

Technology of nutriating winter wheat varieties in variety-soil-fertilizer system

Bakhtiyor Atoev^{1,*}, *Jandos Kaypnazorov*², *Mukhayyo Egamberdieva*², *Samad Makhhammadiev*³, *Murod Karimov*², and *Dilafruz Makhkamova*³

¹Research Institute of Soil Science and Agrochemistry, Kamarniso str., Tashkent, Uzbekistan

²Tashkent State Agrarian University, University str., 2, Tashkent province, Uzbekistan, 100140

³National University of Uzbekistan, University str., 4, Tashkent, Uzbekistan, 100174

Abstract. In this article, the reaction of winter wheat varieties to fertilizers in irrigated soils in the varietal-soil-fertilizer system was studied and a feeding system was developed and recommended for each soil-climatic conditions and varieties. Appropriate fertilizer standards have been developed for each wheat variety, which have increased the germination, weeding, accumulation, tuberization, spike formation, dry mass accumulation, grain quality, and yield structure and yield of winter wheat. N250P200K200 kg/ha was obtained from Polovchanka variety of winter wheat at the rate of N250P200K200 kg/ha used in irrigated brown meadow soils, while in typical irrigated gray soils the yield of winter wheat was higher than N250P200K200 kg/ha of pure wheat with N250P200K200 kg/ha. Grain yield was 80.18 tons/ha from Tanya variety, 76.38 tons/ha from Krasnodar-99 variety and 82.32 tons/ha from Polovchanka variety under N200P150K150 kg/ha. Under the influence of the same optimal fertilizer standards, the growth and development of winter wheat, nutrient accumulation, and grain yield and grain quality are improved, and the efficiency of fertilizers is increased.

1 Introduction

The main direction of grain production in the world agriculture is the production of high and quality wheat from wheat through the introduction of resource and energy-saving technologies [1, 4]. In the practice of world grain production, taking into account soil and climatic conditions in the formation of abundant and high-quality wheat, the creation of high-quality varieties resistant to abiotic and biotic factors of the external environment, keeping the varietal characteristics of the variety in an alternative state, soil-climatic and ecological conditions planting, increasing the potential of the variety to accumulate biomass in nutrient-poor soils, maintaining the moisture balance between the soil and the plant, producing fertilizers in accordance with plant nutrition requirements, and developing and implementing fertilizer application technology in optimal terms and standards are one of the most important tasks to go [2-5, 10].

* Corresponding author: bakhtiyor.atoev@mail.ru

Cereals are one of the most common crops in the world. There are about 500 genera of cereals and more than 6,000 species [1]. Among them are wheat and cereals. Over the next 30 years, global demand for wheat has doubled to 730 million tons. By 2020, the global demand for wheat grain is expected to reach 840 million tons. 2-3% of this is accounted for by developing countries [5].

In this regard, a number of scientific studies on the selection of winter wheat varieties in accordance with soil and climatic conditions and the improvement of high-yield agrotechnologies have been conducted in leading research centers and universities around the world, including the Cambridge Plant Breeding Institute (UK), Washington State University (USA). The University of Sydney (Australia), University of Hohenheim (Germany), Food and Agricultural Organization of the United Nations (Italy), Kuban State Agrarian University (Russia), Kazakhstan National Agrarian University (Kazakhstan), Grain and legumes and Soil Science and Research is being conducted in agrochemical research institutes (Uzbekistan) [6].

A number of scientists have conducted research on the development of agrotechnologies for obtaining high-quality grain from winter wheat using mineral fertilizers in the irrigated soil-climatic conditions of Uzbekistan [2, 3, 5, 7]. In addition, foreign scientists have conducted research on the use of fertilizers for winter (winter) wheat in foreign countries to grow high-quality crops. However, so far there is not enough research to take full account of the biological characteristics of winter wheat varieties, increase their efficiency in the application of fertilizers, and fully develop an optimal feeding system for winter wheat varieties suitable for each soil and climatic conditions. For example, a prior methodology for winter wheat variety to determine the agrochemical, water-physical properties and mechanical composition of irrigated brown meadows and typical gray soils, to determine the effect of fertilizers on the growth, development, yield and grain quality of winter wheat, to increase fertilizer efficiency, optimal fertilizer standards and application times is developed [8, 9].

