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INFLUENCE OF IRRIGATION METHODS AND REGIMES OF WINTER WHEAT VARIETIES ON THE AGROCHEMICAL PROPERTIES OF SOILS UNDER TYPICAL SIEROZEM CONDITIONS

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Abstract
In the conditions of typical sierozem soils of the Fergana region, subjected to irrigation erosion (slope level 1.50), data on the agrochemical properties of the soil, depending on the irrigation regime and methods of winter wheat varieties Davr and Vexa, are presented.

Keywords. Typical gray soils, irrigation erosion, winter wheat, Davr and Vexa varieties, irrigation regime, furrow irrigation, flexible pipe, soil horizons, humus, total nitrogen, total phosphorus, nitrate nitrogen, mobile phosphorus, exchangeable potassium.

Introduction

It is known that wheat is grown on 219.2 million hectares in more than 126 countries of the world, of which 24.2 million hectares are in European countries. In 2022, the average grain yield in the world was 36.9 c/ha, while in European countries this figure is 55.5 c/ha, and the main part of food products is grown in these areas. Today, China, India, Russia, the USA, Canada, France, Pakistan, Ukraine, Germany, and Turkey are the leading countries in wheat cultivation. According to the United Nations, global wheat production increased slightly in 2025 compared to other years and increased by 1% compared to the 2024 grain harvest. It should also be noted that in the context of global climate change, the effective use of available water resources and the application of water-saving technologies for obtaining high and quality grain yields from winter wheat is one of the urgent tasks.

Decree of the President of the Republic of Uzbekistan dated October 23, 2019 No. UP-5853 "On Approving the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030". according to the tasks defined in the Decree a number of measures are being implemented to increase crop yields and soil fertility, efficient use of land, water, fertilizers and other resources, and the introduction of advanced agricultural technologies. Today, high results are being achieved in the system of agricultural technologies for growing agricultural crops of our republic through the use of water- and resource-saving technologies in irrigation, fertilization with local and mineral fertilizers. In particular, in recent years, drip irrigation, sprinkler irrigation, and inter-row irrigation using polyethylene film, as well as the distribution of irrigation water in furrows through artificial flexible pipes, have created the possibility of water saving. In this regard, it is advisable to expand the scope of scientific research on irrigation of irrigation water through artificial flexible pipes in furrows for the effective use of available water resourcesin the Republic

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of Uzbekistan.

In order to solve the above-mentioned problems to a certain extent, scientific research on the development of irrigation regimes for the cultivation of winter wheat varieties Davr and Vexa in the fields of the Gulshan Yangi Bog massif of the Fergana district of the Fergana region was conducted in 2021-2024 under the conditions of typical sierozem soils subjected to irrigation erosion. The steepness of the field is 1.5^0, and the groundwater level is located at a depth of 8-10 meters. The experiment consists of 8 variants, arranged in 4 repetitions, in 1 tier. Each piece is 100 m long and 4.8 m wide. Each variant consists of 8 rows, the area is 480 m^2, and the calculated part is 240 m^2. Field experiments were conducted according to the methods described in the sources "Methods of Conducting Field Experiments" [1], "Methods of Agrochemical, Agrophysical, and Microbiological Research in Irrigated Cotton Regions" [2]. The experimental system is presented in Table 1.

Table 1 Experimental system

Variant Number	Winter wheat varieties	Irrigation method	Pre-irrigation soil moisture relative to FC, %
1.	Period	In a furrow	60-70-60
2.		Flexible pipe	
3.		In a furrow	70-75-70
4.		Flexible pipe	
5.	Vexa	In a furrow	60-70-60
6.		Flexible pipe	
7.		In a furrow	70-75-70
8.		Flexible pipe	

In order to determine the influence of irrigation regimes and methods used in the cultivation of winter wheat varieties on the agrochemical properties of the soil, soil samples were taken and analyzed in the plowed and sub-plowed soil layers in autumn (at the beginning of the growing season) and summer (at the end of the growing season), and when studying the initial agrochemical properties of the experimental field in 2021, the humus content in the 0-30 cm and 30-50 cm plowed soil layers in autumn was 0.982 and 0.764%, respectively, while the total nitrogen and total phosphorus content were 0.095; 0.067% and 0.096; 0.080%. It was established that the content of mobile nitrate nitrogen, assimilable phosphorus, and exchangeable potassium in the soil layers is 18.8-10.1 mg/kg, 25.1-10.9 mg/kg, and 190-165 mg/kg, respectively, and is low and very low.

