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POTENTIAL OF NITROGEN-FIXING BACTERIA IN VARIOUS SALINATED COTTON FIELDS OF TASHKENT REGION, REPUBLIC OF UZBEKISTAN.

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Abstract: This study presents data on the factors affecting the activity of nitrogen-fixing associative bacteria in the climatic conditions of Uzbekistan and the effect of treatment with a suspension of nitrogen-fixing bacteria on the responses of cultivated plants in the early stages of development.

In soils of various mechanical composition, the main maintainers of a positive balance of organic matter are annual legumes, the accumulation of organic matter is observed in fodder and cereal crops from 0.6 to 1.1 t/ha, as well as in cereals from 2.2-3.3 t/ha, medicago and other similar plants. medicago, leguminous crops up to 6.6 t/ha. On irrigated gray soils and irrigated fertile soils with a cotton yield of 30 t/ha, about 0.7-1.0 t/ha of humus is consumed, which, in addition to the humus and root residues of cotton, requires 8-10 t/ha of manure or other types of organic fertilizers.

Key words: agrocenosis, microorganisms, cultivated plants, alfalfa, wheat, biomass, root system, biological chain.

Introduction.

It is known that in agrocenoses, due to the differentiation of the yield, which accounts for 40% to 80% of the biomass produced by plants, the biological chain is disrupted. Thus, as a result of the growth and development of plants, as well as the biosynthesis of organic matter by plants and the absorption of mineral nutrients by the soil, a decrease in the content of nutrients occurs. As plants grow, the accumulation of organic matter increases, but most cultivated crops are consumers, not accumulators, of soil organic matter. Along with the decrease in humus, one of the main plant nutrients, nitrogen, also decreases in parallel. One of the sources of nitrogen enrichment in the soil is the biological fixation of atmospheric nitrogen by free-living, associative, and terminal microorganisms. The process of biological nitrogen fixation is more favorable when the soil is provided with sufficient moisture [Archana, D. S., at all. (2013)]. The vital activity of microorganisms is most effective when the soil has a sufficient amount of carbohydrates, phosphorus and calcium, moderate soil moisture and a neutral reaction. Accounting for the share of nitrogen in the atmosphere is associated with a number of difficulties, and there is a variety of information in the literature [Bageshwar, U. K., at all. (2017)., Ash C., P. at all.(1991)., Barney, B. M. (2020)]. According to data, the amount of nitrogen fixed in different ecosystems around the world ranges from 0 to 200 kg/ha It is reported in the literature that it is equal to 1.8-6.0 kg/ha in saline podzol, 3-9 kg/ha in gray forest and gray subsoil, and 9-18 kg/ha in black soils [Chaudhary, D. at al (2013)., Choudhury, A. T. M. A., and Kennedy, I. R. (2004)., Patika V.F. 1991., Barney, B. M. (2020)]. The nitrogen-fixing activity of soil microflora also tends to increase in gray soils under the influence of the introduction of various carbon sources. [Takami H. 2000., Barney, B. M. (2020)].

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In light of the above, studying the nitrogen-fixing potential of irrigated soils in Uzbekistan is of great scientific and practical importance. Uzbekistan is located in the Turan soil-climatic zone and belongs to the subtropical zone of the Northern Hemisphere. A distinctive feature of this region's climate is the prolonged warmth of its climate. Geomorphologically, the study area belongs to foothills with rolling plains and an arid climate. Sulfur-oasis soils are formed under the influence of irrigated agriculture during the long-term development of natural gray soils. Sulfur-oasis soils are characterized by relatively high humus content in the arable and semi-arable horizons. Long-term and annual application of organic and mineral fertilizers leads to a relatively high accumulation of nitrogen, phosphorus, and potassium in arable land.

The main objective of this study is to study the factors affecting the potential activity of nitrogen-fixing bacteria in various agricultural crops in the gray soils of Uzbekistan.

Materials and method.

Nutrient medium for the isolation and incubation of free nitrogen-fixing and phosphate-mobilizing bacteria.

To isolate pure cultures of free-living nitrogen-fixing and phosphate-mobilizing bacteria and use them in the research process, traditional microbiological methods and the following nutrient media were used:
isolates of nitrogen-fixing and phosphorus-mobilizing bacterium were tested for compatibility of growth by cross streak assay in nutrient agar medium. Nutrient agar medium was prepared and sterilized. The medium was poured into sterile Petri plates and allowed for solidification. To test the compatibility of phosphate solubilizing bacterium. isolates of nitrogen-fixing and phosphorus-mobilizing bacteria was streaked as a strip at one end of the plate and incubated for 24 hrs to form a thick growth [M. Jeya Bharathi., at all 2017].
Potato agar (g/l): wastewater – 1.0., potatoes – 200.0 agar – 20.0 pH 5-6 Sterilization 1 atm. (121 oC) – 20 min.

Result and discussion

Irrigated meadow soils belong to the hydromorphic soils of the gray soil zone (groundwater depth 1-3 m) and have good agrochemical properties. Compared to gray soils, meadow soils are richer in organic matter, humus and nitrogen. The C:N ratio in the plow horizon is 6.5-7.0. The chemical composition of gray soils, is given in (Table 1).

