

Compatibility of 'soil-variety-fertilizer' to fertilizer norms and dynamics of food elements

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Abstract. This article notes the geographical location and soil-climatic conditions of Kashkadarya province in Uzbekistan, as well as the mechanical composition, agrochemical properties and dynamics of nutrients in the soil of field experiments conducted in the conditions of typical irrigated gray soils in Shakhrisabz district. In total, 36% of the irrigated soils of the Kashkadarya basin are typical gray soils, and the genetic layers of the soils of the studied area are medium sandy, with large dust particles predominating in the mechanical fraction and create nutritional regimens. In the driving layers of the studied soils, humus 1.094%, total nitrogen 0.080%, total phosphorus 0.168%, total potassium 1.07%, mobile nitrogen, phosphorus and exchangeable potassium belong to low and moderately supplied groups. It is also possible to fully demonstrate the potential of cotton by creating a scientifically based nutrient environment for the promising variety "Porlok-4".

1 Introduction

The role of soil fertility and high-yielding varieties and modern technologies in improving the well-being of the population, including Uzbekistan, and its appeal to the world community is invaluable [1, 8, 9]. Today, not only Uzbekistan, but all over the world requires the rational use of land and water resources, their conservation, the provision of the population with environmentally safe food on a global scale. Because, according to official data recorded by the FAO, by 2050 the world's population will reach 9.2 billion per capita, and when the food supply of this population is calculated, it is required to produce at least 2 times as much food as today [1, 10, 11].

Today, opportunities to expand arable land are limited. Therefore, the main focus should be on maintaining and restoring soil fertility while not increasing the productivity of agricultural crops and not harming the environment [3]. However, in recent years, soil fertility, including irrigated soils, has declined, making it impossible to obtain the expected yield. This is due to the fact that scientifically based fertilizer standards and ratios, i.e. 'soil-variety-fertilizer' ratio, which take into account the optimal nutrient environment for intensive crops, the level of nutrient availability of soils, soil-climatic conditions and other

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factors, are somewhat neglected. Failure to follow the balance between these factors leads to a decrease in the expected yield or the effectiveness of agro-technical measures [1, 3].

Cotton, which occupies a major place among agricultural crops, is now grown in 84 countries around the world. According to the International Cotton Advisory Council (ICAC), 32-34 million hectares have been cultivated worldwide in recent years, with India leading the way in 2013-2014 (11.7 million ha) and China (4.6 million ha), the United States (3.53 million ha), Pakistan (2.914 million ha), Uzbekistan (1.285 million) and Brazil (1.122 million) [4, 5]. Cotton is also grown in South (1.790 million ha) and North (0.175 million ha), Africa and French-speaking Africa (2.447 million ha) [5].

Agricultural crops, especially cotton varieties, require different fertilizer standards, types, ratios (NPK), as the nutrition of varieties depends on soil-climatic conditions [5, 8, 9]. This fully reflects the potential of varieties by producing the most optimal standards, taking into account the 'soil-variety-fertilizer' ratio, which ultimately creates the opportunity to obtain a quality and weighty crop. The role of mineral fertilizers is invaluable. This is because the FAO Office of the United Nations, when studying the demand for mineral fertilizers in different soil conditions in more than 40 countries around the world, recognizes that mineral fertilizers account for 50-60% of crop yields, in some cases up to 70% [3, 6].

Hence, the optimal norms and terms of nutrients in cotton are the most important and key factor in increasing the yield of crops, especially cotton [7]. However, today the global changes in soil and climatic conditions and the creation of new varieties pose a number of challenges for agricultural workers, especially agrochemists and soil scientists. Therefore, a comprehensive study of nitrogen, phosphorus, potassium and other nutrients necessary for the nutrition of agricultural crops allows to determine the environmental pollution, the coefficient of fertilizer use of crops and their proportions and duration [7, 12].

Taking into account the above, the purpose of this research is to develop the most optimal fertilizer standards, ratios and timing, taking into account the 'soil-variety-fertilizer' ratio of the promising variety of cotton "Porlok-4".

