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**THE EFFECT OF SIDERATE CROPS AND MINERAL FERTILIZER
RATES ON AGROCHEMICAL PROPERTIES OF SOIL**

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ABSTRACT

In this article, data is given on the effect of siderate crops and mineral fertilizer norms on the agrochemical properties of the soil, after siderate crops, high results were observed in the option where the rate of mineral fertilizers N-160, P₂O₅-80, K₂O-48 kg/ha applied, compared to the option where cotton was planted after cotton and the rate of mineral fertilizers N-160, P₂O₅-80, K₂O-48 kg/ha was used, the amount of humus in the soil in its tillage layer (0-30 cm) was 1,092%, the total nitrogen content was 0,100%, total phosphorus amount was 0,219%. These indicators were 0,087%, 0,019%, 0,021% higher than the control option without any

fertilizer, and 0,012%, 0,019%, 0,004% higher than the beginning of the praxis period.

Keywords: Soil, fertility, humus, nitrogen, phosphorus, potassium, manure, siderate crops, cotton.

INTRODUCTION

Regularly obtaining high yields from agricultural crops and increasing labor productivity depends on soil fertility and farming culture. Soil fertility is that a natural property provides a plant with the ability to maximally satisfy its demand for nutrients and soil moisture throughout the praxis period. The more fertile the soil, the plant gets the more nutrients and moisture. Ability of giving product will be high.

Soil fertility varies with farming culture. If agricultural culture is high, the soil fertility will be high, it is ensured the higher yield from crops. Careless treatment of the soil and the use of non-modern methods of farming lead to the destruction of soil fertility, the quantity and quality of the harvest from agricultural crops decreases [2].

In this context, nowadays, in order to preserve, restore and increase the fertility of the soil of our republic, it is important to add as much organic mass as possible to the soil and to have a correct approach to the application rates and norms of mineral fertilizers.

The level the problem have studied. According to data is taken from the research, agricultural crops absorb 60% of the manure applied to the field in the first year, 30% in the second year, and the remaining 10% in the third year. Also, 55% of the applied phosphorus fertilizers are absorbed in the first year, 30% in the second year, and 15% in the third year, while 70% of potassium fertilizers are absorbed in the first year and 30% in the second year, and all nitrogen fertilizers are absorbed in the first year [7].

Under the influence of various biochemical processes occurring in the soil, the remaining root residues from repeated and intermediate crops in short-rotation rotation systems turn into nutrients necessary for the plant, and have a positive effect on increasing the fertility of the soil, the yield of the next year's crops, and its quality indicators [5].

The organic residues left by agricultural crops in the soil over a certain period of time, under the influence of microorganisms, turn into different forms of nutritional substances and contribute to the maintenance of soil fertility. It was observed that humus has a great effect on maintaining soil productivity, it synthesizes the remaining organic residues in the soil and increases its amount [4, 6, 8].

Mineral fertilizers take the first place in feeding agricultural crops, if there is a lack of nitrogen element in the soil, the growth and development of the plant will slow down, the leaves will crumble and turn pale green. In this case, the stems are also thin, and forming of fruit slows down. When the plant is well supplied with nitrogen, the stems and leaves take on a dark green color, the formation of generative organs is improved, and as a result, the yield increases, moreover,

nitrogen is included in humus, which is the main source of soil fertility and high yield from crops. The optimal rates of nitrogen fertilizers depend on various factors, including phosphorus and potassium [7].

METHODS AND MATERIALS

Our research was carried out in the conditions of sierozem soils of the “Bakhmal AGRO” farm in Mirzachol district of Jizzakh region in the period of 2016-2018, and the effect of the use of mineral and organic fertilizers and the use of siderate crops on soil fertility was studied. In the experiment, the total area of each option is 480 m², of which the area to be taken into account is 240 m². Studies were conducted in 4 repetitions, and the variants (13) were in schematical method and arranged in one tier.

The amount of humus in the soil - by the method of I.V.Tyurin (The method is based on the oxidation of carbon in a solution of chromic anhydride and sulfuric acid titration, or the used chromic anhydride salt (Mora), total NPK in one soil sample according to I.M. Malseva, L.P.Grisenko, nitrogen nitrate (N-NO₃) – by ionoselective method, mobile phosphorus (P₂O₅)–according to B.P.Machigin (on carbonate soils, phosphates are released with 1% ammonium carbonate at 18-20 hour infusion of the suspension and the ratio of the soil to the solution is 1:20), exchangeable potassium (K₂₀) – by the method of P.V.Pratasov (in carbonate soils of cotton areas, exchangeable potassium is displaced by ammonium carbonate), chlorine-ion – in Mor’s method (determination consists in titration of chlorides with

a solution of silver nitrate in the presence of a 10% solution of medium potassium chromic acid as an indicator), dry residue, sulfate anion – determined by method of weighing [1, 3].

