Original Article

EFFICIENCY OF APPLICATION ON COTTON OF NEW ENVIRONMENTALLY SAFE FERTILIZER ECOPHOSPHOAZOTINE

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Abstract

The article provides data on the use of environmentally friendly, safe fertilizer Ecophosphoazotine on moderately saline, meadow-alluvial soils in the Bukhara region, the Republic of Uzbekistan on medium and fine-fiber varieties of cotton "Bukhara-10" at a density of 80-90 thousand bushes per hectare and "Bukhara -12-I "(120-130 thousand bushes / ha). As a result of the study, soil cultivation was determined with the use of Ecophosphoazotine - a natural environmentally friendly phosphorus fertilizer, which contains bone meal - 88.5%, P2O5 - 29-34% with a dose of 6-12 kg / ha in pure form. Seed germination compared to control increased by 5.8-6.2-6.7%; 3.5-4.6-5.0%. Yield additive on the tested variant 3.0-4.4c/ha; and 1.1-2.4c/ha. It also improves soil density (in control in spring in layers of 0-30 and 30-50cm) respectively: 1.410-1.420g/cm3; in autumn-1.425-1.510g/cm3; in the tested variant, in autumn, the volume of soil weight (0.010-0.062 and 0.020-0.065 g/cm3) decreases due to the neutralization of the pH of the medium by introducing a certain amount of ecofofazotin, mainly to improve the alkaline environment in order to acidify soils with different salinity. In addition to phosphorus, nitrogen, ecophosphoazotine is rich in biologically extractive substances, i.e. macro and micronutrients important for plant nutrition and development.

Keywords: Ecophosphoazotin, Natural environmentally friendly fertilizer, Salinity reduction, Yield, Quality.

Introduction

It is known that one of the most important issues is the cultivation of high-quality, early-ripening products from agricultural crops and increasing resistance to various adverse environmental conditions. In this direction, organomineral, humic-like, environmentally friendly fertilizers and immunostimulants play a special role in overcoming such problems.

Environmentally friendly fertilizer and immunostimulants improve, regulate growth and development, increase yield and quality, and adaptability of plant resistance to stress, increasing immunity to various diseases in nature [1]; [2]; [3]; [4]; [5].

Ecologically pure bone meal, the so-called Ecophosphoazotin, is one of these natural organic fertilizers, which has a complex effect on plants compared to other fertilizers. First, it gives plants resistance to bacterial and fungal diseases, increases phytoimmunity, and regulates the activity of endogenous phytohormones in plants, ensuring growth and development [1–5, 10].

To solve this problem, of course, it is necessary on a scientific basis to investigate the reasons for the decline in soil fertility, increased salinity, deflation and erosion, violations of melioration, soil compaction, chemical

pollution and improper use of crop rotations. The constant violation of the nutrition of crops, soil and climatic conditions and the negative aspects of such changes, find ways to eliminate them and study, link, develop new, resource-saving, environmentally friendly, low-cost, safe, organic fertilizers, such as ecophosphoazotine. Introduce them into production and develop innovative technologies for food crops on a scientific basis.

Since this problem remains one of the most important problems of our time. In order to overcome this problem, Ecophosphoazotin was used in cotton in the fields of the Scientific Research Institute of Breeding, Seed Production and Agricultural Technology of Cotton Growing, Bukhara Scientific Experimental Station, (in 2019-2020) its effect on soil fertility, structure and growth, development, yield and quality was studied.

Therefore, at present it is relevant to use an environmentally friendly organic fertilizer rich in macro- and microelements with such a universal action as Ecophosphoazotin.

Literature Review

D. Ivantsov in his brochure “EM Biotechnology of Natural Agriculture”: “As a result of plant nutrition, C- makes up 50% of its content, O - 20%, N (comes with water) - 8%, and these gases are absorbed from the atmosphere. Although only 15% of nitrogen and 7% of minerals are extracted from the soil, nitrogen is also fixed in the atmosphere mainly by bacteria, and one cannot function without the other.” [3, 5-6].