2 Materials and methods

The main part of the Kashkadarya province in the southern part of Uzbekistan of Uzbekistan is occupied by the Kashkadarya basin, which borders Samarkand to the north, Bukhara to the northwest, Surkhandarya to the southeast, Turkmenistan to the southwest, and Tajikistan to the northeast [11]. The Kashkadarya Basin is located on the western edge of the Pamir-Alay Mountains and consists of most of the plains: Kitab-Shakhrisabz Plain in the northeast, Guzar Plain in the west, Karshi Desert in the northwest and Nishan Desert in the south, and Sandikli Sand Desert in the southwest. The plain rises to the northeast, forming the Kitab-Shakhrisabz basin between the mountains. From the north-east and south-east the deserts are surrounded by Zarafshan (Koratepa, Chakalikalon mountains) and Gissar mountain ranges (Osmontarosh, Shertog, Yakkabog, Eshakmaydon, Kokbulak, Chakchar, Korasirt, Dehkanabad mountains). The Kitab-Kamashi plain is located in the north-east of the province, the hills of Zarafshan in the north and Gissar ridges in the south-east occupy large areas [11].

In terms of geological structure, the Kashkadarya basin is very complex, and the Zarafshan and Gissar ridges, located in its north-eastern and south-eastern parts, are composed of metamorphic rocks. Also, the south-western slopes of the Hissar ridge are completely covered by Mesozoic and Tertiary deposits, and the regional plain area consists mainly of Quaternary deposits developed over Upper Cretaceous and Tertiary deposits [3].

The peculiar climatic features of Kashkadarya province depend on its geographical location, and the fact that the province is located within the Eurasian continent, in the

central part of Central Asia, has led to a peculiar sharp continental climate. Climate change plays an important role in the composition of the climate, with Arctic air entering the Central Asian region from the north during the winter months, and sometimes precipitation due to global warming caused by tropical air currents in southwestern cyclones in Iran and Afghanistan [11].

Kashkadarya province, located in the southern part of the country, has a special character with its soil and climatic conditions and ancient agricultural culture. Almost all of the existing soils in Uzbekistan are found in the province. In the Kashkadarya basin, the main irrigated gray soils (36% of the irrigated lands of the basin) are distributed [5, 11].

The field experiment was carried out in the U. Ibragimov massif of Shahrisabz district in the conditions of typical gray soils, which are widely irrigated. The coordinates of this experimental area - the geographical location - were determined using a device "GPS-60".

Field research, soil and plant sampling, agrochemical analysis, phenological observations were carried out on the basis of generally accepted methodological guidelines in the field of soil science and agrochemistry. In particular, the Guidelines for the implementation of chemical and agrophysical analyzes in the monitoring of land [4] and special methods "Application of mineral and local fertilizers in cotton", "Methods of field experiments", and "High yield technology in cotton" [2].

3 Results and discussion

According to the chemical analysis of the soil sample taken from the genetic layers of the field experimental soils, it was found that the genetic layers consisted mainly of medium sandy soils, the lower 120-217 cm layers of heavy sandy mechanical composition, and large dust particles predominated by mechanical fractions. The 0-120 cm layers in which the main root system of the crop develops consist of a medium sandy mechanical composition, which allows to create favorable water and nutrient regimes for their growth and development (Table 1).

Table 1. mechanical composition of the typical irrigated gray soil

#	Layer depth, cm	Soil particles in %, in mm							Physical mud (<0.01 mm)	Soil
		>0.25	0.25-0.1	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001		
I K-SH	0-35	1.1	0.6	13.4	42.7	15.7	13.9	12.6	42.2	Medium sandy
	35-51	0.9	0.5	12.7	42.3	15.3	14.9	13.4	43.6	Medium sandy
	51-78	1.2	0.7	14.1	45.1	13.4	12.9	12.6	38.9	Medium sandy
	78-120	1.4	1.0	15.6	45.7	16.1	10.8	9.4	36.3	Medium sandy
	120-167	3.7	0.9	14.1	30.2	10.9	16.7	23.5	51.1	Severe sandy
	167-217	5.3	1.2	10.8	32.4	11.7	15.3	23.3	50.3	Severe sandy

According to the initial agrochemical analysis of typical gray soils irrigated by field experiments, humus 1.094%, total nitrogen 0.080%, total phosphorus 0.168%, total

potassium 1.07%, mobile nitrogen, phosphorus and exchangeable potassium are low in the driving layer of soils (N-NO₃ - less than 20-30 mg/kg, P₂O₅ - less than 15-30 mg/kg, K₂O - 200-300 mg/kg on average) and belonging to the average provided groups. This is due to the fact that the nutrients decrease in a uniform manner from the driving layers to the lower layers (Table 2).