In field experiments, nitrogen (N) -160, 200, 240 from mineral fertilizers; phosphorus (P_2O_5) – 112, 140, 168 and potassium (K_2O) – 80, 100, 120 kg/ha of mineral fertilizers, manure (KPS) – 10, 20 t/ha, and as an intermediate crop (for siderate) rapeseed, perco crops was tried. In the experiment, 60% of the annual rate of phosphorus fertilizers, 50% of potassium and 100% of manure were applied under the plow, and phosphorus and potassium together with the remaining 40% and 50% of nitrogen fertilizers were applied to the cotton between the furrows (at the time of 2-4 leaf emergence and during budding periods). As an intermediate crop (for siderat) rapeseed and perko (Chinese cabbage) crops were planted in the decades of September at the rate of 8-10 kg per hectare to a depth of 2-3 cm, and in the third decades of March, all the blue mass was crushed with KIR - 1.5, it was plowed to a depth of 28-32 cm.

RESULTS AND DISCUSSION

According to the data obtained at the end of the research period of 2018, in control option 1, where fertilizer was not applied, the amount of humus in the 0-30 and 30-50 cm layers of the soil was proportionally 1,005 and 0,664%, nitrogen 0,081-0,048%, phosphorus 0,198-0,128%. It was found that it decreased by 0,075-0,037%, 0,017-0,008%, 0,017-0,008% from the initial indicator. In the Option 4, where the

rate of mineral fertilizers N-160, P₂O₅-112, K₂O-80 kg/ha was applied in the ratio of 1,0:0,7:0,5, humus was found to be 0,070-0,032% relative to the soil layers. It was found that total nitrogen decreased by 0,007-0,004%, phosphorus by 0,006-0,017%. In this regard, in option 3, where mineral fertilizers N-200, P₂O₅-140, K₂O-100 kg/ha were used in cotton, the amount of humus in the tillage (0-30 cm) layer of the soil decreased by 0,040%, nitrogen by 0,006%, phosphorus by 0,004% was determined.

It was observed that increasing the rate of mineral fertilizers (option 3) does not increase the amount of humus in the soil, but has an acceptable effect on the amount of nutrients. In this regard, increasing the rate of mineral fertilizers to N-240, P₂O₅-168, K₂O-120 kg/kg did not give satisfactory results.

As a result of the use of mineral fertilizers in the ratio of 1,0:0,7:0,5 N-160, P₂O₅-112, K₂O-80 kg/ha + 10 t/ha manure in the 6th option, the amount of humus was 1,094-0,753% according to the soil layers, nitrogen was 0,101-0,068%, phosphorus was 0,221-0,151%, and it was found that it increased by 0,014-0,052%, nitrogen by 0,003-0,012%, and phosphorus by 0,006-0,015%.

An increase in the amount of humus important for productivity by 0,014% in the driving layer indicates that the applied fertilizer had an optimal effect. However, better data compared to this manure rate were obtained in option 7, where 20 t/ha of manure was used as an addition to mineral fertilizers in cotton, and proportional amounts of humus were 1,111-0,770%, nitrogen 0,104-0,071, phosphorus 0,225-0,155%. On the background of these proportions and norms of mineral fertilizers, the indicators of the parallel variant 5 were found to be close to the application of 20

t/ha of manure and were 0,025-0,063%, 0,004-0,013%, 0,008-0,017% higher than the control. From this situation, in addition to the norm of mineral fertilizers in cotton, the use of rapeseed and perko crops as manure or siderate in addition to the norm of mineral fertilizers showed that it is acceptable compared to the use of mineral fertilizers of N-240, P₂O₅-168, K₂O-120 kg/ha.

If manure or siderates are not used in cotton, it is acceptable to use mineral fertilizers in the rate of 1,0:0,7:0,5, N-200, P₂O₅-140, K₂O-100 kg/ha.

In cotton, the rate of mineral fertilizers in the rate of 1:0,5:0,3, N-160, P₂O₅-80, K₂O-48 kg/ha was applied. In the option10, the amount of humus in the 0-30 and 30-50 cm layers of the soil was 1,006-0,665%, nitrogen was 0,089-0,051%, phosphorus was 0,200-0,110%, it is higher by 0,001-0,001%, 0,008-0,003%, 0,002-0,002% compared to option 1 (control), in this rate, additional 20 t/kg of manure was applied to compared of option 13, it was found to be higher by 0,093-0,093, 0,013-0,018, 0,021-0,038%, respectively. Therefore, the effect of 20 t/ha of fertilizer applied in this rate was clearly demonstrated in cotton.

