INFLUENCE OF WINTER WHEATAND REPEATED OILSEEDS IN COTTON CROP ROTATION ON THE AGROPHYSICAL PROPERTIES OF THE SOIL OF SURKHANDARYA REGION

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Annotation: As a result of agricultural science, it is established that the intensity of plant development and the height of the crop largely depends on the physical properties of the soil. In recent years, the agricultural literature has increasingly focused on studying the physical properties of soil. With the growth of chemicalization, land reclamation and mechanization, the agrophysical state of the soil becomes one of the most important factors determining the level of yield. The physical properties of the soil are especially insignificant in the conditions of irrigated agriculture. High effective soil fertility is largely created by the favorable addition of the soil layer, which determines its physical properties. The main physical properties of the soil include its specific and volumetric mass, porosity, structure, which determine the water-air and thermal properties of the soil, the activity of microbiological processes, and the nutritional conditions of cultivated plants.

The research is aimed at studying the soil fertility in monoculture of cotton and in various schemes of cotton crop rotations.

Cpossessionhumus in the soil B.The determination of the nitrate form of nitrogen in these soils was carried out by the well-known Grandwald-Liege method, which can be used to most simply and accurately determine the amount of nitrate nitrogen in the soil. Determination of the total nitrogen content in the soil was determined by the method of J.Kjeldahl, determination of mobile mineral forms of phosphorus and potassium was determined by the Machigin method.

Theexperimental data were processed according , using the computer program.

Agrophysical, agrochemical and microbiological properties of the soil were determined by the Soyuznikha Institute method.

Soil volume mass, humidity, and water permeability were determined by the Soyuznikha Institute method.

Repeated, intermediate and green manure crops in the cotton crop rotation enrich the soil with organic substances and contribute to improving the agrophysical and agrochemical properties of the soil and reducing weed infestation by 1.9-2.0 times, and the incidence of cotton wilt by 1.8-2.0 times, increasing the yield of cotton by 4.5-5.5 c / ha, reducing the volume mass by 0.08-0.09 g/, and an increase in humus by 0.09-0.12%

compared to the control. The main novelty of the work is the first study of changes in soil fertility in the southern desert zone on takyrov-like low-humus soils in the south of Uzbekistan. In conclusion, it can be noted that annual and long-term predecessors in the cotton crop rotation and sowing of repeated, intermediate crops have a positive effect on the agrophysical properties of the soil in comparison with a monoculture without cotton fertilizers and only mineral fertilizers.

Keywords. Microaggregate composition of the soil, winter wheat, soy, sesame, safflower, sunflower, ground pear (peanuts), humidity, volume weight, water permeability, etc.

Introduction

The Government of the Republic of Uzbekistan pays great attention to the further development of agriculture, especially the development of cotton growing in the country.

The main crops in the republic are winter wheat, cotton and others.

The main novelty of the work is the first study of changes in soil fertility in the southern desert zone on takyrov-like low-humus soils in the south of Uzbekistan.

Domestic and foreign scientists have studied the impact of agrophysical and agrochemical properties of soil on the growth, development and yield of agricultural crops.

M. Tadjiev, K. M. Tadjiev, M. Tadjiev, K. M. Tadjiev [14, 15, 18, 19, 20, 21] It is noted that repeated oilseeds improved the agrophysical and agrochemical properties of the soil in comparison with the control variants.

With an increase or decrease in density compared to the optimum, the yield decreases, and with significant compaction, it drops sharply. With excessive compaction of the soil, there is a lack of oxygen and an excess of carbon dioxide, which reduces the biological activity of the soil and violates the optimal living conditions of plants [5].

The activity of microorganisms is the main factor in the decomposition of organic matter in the soil. The intensity of this process is often characterized by the rapid release of CO_2 from the soil. The maximum amount of CO_2 from the soil is released in the variants treated with chisel, the minimum amount is released in the variants with fine processing, and plowing provides a high level of biological activity both on the upper (0-10 cm) and lower (10-20 cm) soil layers, and in the shallow case only on the upper layer [16].

Cprotection of potential fertility is largely dependent on the humus content, as it contains the main reserves of nitrogen and phosphorus in the soil. One of the factors for restoring humus reserves is soil cultivation [9]. The most promising system of basic processing, from the point of view of conservation and accumulation of humus, is combined processing based on alternating plowing and loosening with a plow, the humus content of which increases in the arable layer of dark gray forest soils by 0.38 %. These technologies are effective in ensuring the necessary parameters of soil crumbling quality [13].

