

PHYSIOLOGICAL BASIS OF THE INFLUENCE OF NITROGEN FERTILIZERS ON THE YIELD OF COTTON GROWING IN CONDITIONS OF MEDIUM SALINITY OF SOILS

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Annotation: This article presents data on the significant negative impact of salinity, especially moderate and strong salinity levels, on the intensity of photosynthesis in cotton plants. At all salinity levels, with the application of nitrogen fertilizers and their increasing rate, the intensity of photosynthesis increases compared to the control without fertilizers and the background.

Keywords: non-saline soils, slightly saline soils, cotton plant, stem height and leaf number, nitrogen fertilizers

The rate of leaf respiration of cotton plant is more dependent on the leaf surface area. The larger the leaf surface area, the better the rate of respiration. The leaf surface area also changes depending on the amount of nitrogen fertilizers and salinity levels. The rate of leaf respiration of cotton also changed depending on the nitrogen fertilizer rates and salinity levels applied. For example, in studies conducted on non-saline soils, 1.75 $\mu\text{l O}_2$ was produced per 1 gram of wet weight per hour in the 2-3 true leaf phase of cotton. It is noteworthy that this indicator was 1.69 $\mu\text{l O}_2$ in weakly saline soils, 1.48 $\mu\text{l O}_2$ in moderately saline soils, and 1.46 $\mu\text{l O}_2$ in strongly saline soils, with the indicators decreasing with increasing salinity levels. When the background variant was analyzed, these indicators were 1.92; 1.87; 1.71; 1.72 $\mu\text{l O}_2$ in non-saline and the remaining three saline soils. In the experiment, the indicators did not differ significantly from each other in the variants where nitrogen fertilizer was used, since the effect of nitrogen fertilizer was almost absent in this phase (Table 1).

When cotton plants were grown on non-saline soils in the tailoring phase, the control variant without fertilizer was 17.3 $\mu\text{l O}_2$, while the background variant without nitrogen fertilizer was 20.7 $\mu\text{l O}_2$. Different rates of nitrogen fertilizers, for example, background + nitrogen, when applied at 100 kg, were 24.6 $\mu\text{l O}_2$. The sequence of variants in the variants with 150; 200; 250; 300; 350 kg of nitrogen fertilizer was 29.9; 37.4; 40.0; 42.5; 45.8 $\mu\text{l O}_2$. In all variants of nitrogen fertilizer application in weak, medium and strong saline soils, it ranged from 19.0 $\mu\text{l O}_2$ to 40.3 $\mu\text{l O}_2$.

Table 1

Effect of nitrogen fertilizer rates on respiration rate under different saline soil conditions

№	Variants	2-3 true leaves	Budding	Flowering	Budding
		Based on $\mu\text{l O}_2$ per 1 gram of wet mass for 1 hour			
Non-saline					
1	Control	1,75,±0,1	17,3,±1,2	150,2,±2,04	173,4,±3,22
2	P ₁₇₅ K ₁₂₅ -fon	1,92,±0,26	20,7,±1,8	175,5,±2,03	201,7,±4,02

3	Background +N ₁₀₀	2,01,±0,14	24,6,±1,3	180,3,±2,5	216,5,±4,4
4	Background +N ₁₅₀	2,06,±0,09	29,9,±1,64	197,0,±2,14	279,0,±3,4
5	Background +N ₂₀₀	2,24,±0,07	37,4,±1,05	219,3,±2,8	300,8,±4,9
6	Background +N ₂₅₀	2,49,±0,19	40,0,±1,08	245,3,±3,6	350,2,±4,10
7	Background +N ₃₀₀	2,60,±0,24	42,5,±1,17	260,4,±3,14	376,3,±4,20
8	Background +N ₃₅₀	2,75,±0,18	45,8,±1,32	263,7,±2,33	382,0± 4,22
Slightly salty					
1	Nazorat	1,69±0,03	16,0,±1,3	151,7,±0,17	162,7,±4,1
2	P ₁₇₅ K ₁₂₅ -fon	1,87,±0,06	20,9,±1,45	163,7,±3,05	199,0,±3,01
3	Background +N ₁₀₀	1,99,±0,09	23,9,±0,59	176,9,±3,012	220,2,±4,12
4	Background +N ₁₅₀	2,12,±0,1	27,7,±0,8	189,5,±2,04	254,3,±4,35
5	Background +N ₂₀₀	2,16,±0,12	38,1,±1,71	208,4,±3,002	290,4,±3,25
6	Background +N ₂₅₀	2,37,±0,18	38,6,±2,05	239,6,±2,65	326,0,±3,02
7	Background +N ₃₀₀	2,53,±0,09	39,2,±2,014	249,8,±3,19	354,1,±1,005
8	Background +N ₃₅₀	2,67,±1,25	40,3,±2,031	253,0,±4,006	360,6,±4,20

The most reliable results in the studies were obtained with nitrogen 250, phosphorus 175, potassium 125 kg was obtained. The leaf respiration rate in the flowering phase of cotton plants was 150.2 µl O₂ in the control variant without fertilizer application, 175.5 µl O₂ in the background variant, and 180.3; 197.0; 219.3; 245.3; 260.4; 263.7 µl O₂ in the remaining variants with the application of background+ N₁₀₀, background+N₁₅₀, background+N₂₀₀, background+ N₂₅₀, background+N₃₀₀, background+N₃₅₀ kg, respectively. In the variants with the application of nitrogen fertilizer on slightly saline soils, it was 176.9; 189.5; 208.4 239.6; 249.8; 253.0 µl O₂, in accordance with the above indicators. In moderately saline soils and in strongly saline soils, these indicators ranged from 152.4 µl O₂ to 209.4 µl O₂.

