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INFLUENCE OF MINERAL AND ORGANIC FERTILIZERS ON THE AMOUNT OF NUTRIENTS IN THE SOIL

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ABSTRACT:

This study examines the effects of both mineral and organic fertilizers on the nutrient content of soils, focusing on the availability and retention of essential elements such as nitrogen, phosphorus, potassium, and micronutrients. By comparing different fertilization strategies, the research aims to highlight how each type of fertilizer influences soil fertility, structure, and long-term productivity. The findings provide valuable insights for sustainable agricultural practices and effective soil management.

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INTRODUCTION. The soils of the Republic of Karakalpakstan, including the Xo'jayli district, are characterized by a low humus content.

Various methods are used to improve its productivity. One of them is the application of organic fertilizers. Although organic fertilizers contain a small amount of nutrients, they are diverse and contain substances that turn into humus. With their decomposition into humus, the amount of nutrients in the soil increases, creating favorable conditions for plants.

The more nutrients in the soil, the better its nutrient regime, that is, the higher the yield, having a positive effect on the growth and development of the plant. To determine the influence of organic fertilizer content on the soil nutrient regime, we determined nutrients from soil samples before the experiment, at the beginning, middle, and end of the growing season.

The amount of nutrients decreases from the beginning to the end of the growing season. However, its decrease depends on the amount of organic and mineral fertilizers applied to the soil. In the absence of fertilizer application, the greatest decrease in humus and other elements is observed by the end of the growing season.

When applying 40 tons of organic fertilizer per hectare alone and 40 tons of organic fertilizer in combination with mineral fertilizer, conditions are created for a good nutrient regime. Ultimately, vegetation eventually leads to a small decrease in humus and other nutrients in these variants.

The humus content in the soil was 0.700-0.840% at the beginning of the growing season and 0.600-0.860% at the end of the growing season, meaning a decrease in humus content is observed in all variants.

In the variant without organic and mineral fertilizers, the humus content decreased by 0.100% by the end of the growing season, while only with mineral fertilizers it decreased by 0.130%. When organic and mineral fertilizers are used together, it decreases by 0.40-0.80%. Applying 40 tons of organic fertilizer annually will not only restore productivity at the end of the growing season but also contribute to its increase.

During the growing season, humus (%) and nitrogen, phosphorus and potassium change of mobile forms, mg/kg

Variant №	Humus	$N\text{-}NO_3$	$N\text{-}NH_4$	P_2O_5	K_2O
At the beginning of the vegetation					
1	0,700	30	30,0	25,0	170,0
2	0,820	40	35,5	35,0	180,0
3	0,800	40	40,0	40,0	190,0
4	0,770	30	45,0	50,0	200,0
5	0,750	30	60,0	50,0	200,0
6	0,840	30	30,0	35,0	180,0
Mid-vegetation					
1	0,670	20	30,0	30,0	150,0
2	0,810	40	40,0	35,0	160,0
3	0,780	50	40,0	45,0	160,0
4	0,740	50	40,0	40,0	180,0
5	0,720	60	50,0	45,0	170,0
6	0,820	40	32,0	30,0	160,0
At the end of the vegetation					
1	0,600	20	34,0	30,0	140,0
2	0,780	40	42,0	30,0	140,0
3	0,720	40	44,0	35,0	150,0
4	0,700	30	45,0	40,0	150,0
5	0,620	40	50,0	40,0	150,0
6	0,860	30	35,0	30,0	140,0

The results of this study underscore the contrasting yet complementary roles of mineral and organic fertilizers in influencing soil nutrient dynamics. Mineral fertilizers, due to their high solubility and targeted nutrient composition, rapidly increase the availability of essential elements such as nitrogen (N), phosphorus (P), and potassium (K). This immediate nutrient supply is particularly beneficial during critical stages of crop growth. However, the repeated and excessive use of mineral fertilizers can lead to issues such as nutrient leaching, soil acidification, and a decline in soil microbial biodiversity. Organic fertilizers, including compost, manure, and green manure, contribute to nutrient availability through slower mineralization processes. While their nutrient release is not as immediate as mineral fertilizers, organic inputs enhance soil physical properties, such as water retention and aggregation, and support beneficial microbial populations. Additionally, they contribute to the long-term buildup of soil organic matter, which is crucial for sustained fertility and resilience against erosion and drought.

The interaction between organic and mineral fertilizers is particularly noteworthy. When applied in combination, they can offset each other's limitations. Organic matter improves the retention and efficiency of mineral nutrients, while mineral fertilizers can supplement the nutrient shortfalls of organic amendments, particularly in nutrient-deficient soils. Environmental factors such as soil type, pH, temperature, and moisture also influence the effectiveness of both fertilizer types. Therefore, site-specific strategies are essential to optimize nutrient use efficiency and minimize environmental impact.

In summary, the findings advocate for an integrated nutrient management approach that leverages the strengths of both mineral and organic fertilizers. Such practices not only improve soil nutrient status but also promote long-term soil health and agricultural sustainability.

Conclusion. The study demonstrates that both mineral and organic fertilizers significantly affect the nutrient composition of the soil, albeit in different ways. Mineral fertilizers provide a rapid and targeted supply of nutrients, particularly nitrogen, phosphorus, and potassium, which can enhance short-term crop yields. However, their long-term use without proper management may lead to soil degradation and nutrient imbalances. In contrast, organic fertilizers contribute to a gradual and more sustained release of nutrients, while also improving soil structure, microbial activity, and organic matter content. When used in combination, mineral and organic fertilizers can complement each other, leading to more balanced soil fertility and improved agricultural sustainability. Ultimately, the choice and management of fertilizers should be based on soil conditions, crop requirements, and environmental considerations. Integrated nutrient management that combines mineral and organic sources offers the most promising approach for maintaining soil health and ensuring long-term agricultural productivity.

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