Tillage plays an important role in regulating the water regime of the soil. Fine mulching treatment contributes to better moisture supply of plant seeds and subsequently throughout the entire growing season of crops, since it causes a greater accumulation of productive moisture than during plowing [2].

New tillage has a significant impact on the indicators of soil fertility, which determines the yield of crops and the quality of agricultural products [7]

According to the data of Gulalyev Ch. G. and others [3], it was revealed that with prolonged use of soils under cotton, the physical and chemical properties of soils significantly deteriorate. After three years of use of soils under cotton, the humus content decreases by about 20%, water-resistant aggregates by 40%, soil water permeability triples, soil density increases by 7%, and therefore the yield of agricultural crops decreases significantly.

When applying 30 t/ha of manure to the soil with a background, the norms of industrial nitrogen fertilizers can be reduced from 200-250 to 70-140 kg/ha, that is, by 2-3 times. At the same time, soil fertility improves and the yield of marketable products does not decrease [1].

Materials and methods

Purpose of the study. Study of soil fertility in cotton monoculture and in various schemes of cotton crop rotations in comparison with monoculture options.

To achieve the goal of the study, the following tasks were set:

- determine the growth, development, grain yield, accumulation of root and crop residues of winter wheat;

- identify the content of humus, total nitrogen, total phosphorus, and exchangeable potassium in cotton monoculture and cotton crop rotation.

- determine the growth, development, density of standing, the incidence of wilt cotton, the number of weeds, the yield of raw cotton in conditions of intensive cotton crop rotation.

Methods of research and observation. Methods of research and observation. Methods of research with cotton [10], Methods of conducting field testing [11], and Methods of conducting research of the State variety testing of agricultural varieties [12] and methods of field testing by B. A. Dospekhov [4].

Our research was in 2012-2013 and 2018-2020 at the experimental experimental site at the Surkhandarya experimental station of the Research Institute of Seed Breeding and Agricultural Technology of Cotton Cultivation (NIISSAVH) of the Termez district of the Surkhandarya region of the Republic of Uzbekistan. The soils of (2-3 meters).

The soil is poor in humus and other nutrients, and rich in carbonates (8-10%). Two experiments were conducted on this topic. In the first experiment, the influence of various agricultural zones on the microaggregate composition of the soil was studied in a long-term experiment. Studies crop rotation showed that the aggregate composition of the soil microstructure changes significantly depending on the background of fertility, the content of organic matter in the soil. Water-resistant aggregates larger than 0.25 mm are least contained in the soil with a permanent crop without fertilization of 21.8%, with an annual application of manure of 32.4%. On the crop rotation plot (alfalfa layer) 35.2%.

An increase in the number of water-resistant aggregates in variants with annual manure application and in a crop rotation plot contributed to the creation of a more favorable loose soil composition in the arable layer. In our long-term experience, conducted since 1960 in the fields of the experimental station, the aggregate composition of the soil was determined in the spring and autumn of 2012-2013 (Table 1).

Research results

Our research has established that particles larger than 0.25 mm in size were most often observed on crop rotation options and where 10 t/ha of manure was applied annually in combination with mineral fertilizers. In the 40-60 cm layer, particles larger than 0.25 mm were smaller thaninarable soil layer. The size of the soil fraction 0.25-0.1 mm in almost all variants was the same, fraction 0.1-0.05 mm on average, depending on the variants, was from 10.4 to 15.7%.

The largest fraction was the 0.05-0.01 mm fraction, which ranged from 39.7% to 52.4% depending on the studied variants. The 0.01-0.005 mm fraction averaged from 9.8 to 20.4%, and the same number of 0.05-0.001 mm fractions were present. The smallest number of particles was 0.005-0.001 mm in size. The smallest number of particles less than 0.001 mm in size was 0.5 to 3.7%. By the end of the cotton growing season, after multiple row-to-row treatments and vegetation irrigation, the number of water-resistant aggregates larger than 0.25 mm in all variants and soil layers decreased. However, after alfalfa and where organomineral fertilizers were used, the number of water-resistant aggregates larger than 0.25 mm was higher than in the cotton monoculture.

In irrigated agriculture, particles of 0.25-0.1; 0,1-0,05 mm and. It is characteristic that by the end of the cotton growing season, the number of small particles less than 0.001 mm in size increased in all the studied experimental variants.

Similar data were obtained for the micro aggregate composition of the soil in 2013.