Table 2. Primary agrochemical properties of experimental field soils

#	Layer depth, cm	Humus, %	Total N, %	C:N	Fertilizers				
					gross, %		reactive, mg/kg		
					P	K	N-NO ₃	P ₂ O ₅	K ₂ O
I K-SH	0-35	1.094	0.080	8.0	0.168	1.07	24.9	19.7	227
	35-51	0.851	0.068	7.3	0.145	1.05	20.9	19.2	209
	51-78	0.645	0.049	7.7	0.127	1.03	19.2	11.7	184
	78-120	0.470	0.041	6.7	0.113	1.02	16.9	7.9	171
	120-167	0.430	0.045	5.5	0.106	1.01	11.0	5.0	164
	167-217	0.370	0.039	5.4	0.101	0.97	8.6	4.7	149

The ratio of carbon to nitrogen in the studied soil was observed in the range of 5.4-8.0. The ratio of carbon to nitrogen in gray soils occurs in the range of 7-9, the lack of which indicates that the activity of biological processes in soils is slow [1]. The fact that the ratio of carbon to nitrogen in the Ah, Ahay and V1 layers of the experimental field soils is in the range of 7.3-8.0 indicates that it is biologically active.

In the experiment, a promising variety of cotton "Porlok-4" was selected. This variety is early maturing, the growing period and its height averages 110-115 days/cm. Its shape is pyramidal, one pod weighs 6.0-6.5 g, 1000 seeds weigh 120 g, and its structure is oval. The fiber belongs to type III, fiber yield is 38%, and fiber length is 36 mm [3].

The demand, norms and ratios of this cotton to the optimal nutrient conditions in the conditions of typical gray soils, which have long been irrigated by the promising variety "Porlok-4", have not been sufficiently studied. Therefore, in order to fully realize the potential of the variety, using nitrogen, phosphorus and potassium mineral fertilizers in different norms and proportions in the conditions of typical irrigated gray soils in the province of gray soils of the Kashkadarya basin, field experiments were conducted.

The field experiment system is presented in Table 3 below, in which different norms and ratios for nitrogen mineral fertilizers of 250 and 300 kg/ha was developed.

Table 3. Field experiment system

#	Norm of annual mineral fertilizers	Annual distribution of mineral and local fertilizers, t/ha and kg/ha							
		Under the plow		Along with planting	First 3-4 leaves	Flowering		Blooming	
		P	K	N	N	N	K	N	P
		60%	50%	25%	20%	25%	50%	30%	40%
1	Control (N ₀ P ₀ K ₀)	-	-	-	-	-	-	-	-
2	N ₂₅₀ P ₁₇₅ K ₀	105	-	62.5	50	62.5	-	75	70
3	N ₂₅₀ P ₀ K ₁₂₅	0	62.5	62.5	50	62.5	62.5	75	-
4	N ₂₅₀ P ₂₅₀ K ₂₅₀	150	125	62.5	50	62.5	125	75	100

5	N ₂₅₀ P ₂₂₅ K ₁₇₅	135	87.5	62.5	50	62.5	87.5	75	90
6	N ₂₅₀ P ₂₀₀ K ₁₅₀	120	75	62.5	50	62.5	75	75	80
7	N ₂₅₀ P ₁₇₅ K ₁₂₅	105	62.5	62.5	50	62.5	62.5	75	70
8	N ₂₅₀ P ₁₅₀ K ₁₀₀	90	50	62.5	50	62.5	50	75	60
9	N ₃₀₀ P ₂₁₀ K ₀	126	-	75	60	75	-	90	84
10	N ₃₀₀ P ₀ K ₁₅₀	-	75	75	60	75	75	90	-
11	N ₃₀₀ P ₃₀₀ K ₃₀₀	180	150	75	60	75	150	90	120
12	N ₃₀₀ P ₂₇₀ K ₂₁₀	162	105	75	60	75	105	90	108
13	N ₃₀₀ P ₂₄₀ K ₁₈₀	144	90	75	60	75	90	90	96
14	N ₃₀₀ P ₂₁₀ K ₁₅₀	126	75	75	60	75	75	90	84
15	N ₃₀₀ P ₁₈₀ K ₁₂₀	108	60	75	60	75	60	90	72

In this case: 1st option fertilizer-free control (N0P0K0), in the 2nd option the ratio of phosphorus and potassium to nitrogen is set as 1: 07: 0, in the 3rd option N-1: P-0: K05, in the 4th option N-1: P-1 : K-1, 5-option N-1: P-09: K-07, 6-option N-1: P-08: K-06, 7-option N-1: P-07: K-05, Option 8 has N-1: P-06: K-04 ratios. The same ratios were also taken into account in the 300 kg/ha options with increased nitrogen (Table 4).