The humus content in the plow horizon of gray soils is 0.7-1.1%. In general, the humus content in the studied soils is slightly lower than the optimal criteria for the humus content established for these soils (1.2-1.3%). As Okuda and Onishi note however, local farmers input excessive irrigation water, and salt damage, such as the re-accumulation of salt from irrigation water on the surface of the fields, is attributed to inadequate drainage systems [Okuda and Onishi 2015]. The studied soils are enriched with nitrogen, the amount of which varies from 0.06-0.09%. The studied sierozem-oasis soils are divided into low- (3-acre N1, 6), medium- (3-acre N2, 7) and high- (3-acre N3, 4) supplied soils according to the humus content. The analytical data show that the arable soil horizon is enriched with total phosphorus (0.180-0.200%) and potassium (1.75-1.95%). According to the content of mobile phosphorus, these soils are divided into low and medium-rich, and according to the content of mobile potassium, medium-rich. The content of humus and nitrogen in irrigated meadow soils is much higher than in sierozem-oasis soils and is 1.442; 1.551 and 0.1380; 0.1382%, respectively. The ratio of carbon to nitrogen is in the range

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of 6.1-6.5. In terms of the content of total phosphorus and potassium, these soils are similar to sierozem-oasis soils, but they are superior to the latter in terms of the content of mobile phosphates. The amount of mobile potassium in them, on the contrary, is slightly lower than in the sierozem-oasis (Table 1). There is no potential activity of associative soil microorganisms. The data obtained show that the potential nitrogen-fixing activity depends on the type and level of soil fertility. The highest rates of potential nitrogen fixation were determined in humus-rich gray soils (824.4-939.0 µM C_2H_4/kg soil/h) and in irrigated meadow soils (1164.0 µM C_2H_4/kg soil/h). The study of potential nitrogen fixation of showed that the highest activity of nitrogen fixation corresponds to the arable layer of the soil (0-30 cm). This trend of potential nitrogen fixation is consistent with the observed nitrogen fixation in the 50-100 cm soil layers of the soil profile of gray soils and irrigated fertile soils.

It is noticeable that with increasing salt concentration, the acetylene reductase activity of the studied soils decreased significantly. In gray soils, at salt concentrations of 1.9 and 2.5 mM, the acetylene reductase activity was 87.0 and 109.4 µM C_2H_4/kg soil/h, respectively, compared to 824.4 and 939.0 µM C_2H_4/kg soil/h at salt concentrations of 1.0 and 1.0 mM, respectively. Thus, in sierozem soils with low and medium humus contents, nitrogen fixation was 87.0–109.4 and 230.3–321.4 µM C_2N_4/kg soil/h, respectively. Studies have shown that potential nitrogen-fixing activity depends on the salt concentration in the soil solution. Thus, in low and medium-rich sierozem soils with low and medium humus potential, nitrogen fixation was 87.0-109.4 and 230.3-321.4 µM C_2N_4/kg soil/h, respectively. Studies have shown that the potential nitrogen-fixing activity depends on the concentration of salts in the soil solution.

Table 1

Chemical composition of irrigated gray soils (0-30 cm) taken from the cotton root zone of Tashkent region.

Soil type	Experimental area	Humus %	Azot %	C:N	P_2O_5		K_2O	
					of non-irrigated land,%	Irrigated soils mg/kg	of non-irrigated land,%	Irrigated soils mg/kg
medium sandy-gray soils	Experimental site No. 1 CHDPU	1,1	0,0924	6,9	0,2	34	1,75	260
	QTDM №2	1,13	0,098	6,7	0,175	29	1,85	265
	BTDM № 3	0,864	0,082	6,1	0,18	24	1,95	270
	YTDM № 4	0,928	0,086	6,3	0,185	26	1,9	255
	CHDM № 5	0,673	0,0554	7,0	0,175	18	1,95	260
	ZTDM № 6	0,765	0,0703	6,3	0,2	20	1,85	245
abbreviations of words	CHDPU	Chirchik State Pedagogical University field						
	QTDM	Plum fields in the Kibray district						
	BTDM	Boca district cotton field						
	YTDM	Yangi yul district cotton field						
	ZTDM	Zangiota district corn fields						

Conclusion

Thus, relatively small fluctuations in the activity of associative nitrogen fixation, which is an indirect indicator of the number of nitrogen-fixing microorganisms in the soil, may be additional confirmation that it is not the number of diazotrophic bacteria that limits the rate of nitrogen fixation, but their food sources and environmental factors. The dominance of most microorganisms, including nitrogen-fixing bacteria, is associated with the presence of significant bioenergy resources in the arable layer of the soil, the presence of fertilizers, the influence of climatic conditions on the maintenance of the vital activity (temperature) of microorganisms (humidity, air, natural enrichment of the soil with plant residues, microelements, mechanical soil properties, etc.), which has a positive effect on the microbial biocenosis.

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