Long-term research has established that cotton-alfalfa crop rotations and the introduction of organ mineral fertilizers have a positive effect on the microstructure of the soil.

In another experiment on the influence of winter wheat and repeated oilseeds on the agrophysical properties of (Table 2-3). Research results have shown that crops have different effects on soil moisture, volume mass, and water permeability.

Based on long-term studies, it can be concluded that the cultivation of winter wheat and repeated crops in a short-rotation crop rotation positively affects the agrophysical properties of takyrov-like soils.

The agrophysical properties of the soil strongly influence the emergence of friendly crops, RNA, development, yield of raw cotton, the quality of the harvest of raw cotton and cotton seeds.

For grain crops on southern chernozems, the equilibrium soil density in the arable layer does not exceed 1.22, for corn — 1.16 g per m^3 [8].

The main reasons for the decrease in yield on compacted soil are a decrease in the amount of productive moisture, a violation of the exchange of soil and atmospheric air, which makes it difficult for roots to breathe and absorb nutrients [6].

The best development of cotton in the highest yield was obtained with a volume mass of soil equal to 1.1-1.3 g /sm^3 . The volume weight of the soil equal to 1.5 g /sm^3 caused a decrease in yield by 73.3%, 1.6 g /sm^3 by 87.2%. The scientists conclusions are fully confirmed by our long-term research in the south of Uzbekistan.

Table-1

Influence of different crop rotation schemes and fertilizers on the microaggregate composition of the soil, %

(Source: compiled by the authors, M.Tadjiev, K.M. Tadjiev)

№	Варианты	Слой почвы, см	Содержание фракции, %						
			0,25 мм	0,25-0,1 мм	0,1-0,05 мм	0,05-0,01 мм	0,01-0,005 мм	0,005-0,001 мм	0,001 мм
1	Хлопчатник без удобрений	0-40	5,9	2,9	12,1	48,2	17,9	12,5	0,5
		40-60	5,7	3,4	15,7	48,7	12,2	16,0	0,3
2	Хлопчатник + NPK	0-40	6,3	2,6	10,4	50,0	12,4	16,7	1,5
		40-60	5,8	2,3	11,7	52,4	15,6	8,2	1,0
3	Хлопчатник + NPK +10 т/га навоз	0-40	7,4	3,0	12,2	45,0	15,7	15,0	1,6
		40-60	5,8	2,4	14,1	40,0	20,4	15,9	0,5
4	Хлопчатник севообороте 2:8	0-40	7,8	2,7	10,8	42,8	10,8	16,3	3,5
		40-60	6,7	2,3	12,9	39,7	12,9	204	3,6
5	Хлопчатник в севообороте 3:6	0-40	7,6	2,7	12,7	44,5	12,7	16,0	3,7
		40-60	6,7	2,4	13,7	44,6	13,9	17,4	1,3
	Осень 2012 г.								
1	Хлопчатник без удобрений	0-40	3,0	3,0	14,0	47,2	16,8	12,0	7,0
		40-60	2,7	3,0	13,7	47,7	12,0	15,0	6,9
2	Хлопчатник + NPK	0-40	4,8	2,5	10,6	49,0	12,0	15,7	6,4
		40-60	3,8	2,3	10,7	50,0	14,0	10,2	5,4
3	Хлопчатник + NPK +10 т/га навоз	0-40	5,5	3,1	12,0	46,0	14,7	14,0	5,6
		40-60	4,8	2,4	13,1	41,0	16,4	15,5	6,9
4	Хлопчатник севообороте 2:8	0-40	6,5	2,7	11,8	41,3	15,3	15,0	6,6
		40-60	4,6	2,3	11,9	39,0	18,4	15,0	6,3
5	Хлопчатник в севообороте 3:6	0-40	5,6	2,7	12,7	45,6	13,9	15,0	4,4
		40-60	5,7	2,2	13,0	45,0	13,0	16,5	4,6

Table-2
Influence of winter wheatandrepeated oilseeds on the agrophysical properties of the soil (2019 data Experience-1)
(Source: compiled by the authors, M.Tadjiev, K.M. Tadjiev)