Mechanical composition of the studied soils, water-physical, agrochemical properties, terms and norms of application of mineral fertilizers, Polovchanka, Sanzar-8, Tanya, Zamin-1 and Krasnodar-99 varieties of winter wheat and their growth, development, grain yield, grain and evaluation of bread quality indicators, photosynthetic activity, enzyme intensity, nutrient content in soil and plant, and fertilizer efficiency.

2 Materials and methods

Phenological observations, methods of conducting experiments, soil and plant sampling, irrigation, feeding of winter wheat according to the manual "Methods of conducting field experiments" [1, 2] and mathematical statistical processing of the obtained data on «Methods of field experiments» [3], chemical analysis of soil and plant samples «Methods of agrochemical analyzes of soils and plants in Central Asia» [4].

The place where we conducted the field research, irrigated brown meadow soils belong to the territory of Malikhol. The second research site is the territory of the Tashkent State University of Experimental and Scientific Research Station, located on the terrace III of the middle reaches of the river Chirchik, which passes through the Kibray district of Tashkent province.

Irrigated light colored brown meadow soils are weakly saline, stony soils. Irrigated brown meadow soils are slightly compacted, often with rocks. Soils were found to be weakly saline with salts of Cl^- and SO_4^- .

The depth of groundwater was 155-160 cm. Groundwater is also weakly saline in this character. In terms of dry residue content, the soil section belongs to the low-salinity group. Sulfate and chloride salts accumulate in the soil. In recent years, there has been an increase

in groundwater, which 30 years ago was 2-2.5 meters, now it is around 1.0-1.6 meters. It should also be noted that the water under the soil section obtained in spring (155–160 cm) and autumn (200–220 cm) was found to be different. Over the past period, the gradual rise of groundwater under the influence of annual land washing and irrigated agriculture has led to a process of soil grazing. Therefore, groundwater is also salted with chloride-sulphate salts. Humus reserves in the 0.5-meter layer were about 46 tons per hectare, and nitrogen reserves were about 2.8 tons per hectare. The content of humus in the topsoil (0-24 cm) is 1.09%, in the subsoil (24-40 cm) 0.72%, in the same strata the total nitrogen content is 0.095 and 0.062%, the total phosphorus content (0-24 cm) is 0.118 and (24–40 cm) 0.153% total potassium content of 1.2 and 1.4%, respectively. Soils with active phosphorus potassium are poorly supplied. The amount of reactive phosphorus was between 20.5 and 24.2 mg/kg and the amount of reactive potassium were around 100.1 and 106.8 mg/kg.

3 Results and discussion

In typical irrigated gray soils, the situation is different: the soils are not saline and rich in nutrients. The amount of humus also varied from top to bottom. It was found that the humus in the driving layer reached 1.54%. In the lower horizons it decreases, it is 0.53 percent at a depth of 160-220 cm. The total nitrogen content changed in the same way. The drive was 0.130% in the layer and 0.041% in the 160-220 cm layer. The magnitude of the ratio between carbonate and total nitrogen was also derived from these figures, and the amount of phosphorus along the profile also decreased downwards. Phosphorus was 0.152% in the 0-31 cm layer and 0.103% in the 100-220 cm layer. The total potassium content was greater than the nitrogen and phosphorus content. The highest potassium (1.60%) is found in the driving layer and the lowest potassium (1.09%) in the 160-220 cm layer. It was found that the topsoil was moderately supplied with phosphorus and potassium, while the subsoil was low in phosphorus and moderately supplied with potassium.

In irrigated brown soils, field research was conducted in ‘S. Kulliev farm’, Kyzyltepa district, Navoi province. Field experiments with winter wheat varieties Polovchanka, Sanzar-8 were conducted. In typical irrigated gray soils, Tashkent province, Kibray district Tashkent State Agrarian University Field research with Tanya, Polovchanka, Krasnodar-99, Sanzar-8 and Zamin-1 varieties of winter wheat was carried out under the conditions of typical irrigated gray soils spread at the Experimental and Scientific Research Station.

In both soils, the seeds of winter wheat varieties were sown at the same time in the 2nd decade of October, and it was known that the phases of germination, weeding, accumulation, germination, sprouting, milking, waxing, ripening were different. It was found that the structural features changed, especially during grain harvesting.