According to the data in Table 4 above, irrigation and agrotechnical measures were carried out simultaneously with the remaining options for cotton grown in option 1. Nitrogen in the form of nitrate in the soils of this option averaged 24.1 mg/kg in the drive layers before planting and 20.6 mg/kg at the end of the growing season. This means that as plants develop, they absorb a certain amount of nutrients from the soil, as a result of which the balance of nutrients in the soil changes. In option 2, where nitrogen was applied, the average N-NO₃ before planting was 23.9 mg/kg, while during the 2-3 leaf period it was 25.2 mg/kg, and in the later phases it decreased to 13.1 mg/kg when it reached the flowering period. This situation was also observed in other options.

M. A. Belousov, F. Kh. Hashimov, Yu. T. Gritsevich, and H. T. Riskieva [1, 3, 5] were the first to study different norms, terms and ratios of mineral fertilizers in cotton growing, including in the conditions of Uzbekistan. Besides that, JS Sattarov, A. Ergashev studied the effect and dynamics of phosphorus mineral fertilizers on cotton in the conditions of typical and light gray and meadow soils irrigated with gray soils. When applying the norm of mineral fertilizers N₂₀₀P₁₄₀K₁₀₀ kg/ha for 5 years, the typical irrigated gray soils are 37.5 kg/ha in the driving layer, 5.7 kg/ha under the drive, and 31.8-7.1 kg/ha in the grass-grass soils, respectively, and in newly irrigated light gray soils for 3 years, when applied at the following rates, the driving and sub-driving layers were found to be around 41.8-20.4 mg/kg, respectively. The authors acknowledged that changes in mobile phosphorus in soils also depend on cotton navigation.

In China, researchers have conducted field experiments for many years at different rates and ratios based on the “wheat-corn” rotation system to increase the fertility of Typic Ustochsept-saline sandy soils. At the same time, when using mineral fertilizers N₀P₀, K₂₇₀ and N₅₄₀P_{67.5}K₁₃₅ in different options, a significant increase in organic matter in the driving layers of the soil was observed from year to year [6].

In order to determine the laws of biokinetic circulation of the nitrogen element on the basis of the "soil-plant-fertilizer" system in 1985-2006, chestnut formed in Buryatia and Trans-Baikal regions, black, gray forest in the south and conducted experiments in grassy black soil conditions scattered on permanent glaciers. Experimental scheme: 1st option control, 2nd option R40K40 - background, 3rd option background + N60, in addition nitrogen-saturated fertilizers were applied. Noting that nitrogen is mobile in the ‘soil-plant-fertilizer’ system, the authors found that its best balance was observed in gray forest soils, near-deficit condition was observed in chestnut soils, and positive in other soils [12].

