The Effect of Winter Wheat and Repeated Crops on Soil Fertility in the South Of Uzbekistan

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ANNOTATION

The article presents the data of a field laboratory experiment conducted in the south of Uzbekistan in 2017-2020. Before sowing, the soil moisture in the 0-30 cm layer averaged 13.6-14.3%, and in the under-arable layer 16.4-16.9% and the volume mass in the arable layer was 1.26-1.28 g/sm^3, and in the 30-50 sm layer 1.30-1.32 g/sm^3.

Soil moisture at the end of the growing season in the layer of 16.0-16.5% and the volume weight in the arable layer was 1.28-1.30 g/cm3 and in the under-arable layer 1.38-1.40 g/cm3. The water permeability of the soil before sowing oilseeds is 520-550 m3/ha, in the initial state of the soil, the humus content in the 0-30 cm layer was 0.669%, in the under-arable soil layer 0.597%, total nitrogen 0.054-0.059%, respectively, and gross phosphorus 0.124-0.100%. The general condition of nutrients after repeated (oilseed) crops, some increase in their content was observed.

The humus content in the arable soil layer was 0.663-0.785%, the total nitrogen content in the 0-30 cm soil layer was 0.663-0.785%, the total nitrogen content in the 0-30 cm soil layer was 0.088-0.080%, in the under arable 0.050-0.069%, and gross phosphorus respectively 0.130-0.139, and 0.124-0.127 The % content of humus, total nitrogen and total phosphorus increased more after the culture of soybeans, peanuts and sunflower, and a relatively low content was noted in the control (var. 1, 2) variants.

Key words: winter wheat, soybeans, peanuts, sunflower, cotton, growth, development and yield of raw cotton, repeated sowing,humidity, bulk weight, water permeability, humus, total nitrogen and total phosphorus, nitrate, mobile phosphorus and exchangeable potassium

The Government of the Republic of Uzbekistan pays great attention to the further development of agriculture in the country. To solve the food security of the population, each hectare of irrigated arable land is used efficiently and yields 2-3 times the yield within one year. At the same time, special attention is paid to repeated crops-legumes, oilseeds, vegetables and fodder crops. Getting two or three crops on irrigation is an urgent problem in the south of Uzbekistan. Oilseeds with repeated sowing have not been sufficiently studied in the system of short-rotation crop rotation on soil fertility. Our research complements this problem in the cotton crop rotation system.

For this purpose, it is necessary to note the role of intensification of agricultural production aimed at the general rise of agricultural culture, extensive chemicalization, land reclamation, effective use of irrigated lands, improvement of breeding and seed production, development of cotton crop rotations [2,3,5,6,7].

Academician D.N.Pryanishnikov suggested to cotton-growing farms: “Unlimited single use of this technique, but to find a way to repeat it more often” in this regard, he argued that there is a question of whether even 100% of its saturation area is nitrogen-collecting [5.].

According to A.S.Kudrin [1], 80-160 t/ha of humus is preserved on gray-earth cultivated soils in the meter soil layer. K.M.Mirzazhonov, H.Makhsudov [3], K.M.Mirzazhonov, K.M.Yusupaliev [2] note that humus reserves in the Andijan viloyat in the soil layer of 0-60 cm, on the variant without fertilizers amounted to 58 t/ha, with the introduction of mineral fertilizers 67 t/ ha and on crop rotation options 74 t/ha.

Proper crop rotations are the most important component of agricultural production. They determine the direction and rational combination of various branches of production to ensure maximum output of the main crop of the fodder field at the lowest cost of labor and material resources [5, 6].

One of the most important elements of a proper farming system is the introduction of rational crop rotations in relation to each soil zone [2, 3].

B.Volger [10], a researcher at the Institute of Crop Production in Bonn, Germany, notes that intermediate crops in the arable soil layer leave 30-60 kg/ha of nitrogen and are the main precursor and retain the nutrient elements of washing into the lower soil layers and serve as feed for livestock.