It should be noted that the norms of mineral fertilizers N-200, P₂O₅-100, K₂O-60 kg/ha and N-240, P₂O₅-120, K₂O-72 kg/ha were applied to cotton in the 8 and 9 options where used rate of 1,0:0,5:0,3 did not increase or improve soil fertility.

The rate of N-160, P₂O₅-80, K₂O-48 kg/ha of mineral fertilizers in cotton also recorded a high result in the 11th option, where siderates were used, and the rate of N-160, P₂O₅-80, K₂O-48 kg/ha of mineral fertilizers was used in cotton. Higher scores were obtained compared to the variant 10. These indicators were 0,087-

0,087%, 0,019-0,019%, 0,021-0,020% higher than the control option 1, and 0,012-0,050%, 0,019-0,011%, 0,004-0,013% higher compared to the beginning of praxis period.

So, in the system of planting cotton after cotton in sierozem soils that are becoming grassy, in order to maintain and relatively increase soil fertility, mineral fertilizers are applied to cotton in the rate of 1,0:0,7:0,5: N-160, P₂O₅-112, K₂O-80 kg/ha + 20 t. It was found that it is acceptable to apply manure to plant rapeseed and perco as a siderate as an intercrop.

It should be noted that the soil of the experimental field is a sierozem, semi-hydromorphic soil that is becoming grassy due to the location of underground water, and it has been scientifically determined that it causes the change of nutrients in the soil layers.

The amount of mobile forms of nutrients in the soil changes every year, depending on the applied agrotechnical measures and mineral fertilizers. In the researches, in addition to different norms and rates of mineral fertilizers, 10 and 20 t/ha of manure and the use of intermediate crops as a siderate were observed on the change of nutrients.

According to the data obtained at the end of the period of cotton in the experiment, the amount of nitrate nitrogen in the 0-30 and 30-50 cm layers of the soil in the control option 1, where fertilizer was not applied was 14,2 and 8,0 mg/kg, respectively. Mobile phosphorus was 18,5-10,2 mg/kg, exchangeable potassium was

270-198 mg/kg, respectively. We found a decrease 2,1-1,1 mg/kg, 3.1-1.5 mg/kg, and 23,0-12,0 mg/kg from initial parameters, respectively.

In cotton, the rate of mineral fertilizers N-160, P₂O₅-112, K₂O-80 kg/ha was used in the rate of 1,0:0,7:0,5, and in the 4th option, nitrate nitrogen was 1,1-0,5 mg/kg relative to the soil layers. It was found that mobile phosphorus decreased by 1,8-0,8 mg/kg, exchangeable potassium by 8,0-9,0 mg/kg. In this rate, mineral fertilizers N-200, P₂O₅-140, K₂O-100 kg/ha were applied in the 3rd option, nitrate nitrogen 0,5 mg/kg, mobile phosphorus 0,9 mg/kg decreased from the initial indicator in the tillage (0-30 cm) layer of the soil, and exchangeable potassium increased by 6,0 mg/kg.

It was observed that with an increase in the rate of mineral fertilizers (option 3) like the mobile forms of nutrients in the soil, as well as the general forms, had an acceptable effect. In this regard, the increase of mineral fertilizers N-240, P₂O₅-168, K₂O-120 kg/ha did not give satisfactory results.

As a result of the use of mineral fertilizers in the rate of 1,0:0,7:0,5 N-160, P₂O₅-112, K₂O-80 kg/ha + 10 t/ha of manure in cotton, the amount of nitrate nitrogen in the 6th option was 16,9-10,7 mg/kg, mobile phosphorus was 21,9-13,6 mg/kg, exchangeable potassium was 295,0-223,0 mg/kg, proportionally 0,6-0,16 mg/kg compared to the beginning of the praxis period, mobile phosphorus increased by 0,3-1,9 mg/kg, exchangeable potassium was by 2,0-13,0 mg/kg.

Better data compared to this manure rate was obtained in option 7, where manure was applied at the rate of 20 t/ha as an addition to mineral fertilizers in cotton, and

proportionally, the amount of nitrate nitrogen was 18,0-11,8 mg/kg, mobile phosphorus was 22,8-14,5 mg/kg, exchangeable potassium was equal to 298,0-226,0 mg/kg.

