Impact of Compost Prepared Based on Straw And Mineral Fertilizers on Soil Fertility and Crop Yield

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ABSTRACT

It has been identified that the supplementary use of unconventional agro-minerals as additional nutrients in increasing soil fertility and enhancing the yield of crops is yielding favorable results in our Republic.

Unconventional agro-minerals such as glauconite, phosphorite, and bentonite deposits in our country are rich in micro and macro elements. When added to the soil through various methods and means, they have proven to be beneficial to farmers and growers due to their cost-effectiveness and high efficiency.

According to the data, Uzbekistan has more than 200 bentonite deposits with a total reserve exceeding 2 billion tons. It has been found that the use of bentonite and glauconite sands in various agricultural fields in countries like the USA, Italy, Czech Republic, Russia, and Ukraine can increase crop yields by 20-30%.

Furthermore, the research regarding the impact of eye-catching, development, and productivity indicators on the eye, seeds, soil fertility, mineral nutrients, and the influence of organic matter has not been conducted, which is considered a gap in this subject matter.

Keywords: Crops, seeds, soil fertility, mineral resources, organic matter impact, productivity.

Introduction: Currently, there has been limited research conducted on the soil fertility, growth promotion, and productivity indicators of compost prepared with Hovdak bentonite clay and local manure. Although the effectiveness of bentonite clay and other traditional agro-minerals in rural crop cultivation has been studied, the complete evaluation of the efficiency of compost prepared with Hovdak clay and local manure is yet to be explored. In the context of deteriorating arable soils, it is essential to investigate the influence of Hovdak bentonite clay and locally sourced compost on soil fertility, crop growth, development, and yield.

While the productivity of traditional agro-minerals in rural crop farming has been investigated, the effectiveness of compost made from Hovdak bentonite clay and local manure remains largely unexplored. Studies were carried out to assess the impact of Hovdak bentonite clay and locally sourced compost on soil fertility, crop growth, development, and cotton yield in saline-sodic soil conditions. The use of Hovdak bentonite clay and local compost as an additional organic input was found to reduce the usage of

chemical fertilizers and agrochemicals by 30-35% and increase cotton yield by up to 25%. Hovdak bentonite clay and locally sourced compost were applied as an organic soil conditioner in saline-sodic soils, resulting in improved soil structure and recommendations for farmers. Under the influence of the applied compost, the bulk density of the soil's plow layer decreased to 0.04-0.06 g/cm3, porosity increased to 2.3%, and silver content increased to 0.12%. An additional 6.1 kg/ha of cotton yield was obtained compared to the control group.

"In increasing soil fertility, it is necessary to use more manure than required: the excessive use of organic fertilizers in the field of agriculture leads to the sharp depletion of the soil's fertility. The foundation of increasing the silver content in manure is based on using two methods: mixing and spreading crops. It is not scientifically proven that bentonite, which has been used in experiments, is suitable for preparing compost with stable composting due to the low content of moisture-absorbing additives in the composition of bentonite clays. Let's suppose that our searches start with taking the first step here and answering some initial questions. In general, the high content of silver enriches the soil fertility because it contains not only common nitrogen, phosphorus, potassium, and carbonate hydrides but also gums and fulvic acids, which determine the soil's water-resistant macro-microstructure. In general, the high content of silver enriches the soil fertility because it contains not only common nitrogen, phosphorus, potassium, and carbonate hydrides but also gums and fulvic acids, which determine the soil's water-resistant macro-microstructure. In the first year of using the manure, the increase in soil organic matter content was observed in the topsoil (0-30 cm) according to the research results. Additionally, it was found that the total content in this variant increased to 0.008%, specifically in the silver content in soil organic matter. Conversely, the total phosphorus content changed to 0.006% in the topsoil layer, while in the subsoil layer, these indicators did not change significantly."

Bentonite and compost quality prepared based on bentonite and peat over a year were studied in terms of increasing the content of silver in the soil by a factor of t(20 t/ha) compared to the control.

George Millo in the scientific works of the Borzunovs mentioned that bentonite clay is called fuller's earth, in Italy - ponsa, in Russia - suknovaya clay, in Turkey - kilo-mud, in Georgia - gumbrin, in Uzbekistan - gilmoya, tog-yogi, kokshiram, and sozkesak. It is also referred to as sabunbalchiq in Tatarstan [51; 20].

The largest deposits of bentonite clay in Uzbekistan are found in the southern regions of Akrabot, Oktosh, Maydon, G'uzor, Yakkabog', Pachkamar, Dehqonobod, and Hovdak [42]. The bentonite deposits in the southern part of the Republic are characterized by their macro and microelement content, as well as the presence of bentonite residue, shale, and mica [41, 47].

Montmorillonite, one of the main minerals of bentonite clay, was first discovered in a plastic state in Montmorillon, France in 1847 [121].

According to Shobolov, Gerus, Sagareyshveli, and Bashur, bentonite is considered a valuable natural raw material due to its unique physical and chemical properties, which are significant in the world science [113, 24, 108]. The conducted field trials are annually inspected by the special approval commission of the Uzbek Research Institute of Plant Industry (O'zPITI), and they are rated as "good" and "excellent." The application of compost in the production of crops in Jarqo'rgon, Angor, and Qiziriq districts, as well as in the Hovdak region, amounted to a total of 1400 hectares. It was observed that the effectiveness of composting the Hovdak bentonite clay and local peat-based compost in improving the productivity of saline and clay soils was high.

ption order	Annual rates of mineral fertilizers are kg			3 years of compost, manure or bentonite standards.	Gumus		Azot		Fosfor	
					soil layers , sm					
	N	R_2O_5	K_20		0-30	30-50	0-30	30-50	0-30	30-50
1	150	105	75	-	0,890	0,700	0,089	0,073	0,142	0,117
2	200	140	100	-	0,898	0,711	0,094	0,074	0,149	0,119
3	150	105	75	20 (manure)	0,980	0,708	0,093	0,070	0,147	0,118
4	150	105	75	20+1,5(16,5)	0,990	0,710	0,090	0,070	0,148	0,117
5	150	105	75	20+3,0(18,0)	0,990	0,710	0,090	0,069	0,148	0,115
6	150	105	75	20+6,0(21,0)	1,010	0,715	0,096	0,076	0,150	0,117
7	150	105	75	20+9,0(24,0)	1,000	0,710	0,095	0,071	0,150	0,116
8	150	105	75	9,0(bentonit)	0,980	0,700	0,088	0,068	0,148	0,116

It is possible to apply the following rates of compost to sandy loam soils with a content of 9.0 t/ha of bentonite, in order to increase the fertility and yield: a mixture of compost with bentonite in a ratio of 1:0.4, without using organic fertilizers, but with mineral fertilizers at the rates of N-150, P2O5-105, K2O-75 kg/ha, resulted in an average three-year cotton yield of 29.0 to 35.7 c/ha, with a decrease in humus content by 15 t/ha.

The use of organic fertilizers without mineral fertilizers led to an average three-year

cotton yield of 31.8 c/ha when applying 15 t/ha of compost. Additionally, when 9.0 t/ha of bentonite was used, in combination with organic fertilizers at rates of N-150, P2O5-140, K2O-100 kg/ha, an average three-year cotton yield of 31.4 c/ha was achieved, with an additional yield of 2.4 c/ha.

The highest economic efficiency was achieved when using 20.1 t/ha of compost in the variant with the application of N-150, P2O5-105, K2O-75 kg/ha of mineral fertilizers.

Conclusion. Based on the results of the impact of mature compost prepared from organic waste on the soil fertility and yield of cotton, the following conclusions can be drawn:

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