It was found that the respiration rate increased significantly during the period of tillering. For example, in the control variant of the studies conducted on non-saline soils, it was 173.4 µl O₂, but after the start of nitrogen application, this indicator began to increase sharply. For example, in the P₁₇₅, K₁₂₅ - background variant, it was 201.7 µl O₂. These indicators were 162.7 µl O₂ and 199.0 µl O₂ in the control and background variants of weakly saline soils, while in non-saline

Soil salinity negatively affects plant growth and development. In this case, physiological processes are disrupted and stress conditions are observed in plants.

When analyzing the effect of nitrogen fertilizers on the height of the main stem and the number of leaves of cotton plants grown on soils with different levels of salinity, in the control variant, determined on the dates 1.06; 1.07; 1.08; 1.09 according to the study period, the height of the main stem of cotton was as follows in the sequence of the determined dates: 7.6; 14.3; 32.6; 52.0 cm, in the background variant, this indicator was 10.8; 23.2; 49.0; 73.9 cm.

As we know, nitrogen fertilizers are one of the main types of fertilizers for crop growth. At all salinity levels, nitrogen fertilizer application was higher than the remaining (unapplied) options. However, increasing salinity led to a decrease in comparison with non-saline soils. For example, in non-saline soils, when measured on date 1.06 in the background + N₁₀₀ kg option, it was

30.0; when measured on date 1.08, it was 76.9; when measured on date 1.09, it was 88.1 cm, although this was significantly different from the control option.

With increasing nitrogen fertilizer rates, the height of the main stem of cotton increased, which was observed on all measured dates. For example, in the background + N150 kg option, it was 1.06; 1.07; 1.08; When measured on 1.09, the height of the main stem of cotton was 21.3; 37.2; 85.2; 93.4 cm, according to the dates. If we pay attention to these indicators in the background + N200 kg variant, it was slightly higher due to the nitrogen fertilizer used, that is, in accordance with the above indicators, it was 22.6; 40.2; 87.5; 96.1 cm, and in the background + N250 kg variant, it was 25.1; 42.9; 90.9; 103.4 cm. Although the main stem of cotton was slightly higher with increasing nitrogen fertilizer rates, a reliable result was obtained in the variant with N250P175K125 kg.

In non-saline soils, the number of leaves per plant was also studied along with the height of the main stem of cotton plants. According to it, when counted on dates 1.06; 1.07, the control variant was 3.0; 4.5; 4.2; 6.8, while in all variants where nitrogen fertilizers were applied, it was observed that when determined on date 1.06, it was from 5.5 to 8.2, and when determined on date 1.07, it was from 9.2 to 14.4.

Studies conducted on slightly saline soils show that the height of the main stem of cotton at different periods of biometric measurements, namely 6.9; 13.9; 30.2; 49.2 cm, the height of the cotton plant became significantly lower with increasing salinity levels. For example, in moderately and strongly saline soils, it fluctuated from 5.0 cm to 41.0 cm, corresponding to the control option of weakly saline soils.

As a result of the application of nitrogen fertilizers, the height of the main stem of the cotton plant was positively affected, and in weakly saline soils, when the nitrogen background option was used, it was observed that it was from 14.0 cm to 92.8 cm during all biometric studies when the norms of 100; 150; 200; 250; 300; 350 kg were used. When measured at the specified time intervals on moderately saline soils, these indicators ranged from 13.1 cm to 89.1 cm, and on strongly saline soils, these indicators ranged from 12.1 cm to 87.2 cm, recording the lowest results. The most reliable result in the experiment was obtained when using N250P175K125 kg, which was observed at all salinity levels.

In conclusion and recommendation, it can be said that,

1. As a result of improving the salt regime of saline, especially moderately and strongly saline meadow alluvial soils, measures to reduce salinity in these soils are recommended, taking into account the optimization of cotton plant nutrition and physiological processes of the plant, as well as an increase in crop yield.
2. In order to enhance cotton nutrition and accelerate physiological and biochemical processes in cotton plants, and increase the net productivity of photosynthesis in plants, it is advisable to apply nitrogen fertilizers at a rate of 250 kg/ha on the background of P175K125 on non-saline, weakly, moderately and strongly saline meadow alluvial soils.
3. It is recommended to improve the nitrogen regime on saline soils and, through it, the physiological indicators of cotton plants by applying nitrogen fertilizers at a rate of 250 kg/ha.
4. In order to accelerate the physiological processes in cotton plants on meadow alluvial soils of all salinity levels and obtain high yields due to this, it is recommended to apply nitrogen fertilizers against the background of phosphorus-potassium fertilizers P175 K125 at a rate of 250 kg/ha at the beginning of the 2-3-leaf, budding and flowering phases of the plant.
5. Soil salinity has a negative effect on the humus and mobile nutrient regime in the soil. With increasing salinity levels,

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