Merker said that the plant absorbs 40 kg of nitrogen, 60-90 kg of potassium and 30 kg/ha of soil phosphorus during the growing season. Scientists [1-3, 5-6] found that in order to obtain 1 ton of raw cotton, a plant absorbs N-45, P-20 and K-45 kg/ha.

Based on the above considerations, the question arises: “if the amount of nutrients needed by a plant to produce 1 ton of cotton is naturally sufficient in the soil and atmosphere, then why the excessive use of mineral fertilizers, labor, machinery and fuel? ” This can be explained as follows: in the 80-90s of the last century, in order to fulfill the state plan for cotton (5.5-6 million tons), the crop rotation system was not followed, monocultures (cotton) were sown in continuous fields, and the doses of mineral fertilizers were increased. Violation of soil fertility and structure, non-compliance with the irrigation system adversely affected land reclamation, disrupted biochemical processes in the soil and led to the disappearance of beneficial living microorganisms (bacteria, mycorrhiza, hyphae, earthworms, ants, beetles, etc.), and their place was taken by phytotoxic microorganisms that multiply rapidly and cause wilting and drying of plants, which to a certain extent had a negative effect on plant growth and productivity [7–10].

As a result, the susceptibility of agricultural crops to various insects, pests and diseases has increased, which led to a decrease in plant immunity, productivity and quality. and degradation, which led to a decrease in the absorption of nitrogen and phosphorus fertilizers by plants [10-15,16-20].

The literature also reports a violation of the law of balance in nature, which not only harms the environment, but also has a negative impact on heredity, modification, and changes in the properties of a plant (cotton) [10, 21-25, 26-30].

Ecophosphoazotin is a bone meal obtained by processing the bones of domestic animals, which is used instead of phosphate fertilizers and contains up to 29-34% P2O5 [4]. The most important issue today is the development and production of fertilizers that are well absorbed by the plant when caring for crops without harming the environment, soil fertility, structure and number of living microorganisms in the soil.

In this regard, in order to study on a scientific basis what doses of ecophosphoazotine are applied to cotton varieties "Bukhara-12-I" and "Bukhara-10", moderately saline soils, it is necessary to substantiate how it affects soil fertility. As well as the growth and development of cotton, the yield and quality of the fiber, check with field experience, various analyzes and observations.

Research Methodology

The studies were carried out according to the methodology adopted at Scientific Research Institute of Breeding, Seed Production and Agricultural Technology of Cotton Growing, to determine the total content of humus, samples in layers of 0-30, 30-50 cm of soil were taken before application and at the end of the growing season according to the method of I. V. Tyurin, nitrogen and phosphorus were determined by the method of I. M. Maltsev and L. N. Gritsenko, nitrate forms of nitrogen - by an ionometric device, mobile phosphorus - by B.P. Machigin and exchangeable potassium by a flame photometer. Table 1 shows the distribution of experimental variants by repetitions in the field according to the randomization method.table 1.

The amount of gross and mobile forms of humus and nutrients (NPK) in the soil of the experimental field was averaged by sampling for each option from 0-30, 30-50 cm soil layer "Methods of "[31], "Methodology for conducting field research" [32].

Table 1 Distribution of experimental variants by repetitions on the field

number of options	**repetition of experience**		
	I repetition	**II repetition**	**III repetition**
1	**1 option**	**3 option**	**2 option**
2	**2 option**	**1 option**	**3 option**
3	**3 option**	**2 option**	**1 option**
4	**4 option**	**5 option**	**6 option**
5	**5 option**	**6 option**	**4 option**
6	**6 option**	**4 option**	**5 option**

These yield results were dispersively analyzed according to the method of B. Dospekhov "Methodology of field experience" [33]. The distance between the rows is 90 cm. The area of each plot is 270 m^2. The depth of groundwater is -2-2.5 m. The mechanical composition of the soil is of medium weight.