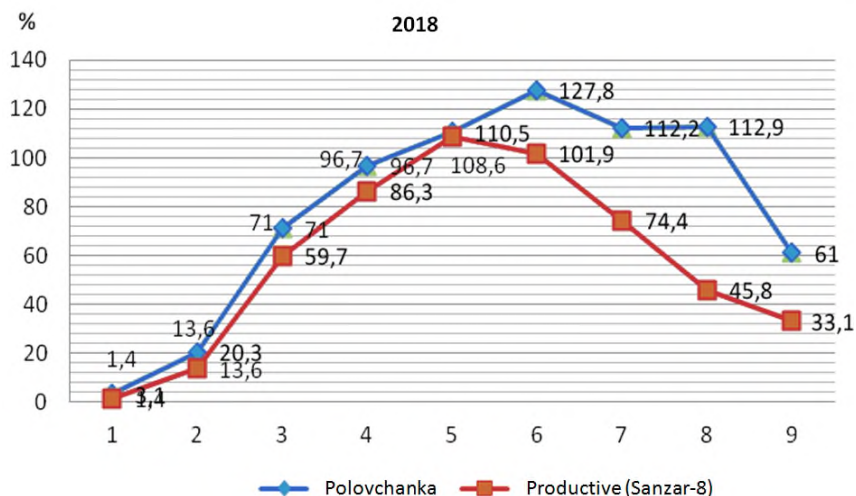
For example, in irrigated brown soils, the yield was higher at Polovchanka N250P200 K200 kg and for Sanzar-8 at N200 R200 K200 kg, while in irrigated typical gray soils. The best yield is 72.94 tons/ha of grain in Tanya N250P150K150 kg/ha, 71.46 tons/ha of grain in N200P100K100 kg/ha and 82 tons of grain per ha in Polovchanka N200P150K150 kg/ha.

Similarly, the amount of nutrients varied in the soils. In irrigated brown meadow soils, nitrogen, phosphorus and potassium levels decreased at the beginning of the winter wheat growing season, Polovchanka variety increased at the beginning of the growing season, and at the beginning of the winter wheat growing season the nutrient content decreased at the beginning of the winter wheat growing season. This process begins earlier, when Polovchanka variety is found to have more nitrogen and potassium from the beginning to the end of the growing season and relatively high phosphorus content in the Fertile variety, in typical irrigated gray soils, at the beginning of the growing season, Nitrogen, Phosphorus

and potassium deficiencies were found. Polovchanka, Tanya and Krasnodar-99 varieties have been found to reduce the amount of nutrients in the soil due to increased absorption of nutrients. At the beginning of the winter wheat vegetation in these soils, the amount of nutrients in the bodies of Sanzar-8 and Zamin-1 began to decrease earlier. Tanya and Polovchanka, Tanya and Krasnodar-99 varieties were rich in nitrogen and potassium from the beginning to the end of the growing season and relatively high levels of phosphorus were found.

In addition, the winter wheat cultivars grown in both soils differ as grains, the quality of grain and flour, the quality of bread made from flour when applied at the rate of N200P200K200 kg/ha Fertile variety (in pure form) compared to Polovchanka navigable winter wheat in irrigated brown meadow soils In the case of Polovchanka, Tanya and Krasnodarskaya – 99 varieties of winter wheat in the typical irrigated gray soil conditions, the quality of bread made from them has improved.

It depends on the size, quality of the product and the amount of costs incurred in growing the crop. The advantages of technological processes used in the cultivation of varieties are evaluated by cost-effectiveness. Economic efficiency in the cultivation of winter wheat varieties showed that grain yield, additional yield, value of grain yield per hectare, value added, cost per hectare, net income and yield per hectare varies depending on the biological characteristics of varieties and fertilizer application rates studied to go. For example, it can be seen that the net profitability, depending on the grain yield per 1 hectare of winter wheat grown on irrigated brown meadow soils varies as follows (Figure 1).