According to Binder K. [9] in Germany, it is necessary to grow crops that accumulate organic residues more and improve the agrophysical properties of the soil [7, 8, 9].

According to A.F. Ustinovich [7], the best growth and development of cotton occurs at a volume mass of 1.1-1.2 g/sm^3.

Comprehensive development of all branches of agriculture is possible on the basis of increasing the culture of agriculture, through the use of a scientifically-based farming system in farms and clusters. This makes it possible to ensure the harmonious development of all branches of production, and above all cotton and animal husbandry. At the same time, the implementation of such measures as the rational use of irrigated lands, improvement of the structure of acreage and the use of the most rational crop rotation systems will be of great importance. To preserve and increase soil fertility, it is necessary to sow repeated (oilseed) crops after winter wheat in the fields of farms that contribute to the enrichment of the soil with organic matter (root, crop residues, leaves and stems, and others).

Research methods

Field experiments to study the effect of winter wheat, repeated (oilseed) crops on soil fertility were conducted using the method developed at the Uzbek Scientific Research Institute of Cotton Growing (1976), "Methods of conducting field experiments with cotton" (2007) and methods of "State variety testing of agricultural crops" (1981) were also used.

Field and laboratory studies were carried out in 2017-2020 in the experimental farm of the Surkhandarya Research and Experimental station NIISSAVH in the conditions of such low-humus and slightly saline soils. The soils of the experimental area are mechanically heavy loamy, with a close occurrence of groundwater (1.5-2.0 m) slightly saline, poorly provided with humus and other nutrients, rich in carbonates (8-10%). The experiment was carried out three times. The area of one plot is 240 m2, with a length of 33.3 m and a width of 7.2 m. The total occupied area of the experimental plot is 1.5 hectares.

Research results and discussion. The results of the research show that the winter wheat grain yield was 70.7 c/ha, root and crop residues in the 0.50 cm soil layer 43.5-45.6 c/ha, soybean, sunflower, sesame, ground pear (peanuts) and safflower yield 17.0-23.5 c/ha and plant residues of repeated crops 22.5-32.5 c/ha, for two harvests per hectare of winter wheat and repeated crops, plant residues in a layer of 0-50 cm of soil amounted to 75.0-79.8 c/ha.

Table-1

The influence of winter wheat and repeated oilseeds on the agrophysical properties of the soil

№	Name of the option	Before sowing				At the end of the growing season of crops				Soil water permeability м³/ha	
		humidity,%		volume weight, g/sm ³		humidity, %		bulk weight, г/см³		in 6 hours	
										before after-to you	at the end of the growing season
		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)	10,5	12,5	1,26	1,32	14,2	16,8	1,33	1,41	85,7	43,1
2	Winter wheat (control)	12,0	13,9	1,26	1,32	14,2	17,1	1,33	1,41	93,4	46,4
3	Winter wheat after harvesting soybean crops	13,0	14,5	1,24	1,31	14,5	17,4	1,29	1,40	107,5	48,7
4	Winter wheat after harvesting sunflower seeds	12,5	13,0	1,25	1,31	14,2	16,8	1,33	1,42	97,0	42,8
5	Winter wheat after harvesting sesame seeds	12,9	14,8	1,24	1,31	15,7	17,9	1,29	1,41	107,1	48,6
6	Winter wheat after harvesting peanuts	12,2	14,2	1,25	1,32	15,0	17,0	1,33	1,40	92,0	44,5
7	Winter wheat after harvesting safflower crops	12,0	15,3	1,24	1,32	15,5	17,7	1,29	1,41	106,8	54,2

Table-2

The effects of winter wheat and repeated (oilseed) crops on the agrochemical properties of the soil (2017y)