The aim and task of the research was to study and identify the effects of the optimal doses and timing of the application of "Ecophosphoazotin" on the density of plants (80-90 thousand bushes/ha) of medium fibrous "Bukhara-10" and fine fibrous varieties (120-130 thousand bushes/ha) cotton "Bukhara-12- I". Also influence on soil fertility, pH of the medium and bulk density of the soil.

Table 2 Experience Scheme

	Experience options	Applied doses, kg/ha	Terms of application
Medium-fiber cotton variety “Bukhara-10” at plant density (80-90 thousand bushes/ha)			
1	Control (traditional method)	N – 250 – P – 175 – K - 100 kg/ha	-
2	Ecophosphoazotin	N – 250 – P – 175 – K – 100 kg/ha + Ecophosphoazotin 186 kg/ha physical, 6.0 kg/ha pure	With sowing

3	Ecophosphoazotin	N – 250 – P – 175 – K - 100 kg/ha + Ecophosphoazotin 372 kg/ha physical, 12.0 kg/ha pure	With sowing
Fine-fiber cotton variety "Bukhara-12-I" plant density (120-130 thousand bushes/ha)			
1	Control (traditional method)	N – 250 – P – 175 – K - 100 kg/ha	-
2	Ecophosphoazotin	N – 250 – P – 175 – K – 100 kg/ha + Ecophosphoazotin 186 kg/ha physical, 6.0 kg/ha pure	With sowing
3	Ecophosphoazotin	N – 250 – P – 175 – K - 100 kg/ha + Ecophosphoazotin 372 kg/ha physical, 12.0 kg/ha pure	With sowing

Also on the germination of seeds, growth and development of plants, abscission of the fruit of the elements, yield and quality of fiber, seeds in moderately saline soils of the Bukhara region of the Republic of Uzbekistan.

Object and subject of research

As an object of research were cotton varieties "Bukhara-10" and "Bukhara-12-I", as well as the introduction of environmentally friendly fertilizer "Ecophosphoazotin" at a plant density of 80-90 thousand bushes/ha; and 120-130 thousand ha. pcs. bush / ha) of cotton.

The control variant was the annual application of mineral fertilizers in doses of N-250 kg/ha; P-175 kg/ha; K-120 kg per hectare. A total of 6 variants were studied. The experiment was repeated three times.

The distribution of experimental variants by repetitions in the field was carried out according to the randomization method.The scheme of experiments is shown in table 2.

"Ecophosphoazotin" was used once in the experiment, with sowing, soils were cultivated at 6-12 kg/ha in pure form. The standing density of cotton plants in varieties "Bukhara-10" was 80-90 thousand bushes/ha; and on fine-fiber varieties "Bukhara-12-I" - 120-130 thousand pieces bush/ha. In studies, the introduction of "Ecophosphoazotin" plants was carried out with a manual method at a consumption rate of 6-12 kg/ha in pure form or in the physical form of 186-372 kg/ha.

Harvesting was carried out manually according to the weighing method from the entire area of the plot. The quality of the fiber was determined in the laboratory of the regional "Sifat", the oil content of the seeds was determined by the method of extraction with petroleum ether on a Soxhlet apparatus. In order to study and determine the effectiveness of Ecophosphoazotin, which plant consumption rates are the most optimal option, we took one plant density per variety (80-90; 120-130 thousand bushes / ha) and 2 different doses of consumption (6-12 kg/ha with sowing) application.

Results and discussion

Phosphorus increases the ability of plant cells to retain water, which enhances resistance in dry and frosty periods. The use of phosphate fertilizers improves fruiting, soil structure, increases the content of sugars and protein in the fruits of agricultural crops.