Table 4. Dynamics of reactive nutrients, mg/kg

#	Norm of annual mineral fertilizers	Iterations	Layer depth, cm	Pre-sowing			First 3-4 leaves			Flowering			Blooming		
				N	P	K	N	P	K	N	P	K	N	P	K
1	Control (N ₀ P ₀ K ₀)	1	0-30	24.9	19.7	227	23.8	17.6	212	20.1	15.7	187	10.2	12.1	155
			30-50	20.9	19.2	209	19.6	17.3	193	16.4	15.3	170	8.7	12.0	140
		2	0-30	24.7	19.3	218	24.3	17.4	202	20.7	15.8	176	9.6	12.5	145
			30-50	19.8	19.0	200	19.7	17.1	186	16.3	15.4	168	8.4	11.3	138
		3	0-30	22.6	20.3	221	22.5	18.3	204	18.4	16.3	179	10.6	12.9	146
			30-50	21.2	19.5	207	21.0	17.6	191	17.3	15.1	173	8.3	11.8	142
2	N ₂₅₀ P ₁₇₅ K ₀	1	0-30	23.8	26.7	227	25.9	27.6	207	20.9	22.4	203	13.6	19.8	163
			30-50	18.7	25.3	210	20.3	26.3	190	17.6	20.8	186	10.9	18.4	149
		2	0-30	24.3	28.9	220	25.6	32.1	200	21.3	24.3	195	12.9	20.9	154
			30-50	22.1	26.4	198	23.6	27.3	182	18.9	21.3	178	11.8	19.1	142
		3	0-30	23.5	30.7	200	24.1	31.4	179	20.5	24.9	174	12.7	22.6	138
			30-50	21.3	27.6	191	22.9	28.7	174	18.6	22.7	170	10.8	19.8	135
3	N ₂₅₀ P ₀ K ₁₂₅	1	0-30	25.3	18.7	236	26.4	16.8	221	22.3	15.2	217	12.8	12.1	187
			30-50	22.0	17.6	201	22.3	15.4	187	18.6	12.9	182	11.5	9.7	164
		2	0-30	24.1	20.1	227	25.1	18.1	214	21.4	15.7	207	13.6	12.1	183
			30-50	19.3	19.3	215	20.1	17.6	201	16.3	15.1	196	12.4	11.7	169
		3	0-30	24.6	19.6	240	24.9	17.4	223	21.1	15.3	214	12.4	11.8	186
			30-50	22.3	18.7	210	22.7	16.8	194	19.2	14.2	187	10.9	10.7	164
4	N ₂₅₀ P ₂₅₀ K ₂₅₀	1	0-30	25.6	42.3	265	27.4	46.2	251	23.4	39.2	245	16.2	29.8	209
			30-50	21.4	35.1	241	22.3	38.1	217	18.9	30.4	210	13.4	22.7	179
		2	0-30	19.8	40.5	257	21.6	44.2	243	25.1	36.4	236	17.4	27.6	202
			30-50	17.6	36.7	239	28.9	38.9	224	18.4	32.5	217	12.6	24.3	178
		3	0-30	23.6	45.9	260	25.3	48.9	241	22.3	40.7	239	15.3	29.7	206
			30-50	21.4	42.7	245	22.1	45.3	234	18.7	37.4	221	11.7	27.1	177
5	N ₂₅₀ P ₂₂₅ K ₁₇₅	1	0-30	25.3	40.3	251	26.3	43.8	234	22.5	37.4	229	13.6	27.3	194
			30-50	22.4	33.4	242	23.1	35.4	221	19.2	29.6	208	12.4	21.7	176
		2	0-30	19.9	39.6	249	22.1	42.1	226	19.6	35.4	224	12.3	26.8	189
			30-50	18.6	37.4	241	20.4	39.7	215	16.8	32.4	207	10.6	24.1	174
		3	0-30	23.5	38.1	253	23.9	40.8	231	20.4	34.8	224	11.8	26.7	185
			30-50	22.4	30.7	239	23.2	32.7	219	18.6	29.1	213	10.9	21.4	176
6	N ₂₅₀ P ₂₀₀ K ₁₅₀	1	0-30	26.4	36.7	250	27.4	39.3	224	22.1	34.7	219	14.2	26.9	179
			30-50	21.9	32.9	237	23.1	34.6	218	18.6	29.7	205	11.6	22.4	167
		2	0-30	24.3	39.1	241	25.3	41.3	221	20.3	32.4	216	13.6	24.6	176
			30-50	20.4	29.8	223	21.3	32.1	197	17.4	27.4	191	11.1	20.9	163
		3	0-30	23.8	30.6	245	25.1	32.4	217	21.6	28.9	213	13.2	22.7	174
			30-50	19.8	26.8	233	21.4	29.7	196	18.9	25.7	189	10.9	19.9	164
7	N ₂₅₀ P ₁₇₅ K ₁₂₅	1	0-30	20.9	35.1	248	22.3	36.4	225	17.5	32.6	206	12.3	24.9	178
			30-50	17.8	30.7	240	19.3	32.1	214	16.3	28.4	198	11.4	21.6	162
		2	0-30	23.7	32.6	235	24.1	34.9	212	18.7	31.6	224	12.9	24.6	187
			30-50	20.6	29.8	233	20.4	31.8	210	16.2	27.6	214	10.8	19.8	174
		3	0-30	25.3	34.2	241	25.3	35.7	218	18.1	31.6	223	12.5	24.6	181
			30-50	22.4	30.8	224	23.4	32.9	198	17.9	28.7	207	11.9	20.1	168

