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Soil And Mineral Fertilizer Requirements Of Spring Wheat Cultivated In The Southern Regions Of Uzbekistan

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Abstract: The article presents data on the study of the influence of spring sowing of wheat on irrigated lands in the southern regions of Uzbekistan, the introduction of crop residues into the soil and nitrogen mineral fertilizers in various ways and at different times on grain yield and ear indicators.

Keywords: wheat, spring wheat cultivation, soil, mineral fertilizers, humus, phosphorus residue in soil, potassium residue in soil.

Introduction: In recent years, global challenges such as population growth, climate change, and resource scarcity have raised serious concerns regarding food security. To address these issues, enhancing the efficiency of cereal crop cultivation, especially wheat, has become a top priority in agricultural research worldwide.

Traditionally, wheat production in Uzbekistan has relied mainly on autumn sowing. However, in recent years, water scarcity during the autumn period and technical challenges in irrigating saline soils or fields distant from water sources have created obstacles for autumn cultivation. In this context, spring sowing of wheat has emerged as an important alternative.

Qashqadaryo region, located in the southern part of Uzbekistan, is characterized by a sharply continental

climate: hot and dry summers, and relatively mild winters. Annual precipitation is limited, concentrated mainly in spring and autumn. Under such agro-climatic conditions, spring wheat cultivation is technically feasible but requires scientifically validated strategies to ensure efficiency. Therefore, evaluating the prospects of spring wheat production in this region requires a comprehensive study of soil fertility, irrigation, and fertilization systems.

METHODS

In Uzbekistan, the cultivation of wheat during spring sowing periods is gaining increasing importance. Particularly in the context of climate change, water scarcity, and soil degradation, conventional agrotechnical approaches are being reconsidered. Therefore, studying the agrobiological characteristics of spring wheat and developing appropriate technologies is of great significance.

According to G.T. Seljaninov (1957), the period from germination to heading in wheat is largely dependent on geographic latitude: as the number of short days increases, the growth period also extends. Furthermore, the duration of plant growth shortens with reduced precipitation, or vice versa. The intervals between growth stages vary not only by region—depending on whether winter or spring wheat is cultivated—but also within the same region, based on moisture availability and agrotechnical conditions.

Similarly, A.N. Nosatovskiy (1965) demonstrated in his research that when soil moisture is abundant but nitrogen is insufficient, the concentration of the soil solution decreases, resulting in a reduced degree of grain vitreousness. Vitreousness is directly linked to the protein content of the grain; in protein-rich wheat, vitreousness tends to be higher. Moreover, applying nitrogen fertilizers in spring, at rates of 30–40 kg/ha of pure nitrogen depending on the developmental stage of the crop, increases the grain protein content by 2.5–3.0% (Lavronov, 1969; Eshmirzayev et al., 1996).

RESULTS AND DISCUSSION

The findings indicate that spring wheat is highly responsive to mineral fertilizers. Not only the fertilizers applied at the time of sowing, but also the residual fertilizers from the previous year's crop play a crucial role. Consequently, the residual nutrient status of the soil becomes an important factor that must be considered for the productivity of the subsequent crop.

To evaluate this, soil samples were collected prior to sowing from contour 280 of the "Qo'yliyev Quvvat" farm, located in the "O'zbekiston" massif of Koson district, Qashqadaryo region. Laboratory analyses were performed to determine the residual levels of mineral nutrients in the soil.

The available phosphorus content was determined using the Machigin–Protasov method, with samples taken from five different points of the experimental plot in accordance with GOST 26205-91 standards. The results are presented in Table 1.

Table 1.

Content of Available Phosphorus in the Soil of Contour 280, "Qo'yliyev Quvvat" Farm, Koson District, Qashqadaryo Region

№	Sample	Contour number	P_2O_5 mg/kg	Level
1	№ 1	280	10 mg/kg	very low
2	№ 2	280	13 mg/kg	very low
3	№ 3	280	11 mg/kg	very low
4	№ 4	280	14 mg/kg	very low
5	№ 5	280	9 mg/kg	very low

The analysis results revealed that the soil of the experimental site is characterized by a very low content of available phosphorus. This indicates the necessity of applying additional mineral fertilizers in order to ensure sustainable agricultural production in this area.

Another essential nutrient for spring wheat and other agricultural crops is potassium. The analysis of soils from the experimental site demonstrated the following levels of exchangeable potassium (Table 2).

Table 2.

Content of Exchangeable Potassium in the Soil of Contour 280, "Qo'yliyev Quvvat" Farm, Koson District, Qashqadaryo Region

№	Sample	Contour number	K_2O mg/kg	Level
1	№ 1	280	230 mg/kg	medium
2	№ 2	280	220 mg/kg	medium
3	№ 3	280	245 mg/kg	medium
4	№ 4	280	210 mg/kg	medium
5	№ 5	280	265 mg/kg	medium

Based on the Machigin–Protasov method (GOST 26205-91), the soil of the experimental contour was analyzed for exchangeable potassium. The results showed an average content of 234 mg/kg, indicating that the soils of this area are moderately supplied with this nutrient. However, according to data from the literature, during spring wheat cultivation the nutrient uptake coefficient of plants is relatively high, which necessitates the application of additional mineral fertilizers.

For cereal crops, particularly wheat, not only the level of mineral nutrients but also the humus content plays a decisive role in achieving high yields. The analysis of the experimental site soils revealed the following humus levels (Table 3).

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Humus Content in the Soil of Contour 280, "Qo'yliyev Quvvat" Farm, Koson District, Qashqadaryo Region (GOST 26213-91)

№	Sample	Contour number	Humus, %	Level
1	№ 1	280	0,90 %	Low
2	№ 2	280	1,08 %	Low
3	№ 3	280	0,96 %	Low
4	№ 4	280	1,1 %	Low
5	№ 5	280	0,89 %	Low

Based on the I.V. Tyurin method, the humus content of the soil in contour 280 of the "Qo'yliyev Quvvat" farm, Koson district, Qashqadaryo region, was determined. The average humus content of the five analyzed samples was 0.98%, indicating that the soils of the study area are poorly supplied with humus. Furthermore, the alkalinity (pH) of the experimental field soils was analyzed, and the results are presented in Table 4.

Table 4.

Soil pH of Contour 280, "Qo'yliyev Quvvat" Farm, Koson District, Qashqadaryo Region

№	Sample	Contour number	pH	Level
1	№ 1	280	5,5	slightly acidic
2	№ 2	280	5,7	slightly acidic
3	№ 3	280	6,1	slightly acidic
4	№ 4	280	6,3	slightly acidic
5	№ 5	280	5,6	slightly acidic

The analysis results showed that the experimental field soil had an average pH of 5.8, corresponding to a slightly acidic environment, which is considered favorable for cultivating agricultural crops, particularly cereals.

CONCLUSION

The assessment of the soil composition in contour 280 of the "Qo'yliyev Quvvat" farm, Koson district, Qashqadaryo region, revealed that it is very poorly supplied with available phosphorus (9–14 mg/kg), moderately supplied with exchangeable potassium (210–265 mg/kg), and poorly supplied with humus (0.89–1.1%). These results indicate that the soil fertility level is insufficient for achieving high productivity of spring wheat without the application of additional fertilizers and soil improvement measures.

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