Analyzing in table. 3 the sum of common and mobile forms of nutrients in this field in spring by soil layers (0-30; 30-50 cm), respectively: humus - 1.099-1.080; 1.023-1.010%, nitrogen-11.3-10.2 mg/kg; phosphorus-21.7-

20.0 mg/kg; potassium - 188-183 mg / kg, by autumn these indicators were as follows: humus - 0.979-0.963%; 0.900-0.890% of the amount of mobile forms: nitrogen - 3.9-3.0 mg/kg; phosphorus - 15.3-11.3 mg/kg; potassium-173-170 mg/kg, these figures indicate that the soil of the experimental field is provided with nutrients

Table 3. Agrochemical characteristics of the soil (before and after the introduction of Ecophosphoazotin)

soil layers, cm	Amount of total humus, in %		General forms,%		Mobile forms, mg/kg					
			N	P	$N\text{-}NO_3$		P_2O_5		K_2O	
	spring	autumn	autumn	autumn	spring	autumn	spring	autumn	spring	autumn
"Bukhara-10"										
0-30	1.080	0.963	0.080	0.150	11.0	3.8	20.0	11.5	183	170
30-50	1.010	0.890	0.076	0.143	10.8	3.5	19.3	11.3	180	165
0-30	1.083	0.965	0.083	0.154	11.1	3.9	20.4	12.5	184	171
30-50	1.012	0.892	0.079	0.147	10.9	3.6	19.8	11.6	182	167
0-30	1.099	0.979	0.088	0.168	11.3	3.9	21.7	15.3	186	173
30-50	1.023	0.900	0.085	0.159	11.5	4.2	20.5	12.0	185	169
"Bukhara-12-I"										
0-30	1.095	0.970	0.085	0.153	10.2	3.0	19.5	11.3	184	170
30-50	1.010	0.890	0.080	0.140	10.9	3.5	19.0	11.0	180	165
0-30	1.097	0.973	0.087	0.156	10.4	3.3	19.9	13.3	186	171
30-50	1.012	0.896	0.084	0.143	10.7	3.5	19.3	11.2	181	166
0-30	1.099	0.977	0.090	0.158	10.7	3.6	21.3	15.1	188	173
30-50	1.015	0.899	0.087	0.146	10.9	3.8	20.0	11.8	183	168

below the average.

Summarizing the autumn data on the number of mobile forms of NPK, we see that by the end of the plant growing season, both varieties used ecophosphoazotin in different amounts according to the variants. One of the main reasons for this is the presence of phosphorus, nitrogen, calcium, potassium, iron, zinc and 3 amino acids in the new preparation, which improves the distribution of nutrients in plants, as well as in saline soils (neutralizes the pH of the soil environment) and as a result of the gradual intake of phosphorus throughout the growing season of plants) an increase in crop elements due to better absorption of phosphorus by the plant than mineral fertilizers, their distribution depending on the leaf surface, the accumulation of dry matter and the accumulation of crop elements in one plant.

Although the mobile forms of nutrients and the amount of humus are assimilated by the plant to varying degrees according to the variants, from the data in Table. 3 shows that in all variants their number decreases in layers from spring to autumn, depending on the yield.

Before sowing and at the end of the growing season, soil samples were taken from the arable and subsurface soil layers every 10-40 cm in a cylindrical way and the bulk density was determined.

From the agrophysical properties of the soil in the spring and autumn periods, the bulk density before the introduction of "Ecophosphoazotin" in the arable layer of the soil (0-30 cm) and subsurface (30-50 cm), respectively, was: in spring - 1.410 -1.420 g/cm^3; in autumn, respectively: 1.425-1.510 g/cm^3, and in the variant with the use of "Ecophosphoazotin" 6-12 kg/ha, respectively, the following indicators: 1.400-1.412 g/cm^3 1.390-1.400 g/cm^3 (spring); 1.415-1.448 g/cm^3; 1.405-1.445 g/cm^3 (autumn). Thus, studies have shown that the volumetric mass of soil in a 0–50 cm soil layer decreases to 0.010–0.061 g/cm^3 by autumn; 0.020-0.065 g/cm^3 compared to the options used in ecophosphoazotine variants.