№	Variants	Before sowing (March)				At the end of the growing season (September)				Water permeability, m^3/ ha	
		Humidity, %		Volume weight g /sm^3		Humidity, %		Volume weight g /sm^3		In 6 hours	
		0-30 sm	30-50 sm	0-30 sm	30-50 sm	0-30 sm	30-50 sm	0-30 sm	30-50 sm	march	september
1	Cotton (control)	13,5	16,2	1,26	1,31	14,3	15,8	1,30	1,41	510	370
2	Cotton after winter wheat (control)	13,6	16,3	1,26	1,30	14,6	16,0	1,29	1,40	520	372
3	Cotton after winter wheat +soybeans	13,9	16,7	1,27	1,30	14,7	16,4	1,28	1,38	550	380
4	Cotton after winter wheat + sunflower	14,0	16,6	1,27	1,30	14,6	16,4	1,29	1,39	540	370
5	Cotton after winter wheat + sesame	14,2	16,7	1,27	1,31	14,7	16,4	1,29	1,38	540	372
6	Cotton after winter wheat + peanuts	14,2	16,9	1,28	1,30	14,7	16,5	1,28	1,37	560	410
7	Cotton after winter wheat + safflower	14,4	16,8	1,26	1,31	14,6	16,3	1,29	1,38	540	401

Table-3
Influence of winter wheatandrepeated oilseeds on the agrophysical properties of the soil
(data for 2020 Experience-1) (Source: compiled by the authors, M.Tadjiev, K.M.Tadjiev)

№	Variants	Before sowing (March)				At the end of the growing season (September)				Water permeability, m^3/ ha	
		Humidity, %		Volume weight g /sm^3		Humidity, %		Volume weight g/m^3		Humidity, %	
		0-30 sm	30-50 sm	0-30 sm	30-50 sm	0-30 sm	30-50 sm	0-30 sm	30-50 sm	0-30 sm	30-50 sm
1	Cotton (control)	13,7	16,3	1,26	1,31	14,5	16,0	1,31	1,41	520	360
2	Cotton after winter wheat (control)	13,6	16,4	1,26	1,30	14,6	16,2	1,30	1,40	530	380
3	Cotton after winter wheat +soybeans	13,9	16,5	1,25	1,30	14,9	16,5	1,29	1,38	540	390
4	Cotton after winter wheat + sunflower	14,0	16,7	1,28	1,30	14,7	16,4	1,30	1,39	540	380
5	Cotton after winter wheat + sesame	14,2	16,8	1,28	1,32	14,7	16,3	1,30	1,38	545	390
6	Cotton after winter wheat + peanuts	14,4	16,9	1,26	1,30	14,8	16,5	1,29	1,38	550	390
7	Cotton after winter wheat + safflower	14,3	16,7	1,27	1,31	14,6	16,4	1,29	1,29	540	380

Table-4
Influence of winter wheatandrepeated oilseeds on the agrophysical properties of the soil
(data for 2020 Experience-2) (Source: compiled by the authors, M.Tadjiev, K.M. Tadjiev)

№	Variants	Before sowing (March)				At the end of the growing season (September)				Water permeability, m^3/ ha	
		Humidity, %		Volume weight g /sm^3		Humidity, %		Volume weight g /sm^3		Humidity, %	
		0-30 sm	30-50 sm	0-30 sm		0-30 sm	30-50 sm	0-30 sm	30-50 sm	0-30 sm	30-50 sm
1	Cotton (control)	12,1	13,5	1,28	1,33	15,2	17,9	1,39	1,49	524,5	350,5
2	Cotton after winter wheat (control)	12,3	14,5	1,27	1,32	15,9	17,5	1,39	1,43	604,4	368,0
3	Cotton after winter wheat +soybeans	12,6	14,9	1,25	1,32	15,9	18,9	1,30	1,41	649,0	407,0
4	Cotton after winter wheat + sunflower	12,7	14,6	1,26	1,33	15,2	17,6	1,32	1,43	636,0	361,7
5	Cotton after winter wheat + sesame	12,3	14,5	1,26	1,30	15,6	17,9	1,32	1,42	630,1	375,0
6	Cotton after winter wheat + peanuts	12,8	14,8	1,25	1,30	15,8	18,5	1,30	1,42	650,0	415,0
7	Cotton after winter wheat + safflower	12,4	14,3	1,26	1,34	15,6	17,7	1,32	1,43	620,0	364,0

Our research, carried out in a long-term experience, which showed that winter wheat and repeated crops, as precursors, have a positive effect on reducing soil density when cultivating a subsequent cotton crop (2-Table).