In the experimental field where winter wheat varieties were cultivated in 2021-2022, by the end of the growing season, in the 1st and 2nd variants, i.e., when irrigating the Davr winter wheat variety with a pre-irrigation soil moisture regime of 60-70-60% of FC using furrows and flexible pipes, the humus content in the 0-30 and 30-50 cm soil layers was 0.972 - 0.762% and 0.970 - 0.762%, total nitrogen 0.085 - 0.064% and 0.086 - 0.066%, total phosphorus 0.089 - 0.076% and 0.092 - 0.078%, nitrate nitrogen from the mobile forms of the soil was 16.9 - 9.3 mg/kg and 17.6 - 9.4 mg/kg, mobile phosphorus 23.9 - 9.8 mg/kg and 24.0 - 9.9 mg/kg, exchangeable potassium 174 - 162 mg/kg and 179 - 163 mg/kg, respectively (Fig. 1).

As can be seen from the presented data, when irrigating winter wheat variety Davr with a pre-irrigation moisture regime of 60-70-60% of FC using furrows and flexible pipes, compared to the

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beginning of the growing season, the amount of humus decreased by 0.012-0.002% and 0.010-0.002%, total nitrogen by 0.010-0.003% and 0.009-0.001%, total phosphorus by 0.007-0.004% and 0.004-0.002%, nitrate nitrogen by 1.9-0.8 mg/kg and 1.2-0.7 mg/kg, mobile phosphorus by 1.2-1.1 mg/kg and 1.1-1.0 mg/kg, exchangeable potassium by 16.0-3.0 mg/kg and 11.0-0.2 mg/kg, respectively. It should also be noted that when irrigating the Davr winter wheat variety using flexible pipes with a pre-irrigation moisture regime of 60-70-60% of FC, the humus, total, and mobile nutrients in the soil were relatively better preserved compared to the variant with furrow irrigation.

In the 5th and 8th variants, where the Vexa winter wheat variety was cultivated, according to the above-mentioned irrigation regimes and methods, the season was observed.

