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PROPERTIES OF MEADOW MARSH SOILS OF CENTRAL FERGANA AND THE INFLUENCE OF NON-TRADITIONAL FERTILIZERS AND AGROTECHNOLOGIES ON THEM

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Annotation
The article examines the irrigated meadow-marsh soils of Central Fergana, focusing on their properties, characteristics, and methods for improving their fertility. It presents the development and application of unconventional fertilizers, as well as the results of studies evaluating their effects in addressing these challenges. The research findings demonstrate that the newly developed unconventional fertilizers have a positive impact on soil properties and fertility, comparable to that of locally available organic fertilizer (farmyard manure). Furthermore, their application represents one of the new and important approaches to reducing waste and improving environmental quality.

Key words and expressions: Meadow marsh soils, experimental variants, fertility, agrochemical properties, water extract, nutrients, humus, fertilizer, non-traditional fertilizer, manure

Introduction

To date, various systems of measures have been developed and put into practice to increase the fertility of irrigated soils, and as a result of their application, relatively positive results have been achieved, and yields are

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being achieved at relatively high levels of the genetic potential of crops. These measures are carried out in many areas, such as fertilization, crop rotation, and improvement of the land reclamation state of soils, each of which has its own mechanism of action. For example, measures aimed at improving the land reclamation state of soils reduce the impact of factors limiting their fertility, the correct organization of crop rotation systems increases the biological activity of the soil, preserves and increases natural fertility, and improving the fertilization system directly increases effective fertility and increases the potential reserves of nutrients in the general background.

Nowadays, the development of new and diverse agrotechnologies aimed at maintaining and increasing soil fertility is of particular importance. One of these areas is new directions in the fertilization system aimed at eliminating the deficit of humus and nutrients in the soil, which are non-traditional methods that directly serve to eliminate the deficit of fertilizers, especially organic fertilizers, and stabilize the ecology of the environment.

Research object and methods

The research object was selected irrigated meadow sedge soils formed in the peripheral areas of the Shohimardonsai extension. The effect of a new non-traditional fertilizer prepared using urban wastewater sludge on their properties and characteristics was also studied.The research used stationary field and chemical-analytical methods. Chemical, physicochemical, agrochemical and agrophysical soil analyses were carried out according to generally accepted manuals. Field experimental studies were carried out on the basis of the manuals “Methodology of field experiments with cotton under irrigation conditions”, “Methodical manuals for conducting field experiments”. Also, the “Methodical recommendations” of the VVDokuchaev Institute of Soil Science were used.

Research results

The demand for non-traditional fertilizers in our country's agriculture is high, and they should replace the shortage of local organic fertilizers, thereby regulating the balance of humus and nutrients in the soil. Due to the annual demand for organic fertilizers in irrigated farming, an average of 10-15 t/ha

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is required, which means that there is practically no shortage of organic fertilizers. On the other hand, the scale of fertilizer production in our Republic is low, using various unnecessary waste residues that pollute the environment. According to statistical data, each year the demand for nitrogen fertilizers in agriculture is met by 70-80%, and the demand for phosphorus fertilizers by 30-40% [4]. Similar results have been reported by other researchers [1., 2., 3., 5., 6.].

There are enough raw materials in our Republic for the types of waste products mentioned above. They also differ in their types, containing nutrients in different quantities and proportions, and in practice, despite the fact that scientific foundations for the production of non-traditional fertilizers from them have been developed and prepared, they have not been widely used. Now, one of the important tasks is to introduce them on a republic-wide scale and determine their effect on different soils, their properties and characteristics. Because waste and residues contain high amounts of organic matter and other nutrients.

The average nutrient content of our unconventional fertilizer was as follows (relative to the air-dried sample):

No.	Organic matter (Humus), %	Gross forms., %			Active forms, mg/kg			
		N	P2O5	K2O	N-NH3	N-NO3	P2O5	K2O
Unity	Kilogram				Gram			
Quantity	191.2	19.5	20.6	11.7	74	19.8	340	2831

Another important aspect in the production of non-traditional fertilizers is the sources of waste and residues located in a particular area. For example, in our research, municipal sewage sludge, that is, the part that remains as a solid, is the main raw material, and it is appropriate to conduct experiments on this for the soils of that area, and related studies are being conducted on this. While transportation and application to other places, improving soil properties, are not without benefits, transportation and related processes lead to a decrease in economic indicators in the use of fertilizers.

The experiments we conducted for this purpose also had advantages in these indicators, and on the other hand, they were distinguished by their convenience, such as the fact that the cultivated areas were widespread and

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a little away from the population. They also had positive significance in that they were prepared directly around the cultivated areas and trenches were opened during planting, so that gaseous nutrients were not depleted.

The experiments were conducted in 4 variants:

1. Control -unfertilized
2.N250P150K75
3. N250P150K75 + local fertilizer (15t/ha)
4. N250P150K75 + non-conventional fertilizer (15t/ha).