Soil moisture before sowing in the 0-30 cm layer was 13.5-14.4%, and in the 30-50 cm horizon 16.2-16.9%, the lowest soil moisture was observed (13.5-16.4%) in the control (var. 1,2), and the highest humidity in the variants (var. 3; var.6), where the predecessors were winter wheat + soybeans, winter wheat + peanuts (var. 3 13.9-16.7; var.6 14.2-16.9%). volume mass of soils s before cotton sowing was 1.26-1.31 g/sm^3 in the 0-30 cm layerthe control variants (var. 1 - var.2) and in the arable layer 1.30-1.31 g/sm^3, and other experimental variants (1.30-1.32 g/sm^3).

Soil water permeability for 6 hours of determination in March on the control variants (510-530 m^3/ ha), and the highest soil water permeability (550-560 m^3/ha) was observed on the variants winter wheat + soy, winter wheat peanuts (var.3 and var.6).

At the end of the cotton growing season, soil moisture in the control variants (var. 1 and var.2) was 14.3-14.6%, in the arable layer and 15.8-16.2% in the sub-arable layer of the soil, the comparative high soil moisture was in the variants (var. 3 and var.6), where the predecessors were winter wheat + soybeans and winter wheat + peanuts 14.7-14.8%, soil volume weight in control variants (var. 1,2).

In the 0-30 cm layer, the soil volume mass s was (1.29-1.31 g / cm3), and in the sub-arable layer (30-50 cm), 1.40-1.41 g/cm3, on variants (var.3-6). Where the predecessors were winter wheat + soy, winter wheat + peanuts 1.38-1.37 g / cm3.

Soil water permeability at the end of the cotton growing season in all studied variants in comparison with the spring ones, a decrease in the indicator was observed. At the end of the cotton growing season, the volume mass of the soil in all studied variants in comparison with the spring definitions was observed to increase slightly. This indicator is explained by repeated watering and inter-row tillage during the growing season of cotton. At the end of the cotton growing season, the positive effect of the precursor on the agrophysical properties of the soil (humidity, volume mass and water permeability of the soil) is also preserved.

The positive effect of the precursors on the agrophysical properties of the soil in subsequent years is fully confirmed in Tables 3-4.

Discussion

M.Tadjiev, K.M.Tadjiev, M.Tadjiev, K.M.Tadjiev [14, 15, 18, 19, 20, 21] experiments were conducted on takyrovid soils, and it was noted that winter wheat and repeated oilseeds contributed to the agrophysical and agrochemical properties of the soil in comparison with the control variants. N.A.Maksyutov [8] grain crops on chernozems, the soil density in the arable layer does not exceed 1.22, for corn — 1.16 g per g the main reasons for the decrease in yield on compacted soil are a decrease in the amount of productive moisture, makes it difficult for the roots to breathe and absorb nutrients. A.I.Titovskaya [16], the activity of microorganisms is the main factor in the decomposition of organic matter in the soil N.P.Melikhova [9] believe that one of the factors for the restoration of humus reserves is soil treatment N.V.Perfilyev [13], I.A.Kolkova [7] believe that the most important factor in the restoration of humus reserves is soil treatment. a promising system of basic treatment, from the point of view of conservation and accumulation of humus, is combined treatment.

M.Tadjieva [14] note that sowing after the main crop of intermediate crops significantly improved the agrophysical properties of the soil in comparison with the control. Our research was conducted in the southern desert zone of the Republic and the soils in this part of the takyrovidny region, which are poor in humus and other nutrients and rich in carbonates (8-10%). To create favorable conditions for agricultural crops, it is necessary to master the cotton-alfalfa crop rotation and sowing after the main sowing, it is necessary to sow intermediate, repeated crops that significantly enrich takyrov-like soils

with root and crop residues and contribute to improving the agrophysical properties of the soil and increasing the yield of the main cotton crop.

Conclusion

Long-term studies have established that repeated, intermediate and green manure crops in the cotton crop rotation enrich the soil with organic substances and contribute to improving the agrophysical and agrochemical properties of the soil and reducing weed infestation by 1.9-2.0 times, and the incidence of cotton wilt by 1.8-2.0 times, increasing the yield of cotton by 0.45-0.55 kg/ha, reducing the volume by 0.08-0.09 g /sm^3, and an increase in humus by 0.09-0.12% compared to kontorl.

Prospects for further research in cotton crop rotations, it is necessary to include green manure and leguminous crops, which enrich low-humus soils with plant residues much faster, and contribute to improving the agrophysical and agrochemical properties of low-humus takyrov-like soils in our region.

In conclusion, it can be noted that annual and long-term predecessors in the cotton crop rotation and sowing of repeated and intermediate crops have a positive effect on the agrophysical properties of the soil in comparison with a monoculture without cotton fertilizers and only mineral fertilizers.

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