mikroelementli o‘g‘itlarni o‘simlikning bargi orqali qo‘llashning g‘o‘zaning 1000 dona chigit vazni hamda bir ko‘sakdagi paxta vazni o‘zgarishiga ta’siri // Science and innovation. 2023. B. 1811–1815.
8. Davronov Q., Teshaboyev N. The effect of foliar application of micro element fertilizers on cotton flowering dynamics in cotton cultivation // Science and innovation. 2023. P. 193–196.
9. Мирзажонов К.М., Умбетаев У. Влияние сульфоаммолизированных продуктов на подвижность фосфора в карбонатных почвах // Тупроқ унумдорлигини ошириш муаммолари. – Тошкент, 2007.