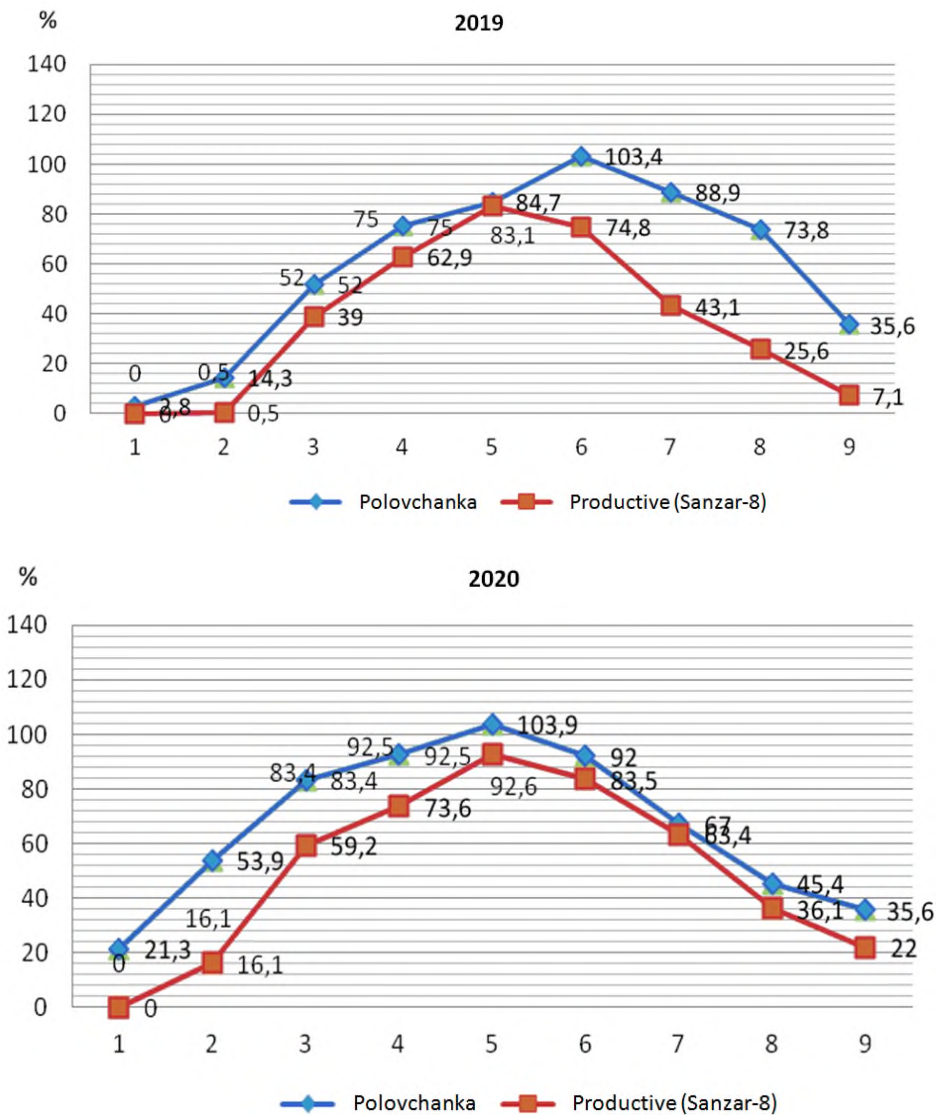


Fig. 1. Yield rate of winter wheat varieties, %

Thus, we have developed and recommended separate fertilizer standards for each cultivar and timing of its application for each soil for the conditions of irrigated brown grassland and irrigated typical gray soils under study. It was recommended to apply 60% of the annual norms of potassium fertilizer under plowing, 20% during sowing and 20% during harvesting. In these production experiments, it had a positive effect. The scientific and practical results of field experiments conducted on irrigated brown meadow soils in 2003-2006 and on typical gray soils irrigated in 2011-2015 were tested under experimental conditions.

In terms of production, the average yield of grain of Polovchanka variety is 68.6 q/ha, net profit is 659,620 UZS/ha, profitability is 50.8%, grain yield of Sanzar-8 is 55.2 q/ha, net profit is 555,753 UZS/ha, the yield rate was 47.7%. In pure form, N250P200K200 kg/ha

yielded an average yield of 7 -9 q/ha more than in the case of non-application of fertilizer standards (Table 1).

Table 1. Winter wheat grain yield and net income grown on irrigated arable brown meadow soils

#	Annual norm of mineral fertilizers, kg/ha			Grain harvest, q/ha	Net income (per hectare), UZS	Profitability, %
	N	P	K			
<i>Polovchanka</i>						
1	250	200	200	68.6	659620	50.8
<i>Sanzar-8</i>						
2	200	200	200	55.2	555753	47.7

The results of the study were introduced on a total area of 2,125 hectares under irrigated brown meadow soils.