In order to influence the germination of seeds of organic fertilizer ecophosphoazotine in 2 different varieties of cotton was determined in the field.

Seed germination began to germinate on the sixth day from the date of sowing (under the conditions of this year) and its germination was 5.8-6.7% for both varieties of cotton in the control variant, and “Bukhara-12-I” was 86.5-88.6-90.0%, and the percentage of germination in of both varieties of cotton was 5.0-4.6-3.5% higher than in the control variants.

It should be noted that in each of the 2 varieties used, on which applied ecophosphoazotin root rot, gommosis was practically absent. Although there were a number of difficulties during the sowing period due to rainfall, the seeds of both varieties of cotton were fully harvested without loss.

The presence of 3 different amino acids, zinc and potassium in ecophosphoazotine ensured that the seedlings would germinate faster and healthier than the control. In other words, these trace elements and amino acids increase the resistance of immunostimulants to various stressful situations, which allows you to evenly collect seedlings in rainy, salty and cold weather.

The most important factors in increasing plant productivity are such agrotechnical measures as light, thermal, water-air and mineral, the norms for the timing of the application of local fertilizers, the density of plant standing and chasing, and other agricultural activities.

All physiological and genetic processes occurring in the plant body are directly related to how its tissues and cells are supplied with water and nutrients. If this process is carried out normally, the yield and its quality will be high. The intensity of plant respiration, metabolism in it, water evaporation, and other similar processes are largely directly related to how the plant is supplied with water and nutrients, to the number of seedlings and the timing of germination.

To determine the effect of these factors on the weight of one cotton bolls and the yield of cotton varieties “Bukhara-10”and “Bukhara-12-I” using ecophospho- azotine, 100 test bolls from all variants were selected before each harvest and determined by measuring the average weight. According to the analysis of the results in the cotton variety “Bukhara-10” and “Bukhara-12-I” - on which Ecophosphoazotin-186-372 kg/ha was used (physically), the average weight of one cotton bolls in the “Bukhara-10” variety was respectively: 8.1-8.3 g, and in the “Bukhara- 12-I” and 3.8-4.0 g, the yield for two harvests in varieties “Bukhara-10” and “Bukhara-12-I” with different use of Ecophosphoazotin compared with the control (43.1-37.0 c/ha; 7.9-3.7 g), respectively, was: 46.1-47.5 c/ha ha and; 38.1-39.4 c/ha, which is higher by 3.0-4.4 c/ha; 1.1-2.4c/ha; 0.2-0.4g; 0.1-0.3g.

Pictures 1. Medium fiber variety "Bukhara-12- I ". General view of the crop when using Ecophosphoazotin-12 kg/ha

Pictures 2. Fine-fiber variety "Bukhara-12-I". General view of the crop when using Ecophosphoazotin -12 kg/ha

The best indicators for fiber yield were noted in both varieties of cotton when using ecophosphoazotine, the quality of the fiber, respectively, was: 35.9 - 36 mm; 47.1-46.8 mm; fiber yield 38.3-38.5%; 32.6-33.0% in the control variants, respectively, were: 46.0-35.5 mm; 32-38% in relation to the control was a high rate of 0.5-0.4 mm; 1.1-0.8mm; 0.3-0.5%; 0.6-1.0%.

Conclusion

Thus, it can be concluded from these studies that one of the main reasons for the new preparation of Ecophosphoazotin are the presence of phosphorus, nitrogen, calcium, potassium, iron, zinc and 3 amino acids, which improves the distribution of nutrients in plants, as well as in saline soils by neutralizing the pH of the environment and as a result of the gradual supply of phosphorus throughout the growing season plants leads to an increase in fruit elements due to better absorption of phosphorus by the plant than mineral fertilizers, their distribution depending on the leaf surface, the accumulation of dry matter and the accumulation of crop elements in one plant.

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