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NUTRIENT INFLUENCE IN SOIL ENVIRONMENTS IN COTTON

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ABSTRACT
The experiments carried out to clarify the different norms of nitrogen, phosphorus and potassium in stationary experiments revealed the need to introduce nitrogen up to 3 times more than without nitrogen, the growth, development and metabolism in the root system of cotton is significantly accelerated.
KEYWORDS: *Nutrients, nitrogen doses, nitrogen effects, soil alkalinity, root system, metabolism, synergism, antagonism.*

INTRODUCTION

The assimilation of nutrients depends on the nature of their interaction: synergism manifests itself in strengthening, and antagonism in inhibiting the influence of one or of the elements when they are introduced in a complex.

An example of synergy is the positive effect of increasing doses and assimilation of nitrogen on the removal of other nutrients, which has been established in different environmental conditions and in different crops. This effect of nitrogen is explained by an increase in the metabolic activity of plants, which is accompanied by an acceleration of the reaction and a change in the absorption capacity.

Table 1
Dynamics of assimilation of nutrients in cotton depending on increasing doses of nitrogen.

Timing of taking plant samples	Nitrogen doses	Assimilation of nutrients,%				
		N	P	K	Ca	Mg
10 may	N1	100	20,2	106,4	57,7	7,5
	N2	100	17,8	99,7	50,0	6,4
	N3	100	17,0	94,5	53,0	7,4
28 may	N1	100	19,8	93,4	75,0	9,7
(flowering)	N2	100	19,5	105,4	75,8	10,3
	N3	100	22,8	109,2	83,6	11,5
5 july	N1	100	30,5	87,5	103,0	11,2
(maturation)	N2	100	31,7	101,2	113,2	11,3
	N3	100	35,4	96,1	119,0	12,2

This conclusion is supported by factors, the assimilation of other elements begins to increase only after a certain time has passed since the active absorption of nitrogen (Table 1).

A consequence of the antagonistic relationship in the absorption of nutrients is a weakening of the relative absorption of sodium, magnesium and calcium as a result of an excessive

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intake of potassium or less active absorption of sulfur and phosphorus with an excess of chlorine.

An antagonistic relationship is manifested by leaves between ions of the same type. Cations or anions, and they are more pronounced for cations, including hydrogen (H +). Its influence is manifested strongly with an increase in soil alkalinity, which is possible in colossi to some extent, with a large influence of pH on the assimilation of nutrients.

The experiments carried out under the conditions of a stationary experiment on a typical gray-earth soil with the addition of ammonia nitrogen, the coefficient of nitrogen utilization increased to 70-85 days. The growth of cotton, then declined slightly. The maximum nitrogen consumption was at a nitrogen dose of 120 kg / ha (75%), with an increase to 480 kg / ha (up to 85%).

However, at the time of harvesting, the nitrogen utilization rate under the option (20 is higher than 66%), of the applied amount than in the option 480 kg (52%). These data indicate the high assimilability of cotton root systems in relation to fertilizer nitrogen. In addition, it will be methodologically correct if we evaluate the coefficient of nitrogen utilization at the moment of maximum accumulation of the vegetative mass of the plant. The root system of cotton is characterized by an insignificant accumulation of nitrogen fertilizer.

Independently, nitrogen fertilization accumulated in the roots did not exceed 2-5% of the accumulated nitrogen in plants. In addition, the roots of the cotton plant remain in the soil and the old ones decompose, releasing bound nitrogen.

In the process of plant growth, nitrogen is absorbed not only from fertilizers, but also directly from soil nitrogen, therefore their ratio in the plant organism is constantly changing. At a low level of nitrogen nutrition (it was equal to 4 mg ha 100 g or 40 mg ha 1 kg of soil), the amount of nitrogen fertilizer (in% of the total accumulation of nitrogen in the plant) at the beginning of the growing season prevailed over the amount of soil nitrogen, as the plant ages, the proportion of the latter increased, while the proportion of nitrogen in fertilizers decreased.