According to our results, no significant changes were observed in the results of the water absorption composition of the soil over the past three years in all variants. From this it can be concluded that the effect of organic fertilizer on the general chemical properties of the soil, both in the no-fertilizer variant and in the case of the application of mineral fertilizers and organic fertilizers (as well as in the case of non-traditional fertilizers), is very small. However, the results of the effect on other (agrochemical, agrophysical) properties showed that different results were recorded.

According to the analysis of the results obtained, different fertilization methods and the effects of unconventional fertilizer application have different effects on soil fertility and will increase proportionally as the fertilizer application system is improved.According to a 3-year analysis of the experimental options, positive changes in soil fertility and properties belong to options 3 and 4.

According to the conclusions of previous experiments on the combined use of mineral fertilizers with organic fertilizers and their implementation in different proportions, as indicated in option 3, such fertilization methods have been proven to be the most optimal options for almost all soils.

This has been proven in our experiments, and in addition, it has been found that the use of non-traditional fertilizers also gives high results.

According to our research, there is a wide variation in soil nutrient changes across the options. The most negative situation is observed in the control option, while the most positive situation is observed in the option where unconventional fertilizers are applied (Table 2).

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Table 2 Changes in nutrient levels in soils of the study area (averaged amounts across returns).

Option No.	Depth	Humus, %	Gross forms., %			Humus, %	Gross forms., %		
			N	P2O5	K2O		N	P2O5	K2O
		16.10.2022.				14.09.2025			
1	0-30	1,610	0.110	0.235	0.510	1,360	0.092	0.220	0.460
	30-50	1,440	0.086	0.210	0.350	1,240	0.075	0.180	0.320
4	0-30	1,535	0.118	0.26	0.518	1,980	0.162	0.30	0.580
	30-50	1,380	0.095	0.21	0.346	1,560	0.125	0.24	0.360

The results show that the most positive situation, both in terms of the amount of humus and the amount of other nutrients, is observed in the variants where unconventional fertilizers are used, while the depletion of the control variant soils in nutrients, and the use of mineral fertilizers themselves at the annual established rates, is proceeding in a relatively progressive direction. An analysis of the differences in the total amount of nutrients is presented in Table 3.

According to our results, the soils of the control option have undergone negative changes in terms of fertility over time. The lack of fertilization over time leads to a high consumption of nutrients accumulated in the soil as a result of natural and previous fertilization, and as a result, nutrients have decreased in both gross and mobile forms, and this decrease is on average about 0.1% per year due to humus. Phosphorus and potassium forms have decreased over time by about 10-15%.

Table 3 Dynamics of changes in the content of humus and nutrients in soils of experimental plots under the influence of various agrotechnologies

Option No.	Depth	Humus, %	Gross forms., %			Humus, %	Gross forms., %		
			N	P2O5	K2O		N	P2O5	K2O
		2022.				2025			
1	0-30	1,610	0.110	0.235	0.510	-0.31	-0.018	-0.015	-0.05
	30-50	1,440	0.086	0.210	0.350	-0.2	-0.011	-0.006	-0.03
4	0-30	1,535	0.118	0.26	0.518	+0.445	+0.044	+0.04	+0.062
	30-50	1,380	0.095	0.21	0.346	+0.18	+0.030	+0.03	+0.014

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In the remaining options, changes in nutrient levels were positive, with a relatively slow increase in productivity without organic fertilizers and a relatively greater increase in productivity with the use of mineral fertilizers, while the third option, combined with the use of organic fertilizers, showed a relatively greater increase in productivity.

Applying local organic fertilizers and manures in combination with mineral fertilizers not only regulates the balance of humus and other nutrients in the soil, but also causes them to gradually increase.

Manure also contains other essential nutrients. However, on the other hand, it contains fewer nutrients than non-traditional fertilizers, and they also differ in their preparation methods.

Based on the goal, the last option for testing the effect of non-traditional fertilizers gave the most positive indicators, having a highly positive effect on the agrochemical properties of the soil. These indicators lead to an average increase in humus in the topsoil layer of soils by about 0.15% per year, indicating that the humus reserve is increasing by about 6 tons per year. The remaining nutrients also increased accordingly, in their gross form, nitrogen by an average of 0.015%, phosphorus by about 0.013%, and potassium by 0.02%.

This new non-traditional fertilizer used, as indicated above, was composted for a long time during the preparation process with mineral fertilizers, manure and municipal waste sludge (the main component of composting) and soil. As a result, its composition is enriched with nutrients. Therefore, in our experiments, the higher accumulation of soil nutrients in the variants where this fertilizer was used compared to all other variants is explained by its composition.

However, it should be applied taking into account that its effect does not last as long in the soil as ordinary manure, and it decomposes quickly. It can be considered an axiom that its effect ends faster than ordinary manure, since during the decomposition process it becomes a ready-made nutrient for the plant and is quickly absorbed, as well as quickly decomposed by microorganisms.

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Conclusion

Thus, the unconventional fertilizer applied to the soil and the applied agrotechnologies have a positive effect on the soil fertility properties in terms of the amount of all nutrients. Changes occur in the correct proportion to the composition of the prepared fertilizer, and when applied consistently, slightly less than the standard indicators specified in the experimental scheme, the application gives a more positive result and allows the fertilizer to be applied to a larger area.

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