8	$N_{250}P_{150}K_{100}$	1	0-30	23.7	29.8	240	25.1	31.8	220	20.6	27.6	213	12.9	21.1	174
			30-50	19.5	26.7	233	20.3	28.4	210	16.9	24.3	197	11.2	18.4	163
		2	0-30	23.4	30.1	238	24.8	32.6	215	22.4	28.4	224	13.6	21.7	178
			30-50	20.1	26.3	230	22.3	28.1	206	18.7	24.9	205	11.7	19.1	175
		3	0-30	23.5	28.6	227	24.1	29.7	204	19.5	26.4	208	12.6	19.7	173
			30-50	19.7	25.9	225	19.8	27.6	197	15.6	23.9	196	10.8	18.3	163
9	$N_{300}P_{210}K_{0}$	1	0-30	24.6	40.9	230	25.6	43.2	208	20.9	36.7	205	14.9	27.1	162
			30-50	20.5	40.0	204	21.7	41.8	193	19.6	34.5	186	12.6	25.8	142
		2	0-30	27.3	41.9	215	27.9	44.3	194	22.4	38.1	189	14.3	28.6	140
			30-50	21.5	35.8	210	21.7	38.4	187	18.6	32.9	179	12.1	24.3	135
		3	0-30	24.9	42.7	216	26.3	44.6	192	22.3	37.4	182	14.2	27.9	139
			30-50	20.9	30.9	207	21.4	32.1	183	19.3	26.9	174	12.6	19.7	129
10	$N_{300}P_{0}K_{150}$	1	0-30	25.9	19.7	241	27.3	18.1	224	22.1	15.3	221	15.3	11.4	189
			30-50	20.4	19.2	230	21.4	17.4	213	17.4	14.7	208	11.9	11.0	176
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			30-50	20.4	18.6	207	21.5	17.2	192	17.2	14.3	189	11.7	9.8	163
		3	0-30	24.1	20.1	218	25.3	18.4	201	20.6	15.4	196	14.2	10.9	167
			30-50	21.0	19.0	205	22.5	17.2	187	19.3	14.8	184	12.9	9.7	162
11	$N_{300}P_{300}K_{300}$	1	0-30	23.5	46.7	274	24.3	52.1	260	20.3	44.1	251	13.9	31.4	214
			30-50	20.3	41.6	245	20.9	46.9	239	18.4	38.7	234	12.4	27.3	201
		2	0-30	24.1	45.1	269	24.6	49.2	254	19.8	41.2	251	13.8	29.4	214
			30-50	19.4	38.9	254	20.3	43.6	246	17.6	36.8	239	12.5	25.1	201
		3	0-30	20.7	43.9	278	21.4	48.2	263	20.6	40.4	256	14.2	29.4	214
			30-50	18.6	40.1	263	19.8	44.7	248	17.2	27.3	239	12.3	21.6	209
12	$N_{300}P_{270}K_{210}$	1	0-30	19.5	45.3	249	21.1	48.6	221	16.5	42.1	217	12.6	31.7	178
			30-50	17.9	36.9	241	19.2	39.6	219	15.6	33.5	208	11.4	27.6	169
		2	0-30	25.3	47.1	253	25.3	49.6	224	20.4	32.4	223	15.3	33.9	178
			30-50	22.4	40.1	244	24.6	41.3	216	18.9	30.8	216	14.2	24.1	169
		3	0-30	24.6	41.2	253	24.8	44.2	228	19.7	37.1	226	14.9	29.7	186
			30-50	20.3	36.7	231	22.3	38.1	209	17.6	34.9	214	12.8	25.4	174
13	$N_{300}P_{240}K_{180}$	1	0-30	23.9	44.3	247	24.3	46.3	221	19.6	39.5	215	12.9	29.5	174
			30-50	20.4	40.6	233	22.1	41.7	209	17.5	35.4	200	11.6	24.3	168
		2	0-30	25.1	39.8	247	25.9	42.1	218	20.6	36.2	214	13.8	26.1	169
			30-50	23.6	32.9	241	23.4	34.8	205	18.7	29.4	205	12.4	21.7	157
		3	0-30	23.7	39.1	253	24.8	40.9	230	19.3	35.8	223	12.7	25.3	176
			30-50	20.9	36.5	247	21.8	38.6	224	17.2	32.9	217	10.9	22.7	169
14	$N_{300}P_{210}K_{150}$	1	0-30	23.6	38.7	241	24.7	38.9	217	19.6	32.6	214	13.9	22.1	167
			30-50	20.7	36.9	247	21.3	37.6	210	16.8	31.4	203	12.5	19.9	156
		2	0-30	21.6	39.4	249	22.6	40.7	224	17.6	34.7	217	12.9	24.7	163
			30-50	20.8	37.1	238	21.4	38.3	216	16.3	32.6	206	10.8	22.3	157
		3	0-30	26.4	36.4	236	27.3	37.6	229	20.4	31.7	219	13.6	22.4	168
			30-50	20.7	34.3	224	21.9	35.4	200	17.9	29.8	198	12.3	19.8	151
15	$N_{300}P_{180}K_{120}$	1	0-30	23.4	36.7	241	24.6	37.9	218	20.1	29.8	214	11.9	23.4	172
			30-50	20.4	34.2	224	21.4	34.3	203	16.9	27.4	197	9.8	19.3	159
		2	0-30	24.6	35.8	239	25.3	36.9	211	19.4	29.6	206	11.2	22.4	164
			30-50	20.3	33.5	231	21.1	34.7	208	17.2	27.3	200	9.6	18.3	158
		3	0-30	23.9	34.1	248	25.3	31.9	216	19.6	25.8	217	10.7	17.9	175
			30-50	20.7	28.3	239	21.7	28.7	210	17.4	22.9	202	8.9	16.8	163