On the background of these proportions and norms of mineral fertilizers, the indicators of the 5th variant, which used siderates in parallel, were close to those of 20 t/ha of manure, 0,8-1,8 mg/kg, 0,8-2,2 mg/kg, 3,0-14,0 mg/kg was found to be higher. From this situation, in addition to the norm of mineral fertilizers in cotton, the use of rapeseed and perco crops as manure or siderate in addition to the norm of mineral fertilizers in increasing soil fertility was optimal compared to the use of mineral fertilizers in the norm of N-240, P₂O₅-168, K₂O-120 kg/ha.

Table 1

Effect of feeding cotton with different rates and proportions of mineral fertilizers, application of organic fertilizers and use of intercropping on soil nutrient content (2018)

Norms of mineral fertilizers, kg/ha			The proportion of mineral fertilizers, N: P: K	Manure, t/ha	The total form of nutrients, %						Mobile form of nutrients			
N	P ₂ O ₅	K ₂ O			Humus		nitrogen		phosphorus		N-NO ₃		P ₂ O ₅	
					0-30	30-50	0-30	30-50	0-30	30-50	0-30	30-50	0-30	30-50
At the beginning of the praxis period														
					1,080	0,701	0,098	0,056	0,215	0,136	16,3	9,1	21,6	1,0
At the end of the praxis period														

Control (without fertilizer)			-	-	1,005	0,664	0,081	0,048	0,198	0,128	14,2	8,0	18,5	10
140	168	120	1:0,7:0,5		1,058	0,717	0,096	0,063	0,214	0,144	16,1	9,9	21,4	10
100	140	100	1:0,7:0,5		1,040	0,699	0,092	0,059	0,211	0,141	15,8	9,6	20,7	10
60	112	80	1:0,7:0,5		1,010	0,669	0,091	0,052	0,209	0,119	15,2	8,6	19,8	10
60	112	80	1:0,7:0,5	siderate	1,105	0,764	0,102	0,069	0,223	0,153	17,1	10,9	22,2	10
60	112	80	1:0,7:0,5	10	1,094	0,753	0,101	0,068	0,221	0,151	16,9	10,7	21,9	10
60	112	80	1:0,7:0,5	20	1,111	0,770	0,104	0,071	0,225	0,155	18,0	11,8	22,8	10
140	120	72	1:0,5:0,3		1,032	0,691	0,095	0,062	0,209	0,139	16,0	9,8	21,0	10
100	100	60	1:0,5:0,3		1,020	0,679	0,090	0,057	0,204	0,134	15,4	9,2	20,8	10
60	80	48	1:0,5:0,3		1,006	0,665	0,089	0,051	0,200	0,110	14,5	8,3	19,0	10
60	80	48	1:0,5:0,3	siderate	1,092	0,751	0,100	0,067	0,219	0,149	16,8	10,6	22,0	10
60	80	48	1:0,5:0,3	10	1,087	0,746	0,099	0,066	0,218	0,148	16,7	10,5	21,8	10
60	80	48	1:0,5:0,3	20	1,099	0,758	0,102	0,069	0,221	0,151	17,0	10,8	22,6	10

N-160, P₂O₅-80, K₂O-48 kg/ha was used in cotton, the norm of mineral fertilizers in the rate of 1,0:0,5:0,3. In option 10, the amount of nitrate nitrogen in the 0-30 and 30-50 cm layers of the soil was 14,5- 8,3 mg/kg, mobile phosphorus was 19.0-10,2 mg/kg, exchangeable potassium was 280,0-195,0 mg/kg, it was 0,3-0,3 mg/kg, 0,5-0,0 mg/kg, 10,0 mg/kg higher compared to option 1 (control), and compared to the 13th option, where an additional 20 t/ha of manure was used in this rate 2,5-1,6, 3,6-3,1, 17,0-30,0 mg/kg was found to be less in the analysis. Therefore, it was

determined that the effect of 20 t/ha of additional applied fertilizer was effective in cotton.

High results were also recorded in option 11, where mineral fertilizers was used N-160, P₂O₅-80, K₂O-48 kg/ha and siderates were used in cotton, the amount of nitrate nitrogen was 16,8-10,6 mg/kg, mobile phosphorus was 22,0- 13,7 mg/kg, exchangeable potassium was 295,0-223,0 mg/kg. Similar data were obtained in the 2016 and 2017 years of the study.

CONCLUSION

Based on the data given above, it can be concluded that in order to maintain and increase soil fertility in the conditions of sierozem soils of the Jizzakh region, regardless of the proportions N-160, P₂O₅-112, K₂O-80 kg/ha or N-160, P₂O₅ -80, K₂O-48 kg/ha norms + 10-20 t/ha manure application or mixed planting of rapeseed and perko as an intermediate crop, it is acceptable to plow the land as a siderate.

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