№	Name of the option	Soil layer, sm	Initial state the content of total nutrients, %			The general state of the nutrient content after repeated cultures, %		
			гумус	азот	фосфор	гумус	азот	Фосфор
1	Cotton (control)	0-30	0,669	0,059	0,124	0,663	0,058	0,130
		30-50	0,597	0,054	0,100	0,623	0,050	0,124
2	Winter wheat (control)	0-30	0,669	0,059	0,124	0,716	0,062	0,134
		30-50	0,597	0,054	0,100	0,646	0,054	0,127
3	Winter wheat after harvesting soybean crops	0-30	0,669	0,059	0,124	0,740	0,068	0,135
		30-50	0,597	0,054	0,100	0,705	0,058	0,125
4	Winter wheat after harvesting sunflower seeds	0-30	0,669	0,059	0,124	0,740	0,068	0,137
		30-50	0,597	0,054	0,100	0,667	0,060	0,125
5	Winter wheat after harvesting sesame seeds	0-30	0,669	0,059	0,124	0,762	0,068	0,137
		30-50	0,597	0,054	0,100	0,700	0,060	0,125
6	Winter wheat after harvesting peanuts	0-30	0,669	0,059	0,124	0,762	0,067	0,139
		30-50	0,597	0,054	0,100	0,700	0,060	0,120
7	Winter wheat after harvesting safflower crops	0-30	0,669	0,059	0,124	0,785	0,080	0,139
		30-50	0,597	0,054	0,100	0,700	0,069	0,123

Table-3

The influence of winter wheat and repeated (oilseed) crops on the agrochemical properties of the soil (2018y.)

№	Name of the option	Soil layer, cm	The general state of the nutrient content after repeated cultures, %			Content of mobile nutrients after repeated cultures, mg/kg		
			гумус	азот	фосфор	$N\text{-}NO_3$	P_2O_5	K_2O
1	Cotton (control)	0-30	0,693	0,054	0,130	2,925	13,8	125
		30-50	0,620	0,050	0,124	1,550	12,0	125
2	Winter wheat (control)	0-30	0,693	0,056	0,133	2,350	14,0	127
		30-50	0,622	0,050	0,120	2,550	12,5	125
3	Winter wheat after harvesting soybean crops	0-30	0,739	0,077	0,135	2,925	18,0	125
		30-50	0,705	0,058	0,125	2,300	15,2	125
4	Winter wheat after harvesting sunflower seeds	0-30	0,740	0,068	0,130	5,790	18,0	175
		30-50	0,660	0,060	0,125	4,96	19,1	125
5	Winter wheat after harvesting sesame seeds	0-30	0,762	0,067	0,139	9,01	15,8	100
		30-50	0,690	0,060	0,125	4,96	19,1	125
6	Winter wheat after harvesting peanuts	0-30	0,762	0,067	0,139	9,01	15,8	100
		30-50	0,700	0,062	0,120	2,54	15,0	100
7	Winter wheat after harvesting safflower crops	0-30	0,775	0,076	0,139	9,180	18,8	125
		30-50	0,760	0,069	0,125	2,36	13,5	125

The results of the studies are shown in Tables 1, 2, 3 which show that repeated crops have different effects on the agrophysical properties of the soil, especially on moisture, bulk mass and water permeability of the soil. After repeated crops, the agrophysical properties of the soil improved.

The results of agrochemical analyses of the soil after growing repeated crops show that repeated oilseeds when sown after winter wheat have a positive effect on the agrochemical properties of the soil (Table 2). After growing repeated crops, the content of humus, total nitrogen and total phosphorus showed some increases compared to the control variant.

Table 3 shows that repeated oilseeds leaving a large amount of organic residues in a layer of 0-50 cm of soil contributed to an increase in the total content and mobile nutrients in the soil.

For example, humus in a layer of 0-30 cm of soil was 0.667%, total nitrogen 0.054% and total phosphorus 0.136%, and after repeated soybean culture, respectively, humus 0.759%, total nitrogen 0.077% and total phosphorus 0.135% and mobile nutrients nitrate nitrogen 2.925 mg/kg and mobile phosphorus 18.0 mg/kg of soil.

In conclusion, it can be noted that repeated oilseeds contributed to the improvement of the agrophysical and agrochemical properties of the soil in comparison with the control variants. Which turned out to be the best precursors of the main cotton crop.

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