In the first control option of the experiments conducted by Ukrainian researchers [7, 12] to study the nitrogen element turnover in agriculture, when combined with the application of mineral and local fertilizers ($N_{40}P_{36}K_{40}$ +6 t/ha fertilizer) and found that the amount of nutrients that went out with the crops of beet crops was high. In the control option, -74.3 kg/ha, and in the option using mineral and local fertilizers, -66.8 kg/ha of additional nitrogen was released.

A. S. Merzlikin [12] noted that the role of mineral and local fertilizers in increasing crop yields and soil fertility is invaluable. For example, American scientists estimate that 41 percent of crop yields are due to mineral fertilizers, 13 to 20 percent to herbicides, 15 percent to favorable weather, 8 percent to variety, 5 percent to irrigation, and 11 to 18 percent to other factors. German scientists say that 50% is the share of fertilizers, French scientists say 50-70%, and Russian scientists say 50-60%.

4 Conclusion

The geological structure of the Kashkadarya basin is very complex, surrounded by the Zarafshan and Hissar ridges and has unique climatic features. The soil and climatic conditions of this basin and the culture of agriculture have a special character. Typical irrigated gray soils in the field experiment account for 36% of the irrigated soils in the Kashkadarya Basin. The studied irrigated typical gray soils consist mainly of medium sandy soils in the genetic layers, and heavy sandy mechanical soils in the lower 120-217 cm layers. In terms of mechanical fractions, large dust particles predominate. The fact that the 0-120 cm layers in which the main root system of crops develops consists of a medium sandy mechanical composition creates favorable water and nutrient regimes for their growth and development. In the driving layer of soils, humus is around 1.094%, total nitrogen is 0.080%, total phosphorus is 0.168%, total potassium is around 1.07%, mobile nitrogen, phosphorus and exchangeable potassium belong to low and moderately supplied groups.

Nitrate in the form of nitrate in the soils of the field experiments averaged 24.1 mg/kg in the driving layers of Option 1 before planting and 20.6 mg/kg at the end of the growing season. In option 2, where nitrogen was applied, the average $N-NO_3$ before planting was 23.9 mg/kg, while during the 2-3 leaf period it was 25.2 mg/kg, and in the later phases it decreased to 13.1 mg/kg when it reached the flowering period. This situation was also observed in other options. Under these soil conditions, a scientifically based nutrient environment is created for the variety by determining the nutrient requirements of the promising cotton variety "Porlok-4". This allows to get a quality and weighty harvest, fully demonstrating the potential of the variety.

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