Thus, by the 70-75th day of the growing season, their ratio was approximately equal. With a high level of nitrogen nutrition (16 mg per 100 g of soil or 160 mg / kg), the proportion of nitrogen fertilization decreased, and the proportion of soil nitrogen increased during the growing season of the plant.

However, under these nutritional conditions, the proportion of soil nitrogen was lower than with a low level of nitrogen nutrition. Therefore, during the growing season, the amount of nitrogen fertilization largely prevailed over the amount of soil nitrogen.

So, the nature of the input of nitrogen fertilizer introduced into plants depends on the dose of nitrogen; when it is increased up to 4 times, the input does not decrease its use by the roots until the beginning of maturation of the boxes.

It is not yet clear to us what proportion of the applied nitrogen fertilizer is transformed in the soil and in plants.

Nitrogen fertilizers, getting into the soil, undergo a number of transformations, which are determined by both the levels of nitrogen salts and the level and ratio of other nutrients in fertilizers.

Some researchers believe that the expansion of the applied nitrogen fertilizers is determined by the level of ammonium and potassium in the fertilizers (Yarovenko, Korenkov et al. 1975, Pirokhunov, 1976, etc.). In addition, the applied nitrogen fertilizers undergo various biological, physicochemical transformations, as a result of which the plants do not use nitrogen fertilizers completely under irrigation conditions, some of them are washed out of the soil by water drains.

A high dose of ammoniacal nitrogen promotes growth immobilized by microflora, quantitative and qualitative changes in nitrogen introduced into the soil are determined by the form and doses of fertilizers, as well as soil properties (Mukhamedzhanov. Sulaimanov, Yarovenko 1975, etc.), therefore, maintaining the optimal level of nitrogen nutrition for plants is possible only taking into account environmental factors that determine the conversion of nitrogen fertilizers and soil.

Nitrogen introduced into the soil in early doses in the form of ammonium nitrate is distributed according to the forms as follows: by the time of sowing, fertilizer nitrates accounted for an average of about 50% of the applied amount of nitrogen, which was close to the applied amount of nitrates.

Ammonic nitrogen of fertilizers is found in an exchangeable and non-exchangeable state. However, if the share of exchangeable ammonium in the total amount of applied nitrogen decreased with increasing fertilizer dose, then the share of fixed ammonium increased.

The actual increase in the total mineral nitrogen from fertilizers turned out to be close to the applied amount; with an increase in the nitrogen dose, the composition and ratio of nitrogenous compounds changed significantly. With an increase in the dose of fertilizers, the proportion of nitrate nitrogen in the soil also increased. These changes were significant. If, in the PK variant, nitrate nitrogen was only 5% of the total

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Table 2
The ratio of forms of mineral nitrogen in the soil,% of the total amount by development phases.

Option experience	Sowing 11.04			Budding, 16 06.			Flowering. 15.08		
	$N\text{-}NO_3^-$	$N\text{-}NH_4^+$ exch.	$N\text{-}NH_4^+$ Fix.	$N\text{-}NO_3^-$	$N\text{-}NH_4^+$ exch	$N\text{-}NH_4^+$ Fix.	$N\text{-}NO_3^-$	$N\text{-}NH_4^+$ exch	$N\text{-}NH_4^+$ fix.
1.PK (background)	5	2	93	3	2	95	6	2	92
2.PK+N1	9	4	87	3	3	94	6	2	92
3.PK+N2	13	6	81	5	4	91	8	3	89
4.PK+N4	18	9	73	10	4	86	9	3	88
5.PK+N8	24	10	66	12	3	85	9	3	88
6.PK+N16	29	15	56	23	8	69	7	5	88
7.PK+N32	40	10	50	35	7	58	25	7	68

As can be seen from these tables, nitrogen consumption during the growing season largely depends on the content of its mineral forms in the soil.

