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SUBMITTED 26 January 2025
ACCEPTED 25 February 2025
PUBLISHED 27 March 2025
VOLUME Vol.05 Issue03 2025

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The Influence of Non-Traditional Fertilizers on Cotton Productivity

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Abstract: The growth and development of cotton are primarily influenced by soil fertility, agrochemical and agrophysical properties, the availability of nutrients, water, and air regimes, as well as plant density and the sum of effective temperatures.

Keywords: Mineral fertilizers, glauconite, glaucophos, soil fertility, macroelement.

Introduction: Soil fertility, agrochemical and agrophysical properties, nutrient availability, water and air regimes, plant density, and the sum of effective temperatures primarily influence the growth and development of cotton.

In the first variant, mineral fertilizers were applied at a rate of N250, P175, and K125 kg/ha. In the second and third variants, glauconite and glaucophos were used without mineral fertilizers at a rate of 900 kg/ha. In the fourth and fifth variants, reduced (by 25%) rates of mineral fertilizers were applied (N180, P130, K90 kg/ha). In the sixth to ninth variants, the NPK rates were 180, 130, and 90 kg/ha, while the glauconite and glaucophos rates were 9020 and 1200 kg/ha,

respectively.

In our field experiment, we studied the effects of glauconite and glaucophos compared to the full rate of mineral fertilizers (N250, P175, K125 kg/ha). We examined these substances without mineral fertilizers and with a reduced annual mineral fertilizer rate (decreased by 25%) to N185, P130, K90 kg/ha.

The average cotton yield ranged from 21.9 to 34.9 c/ha. When applying mineral fertilizers at a rate of N250, P175, K125 kg/ha (Variant 1), the yield was 32.0 c/ha. The application of pure glauconite without mineral fertilizers at a rate of 900 kg/ha resulted in a yield of 21.9 c/ha (Variant 2). This can be explained by the insufficient macroelement content in glauconite necessary for plant growth, despite its sufficient microelement content. Applying glaucophos at a rate of 900 kg/ha (Variant 3) resulted in a yield of 25.0 c/ha, which is 3.1 c/ha higher than in Variant 2. The presence of phosphorus in glaucophos contributes to increased yield to some extent. However, the absence of nitrogen and potassium in sufficient quantities negatively affects cotton productivity. The application of glauconite and glaucophos at 900 kg/ha without mineral fertilizers did not achieve the same yield level as Variant 1, where N250, P175, K125 kg/ha were applied. When glauconite and glaucophos were used in combination with mineral fertilizers, the annual NPK rate was reduced by 25%, to N185, P130, K90 kg/ha. The yield in these variants (Variants 4-9) ranged from 31.8 to 34.9 c/ha. Applying glauconite at a rate of 600 kg/ha along with mineral fertilizers resulted in a raw

cotton yield of 33.4 c/ha, which is 1.4 c/ha higher than in Variant 1. The data in Table 1 indicate that further increasing the glauconite rate to 900 and 1200 kg/ha (Variants 6 and 8) did not lead to higher yields. The yield remained nearly the same (Variant 8) or even decreased (Variant 6) compared to Variant 4. When glaucophos was applied at a rate of 600 kg/ha (Variant 5), the cotton yield reached 34.9 c/ha, which is 2.9 c/ha higher than in Variant 1 and 1.5 c/ha higher than in Variant 4.

It should be noted that increasing the glaucophos rate to 900 and 1200 kg/ha (Variants 7 and 9) led to a yield reduction of 2.4 c/ha. This indicates that for normal growth, development, and increased cotton yield, applying 600 kg/ha is sufficient. The yield increase of raw cotton when using mineral fertilizers in combination with glauconite and glaucophos, compared to Variant 1 (N250, P175, K125 kg/ha), was 1.4 c/ha in Variants 4 (600 kg/ha) and 8 (1200 kg/ha) with glauconite. However, in Variant 6 (900 kg/ha), the yield decreased by 0.2 c/ha. In Variants 5, 7, and 9, where glaucophos was applied at rates of 600, 900, and 1200 kg/ha, the yield increases were 2.6 and 0.5 c/ha, respectively (Table 2). However, in these variants, mineral fertilizer use was reduced by 25%, while cotton plants were still supplied with essential microelements. The extraction of local mineral agro-ores is relatively inexpensive. Therefore, from both economic and environmental perspectives, these fertilizers are a viable option for cotton nutrition.

Raw cotton yield depending on the application rate of nutrients

Variant Number	Replication			Average	Deviation, $\pm$		
	I	II	III		From var. 1	From var. 2	From var. 4 and 5
1	34,2	35,4	26,5	32,0	00	00	
2	21,4	25,7	18,5	21,9	-10,1	00	
3	26,8	27,8	20,6	25,0	-7,0	00	
4	35,0	38,0	27,2	33,4	-1,4	+11,5	00
5	36,5	38,5	29,9	34,9	-0,2	+9,9	-1,6
6	33,8	35,2	26,3	31,8	-0,2	+9,9	-1,6
7	33,4	35,9	23,4	30,5	-0,5	9,0	-2,4
8	35,5	36,0	20,8	30,8	+8,9	+11,5	2,6
9	34,4	32,6	30,6	32,5	+10,6	+7,5	2,4

$m = 0,78$ c/ha;

Least Significant Difference (LSD)₀₉₅ = 2,75%

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