In the conditions of typical irrigated gray soils of Tashkent province, when conducting experiments on production of winter wheat using Tanya and Krasnodar-99 varieties (pure) N250P175K125 kg/ha and Zamin-1 navigator (pure) N200P140K100 kg/ha, Krasnodar-99 yield of 65 varieties averaged 65.3 q/ha, net profit 964,500 UZS/ha, yield rate 23.1%, Tanya variety yielded an average of 69.7 q/ha, net profit 1,246,100 UZS/ha, yield 27.9 percent. In pure form, N250P175K125 kg/ha yielded an average yield of 7-9 q/ha compared to the yield under conditions where fertilizer standards were not applied (Table 2).

Table 2. Winter wheat grain yield and net income grown on typical gray soils irrigated under production conditions

#	Annual norm of mineral fertilizers, kg/ha			Grain harvest, q/ha	Net income (per hectare), UZS	Profitability, %
	N	P	K			
<i>Tanya</i>						
1	250	175	125	69.7	1246100	27.9
<i>Krasnodar-99</i>						
2	250	175	125	65.3	964500	23.1
<i>Zamin-1</i>						
3	200	140	100	61.6	727.7	18.5

In the conditions of typical irrigated gray soils of Tashkent province, it was introduced on a total area of 200 hectares. Farms that applied the optimal fertilizer standards recommended for production were able to obtain high and quality yields from winter wheat.

4 Conclusion

The mechanical composition of irrigated brown grassland soil is light. Soils are weakly saline in the chloride-sulfate type. Groundwater varies from 1.0 to 1.6 meters. The humus content in the driving layer was 1.09%, total nitrogen 0.095%, total phosphorus 0.118%, and total potassium 1.1%. If it is found that the total nitrogen, phosphorus and potassium content in the subsoil is reduced, the mechanical composition of the typical gray soil to be irrigated is medium sand. The soils are not saline. The humus content in the driving layer was 1.54%, total nitrogen 0.130%, total phosphorus 0.152% and total potassium 1.6%.

Decreases in total nitrogen, phosphorus, and potassium levels have been known in the subsurface strata.

In both soils studied, it was found that the reaction of winter wheat to the applied fertilizers was not the same. This affected the germination, threshing, accumulation, threshing, threshing of winter wheat, and as a result, the indicators of yield and yield quality also changed. In the conditions of irrigated brown meadow soils, the yield of winter wheat in Polovchanka variety is N250P200K200 kg per hectare at the rate of 689,841 UZS, and in the yielding variety is N200P200K200 kg per hectare at the rate of 576 kg per hectare. The net income of Polovchanka variety of winter wheat (in pure form) was 1,507,742 UZS at the rate of N250P150K150 kg/ha, 2,125,588 UZS at the rate of N200P175K125 kg/ha and 2,044,473 UZS at Krasnodar-99 variety. The yield of winter wheat was 1,130,898 UZS for N200P100K100 kg of fertilizer (net) and 1,715,103 UZS for Zamin-1 at N200P140K100 kg.

References

1. *Methods of conducting field experiments*, 148 (UzPITI Press, Tashkent, 2007)
2. D. Yormatova, Z. Ziyodullaev, *Technical parameters of wheat*, 7 (2013)
3. S. Isaev, I. Begmatov, G. Goziev, S. Khasanov, IOP Publishing **883**(1), 012080 (2020)
4. S. K. Isaev, R. U. Rakhmatov, S. S. Tadjiev, G. I. Goziev, S. Z. Khasanov, IOP Publishing **614**(1), 012147 (2020)
5. N. Shakirov, Annual traditional journal of UzNU, 23-28 (2016)
6. T. Ernazarov, Annual traditional journal of TIIM, 1-12 (2016)
7. B. Matyakubov, K. Isabaev, D. Yulchiyev, SH. Azizov, Journal of Critical Reviews **7**(5), 376-379 (2020)
8. I. Abdullaev, M. Horst, N. Mirzaev, B. Matyakubov, Paper No 132 Presented at the 9th International Drainage Workshop (Utrecht, the Netherlands, 2003)
9. SH. Kenjabaev, F. Hans-Georg, I. Begmatov, S. Isaev, B. Matyakubov, Integration of the FAO-56 approach and budget Journal of Critical Reviews **7**(5), 340-349 (2020)
10. N. Teshae, B. Mamadaliyev, A. Ibragimov, S. Khasanov, InterCarto. InterGIS **26**(3), 324-333 (2020)