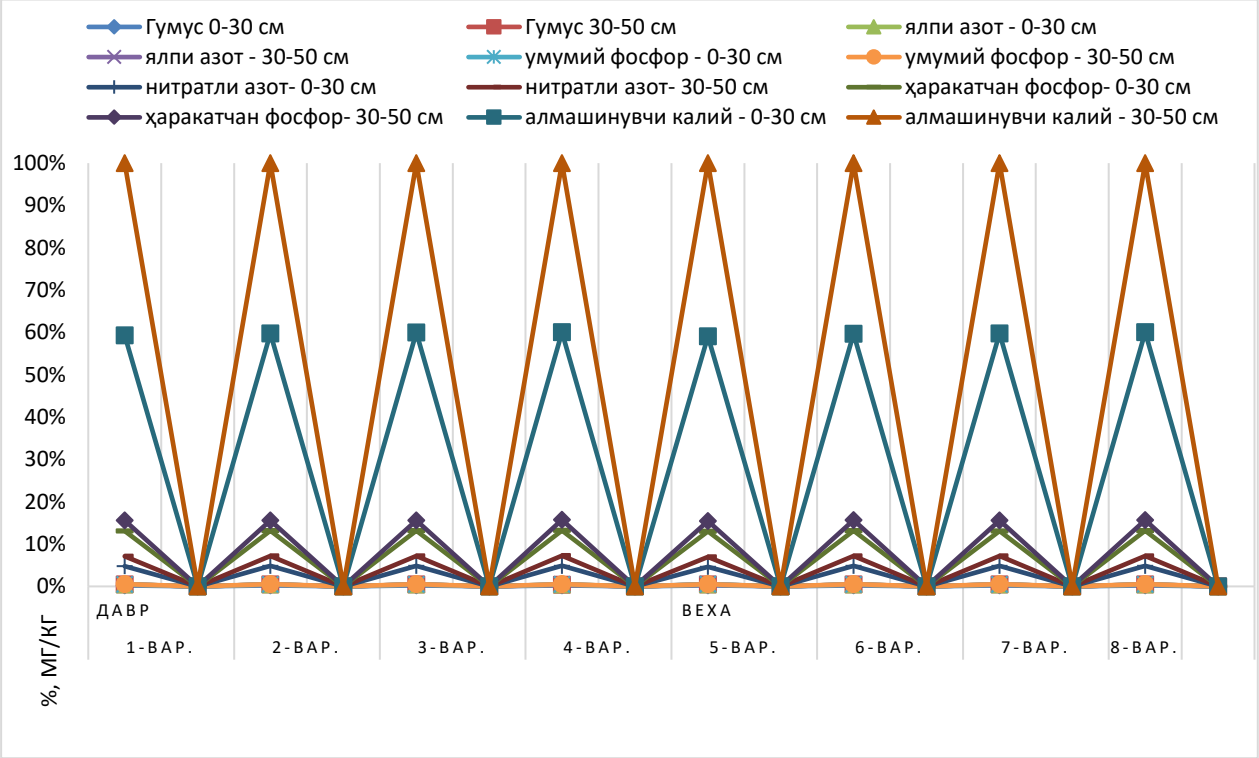

Figure 1. Influence of irrigation methods and regimes of winter wheat varieties on the agrochemical properties of soils, %, mg/kg (2021-2022).

At the end of the experiment, the humus content in the plow layer was 0.969-0.761% and 0.968-0.762%, total nitrogen 0.083-0.062% and 0.085-0.064%, total phosphorus 0.090-0.073% and 0.092-0.074%, nitrate nitrogen 16.1-9.3 mg/kg and 17.3-9.5 mg/kg, mobile phosphorus 23.7-9.6 mg/kg and 23.9-9.8 mg/kg, and exchangeable potassium 172.0-160.0 mg/kg and 176.0-162.0 mg/kg, respectively, or it was established that when irrigating winter wheat variety Vexa using flexible pipes with a pre-irrigation moisture regime of 60-70-60% of FC, the loss of nutrients in the soil composition was less compared to the variant with furrow irrigation. It should also be noted that in the Vexa variety, regardless of irrigation regimes and methods, the loss of common and mobile forms of nutrients in the soil composition was less compared to the Davr variety. One of the main reasons for this is that the experiment was conducted on typical sierozem soils subjected to irrigation erosion, and secondly, this can be explained by the stronger development

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of the root system of the Davr variety compared to the Vexa variety of winter wheat.

In the experiment, relatively optimal indicators were determined in variants 4 and 8, where winter wheat varieties Davr and Vexa were irrigated using flexible pipes with a pre-irrigation soil moisture regime of 70-75-70% of FC, and the humus content in the plow and sub-plow soil layers was 0.974-0.765% and 0.971-0.764%, total nitrogen 0.091-0.068% and 0.087-0.065%, total phosphorus 0.096-0.080% and 0.093-0.076% respectively, the nitrate nitrogen content was 18.3-9.8 mg/kg and 17.9-9.7 mg/kg, mobile phosphorus 24.7-10.4 mg/kg and 24.4-10.2 mg/kg, exchangeable potassium 185-165 mg/kg and 182-164 mg/kg, or it was established that in variant 8 the nutrient content in the soil was lower compared to variant 4.

In the data obtained in 2022-2023 and 2023-2024, it was also observed that the above patterns were fully preserved.

In conclusion, it can be said that pre-irrigation soil moisture of winter wheat varieties Davr and Vexa with irrigation using flexible pipes in the order of 70-75-70% of FC has a positive effect on the content of humus, gross nitrogen, total phosphorus and mobile $N\text{-}NO_3$, P_2O_5 and K_2O in the soil.

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