As the determination of the difference between the nitrogen content at the time of sowing and its content according to the phases of plant development showed, it can be seen that according to the first two doses (1 and 2 mg / 100 g of soil), the plants accumulated the bulk of nitrogen in the budding phase.

The difference in the removal of this element during the flowering phase for this variant was insignificant. The loss of mineral nitrogen in the soil is much greater than its consumption by plants.

However, during the flowering phase in variants with N4 and N8, the nitrogen removal coincided with the introduced decrease in mineral nitrogen in the soil.

At the N3 dose, a higher nitrogen removal by plants by the flowering phase was noted than its decrease in the soil.

Table 3
Nitrogen carryover depending on the level of nitrogen fertilization.
mg plants

Experience Option	budding	flowering
1.PK (background)	84	63
2.PK+N1	102	106
3.PK+N2	132	182
4.PK+N4	183	530
5.PK+N8	416	881
6.PK+N16	379	889
7.PK+N32	378	736

The loss of mineral nitrogen in the soil is due to a number of reasons: the consumption of nitrogen by plants, microorganisms, fungi, leaching of nitrates into deeper soil horizons and volatilization into gaseous compounds. The highest utilization rate of nitrogen from soil was observed in a rather narrow interval, which is the optimal use of nitrogen in fertilizers and soil. The maximum yield was obtained with N3, however, the nitrogen consumption for the formation of a unit of dry matter was not higher than that of lower doses of nitrogen.

During the growing season, transformation, migration and assimilation of nitrogen in the fertilizer and in the soil took place. Introduced nitrogen into deeper soil layers led to the accumulation of fertilizer nitrogen at depths of 100-130 cm, which indicates part of the nitrogen migrates outside the root layer.

Consequently, with a relative deficiency of any substance for the formation of the crop, the plant uses the remaining substances to a lesser extent.

With the introduction of nitrogen in the late phases of plant development, when the growth processes are largely completed, it is less used in these processes and more in the synthesis of protein and its deposition in the reserve. Therefore, late feeding does not give a large increase in grain yield, but increases the protein content in it up to 1.5 times or more (Belousov 1975).

According to M. Nazarov (1990), nitrogen fertilization, in addition to increasing the protein

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content, reduces lodging of cotton and increases plant resistance to wilts.

In the process of plant growth, nitrogen is absorbed not only from fertilizers, but also directly nitrogen from the soil, to which their ratio in the plant organism is constantly changing.

According to Belousov (1975), with a high level of nitrogen nutrition (16 mg N per 100 g of soil), the proportion of nitrogen in fertilizers decreased, and the proportion of soil nitrogen increased during the growing season. The accumulation of nitrogen in a plant is determined by the nature of the input of nitrogen in fertilizers and nitrogen in the soil. The intensity of nitrogen intake in cotton increased up to 50-60 days after the emergence of seedlings, and then slightly decreased by the time of seed ripening. Changes in the rate of intake of nutrients and their metabolism in a plant are closely related to its growth and development (Kursonov, 1976). At a low level of nitrogen nutrition, the dependence curve reaches a plateau at 20 mg N15 per day, while at a high level of nitrogen, the curve forms a plateau at 115-120 mg N15 per day. Under these conditions, up to about 100 mg / day, the dependence is directly proportional.

Therefore, at a rate of N4 compared to N120 mg / kg of soil, the synthesis of soil nitrogen slows down 3 times.

During the flowering period, with an increased level of nitrogen nutrition, an intensive synthesis of proteins in flowers is noted, and in the leaves it decreases markedly. With an increase in phosphorus levels, the intensity of protein synthesis in leaves, buds and flowers decreases.

Thus, the nature of the input of nitrogen from fertilizer into the plant was determined by its level in the soil, the rate of input, the characteristics of the growth and metabolism of nitrogen compounds during the growing season.

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