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Research Article

CHANGES IN THE AGROPHYSICAL PROPERTIES OF GRAY MEADOW SOILS OF THE SYRDARYA REGION UNDER THE INFLUENCE OF MINIMAL PROCESSING

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ABSTRACT

The soils distributed in the Mirzachol oasis are of varying degrees of salinity, therefore, desalination of the soils distributed in this area is important for obtaining a high yield from agricultural crops. Development of desalination methods is one of the most urgent issues. One of the methods of desalination is mulching and low tillage. In these methods, the salinization process slows down due to the reduction of moisture that evaporates from the surface of the soil through capillary channels through mulching and low tillage of soils with close seepage water, including gray-meadow soils.

KEYWORDS

Soil, option, minimum tillage, control, density, total porosity, water-resistant aggregates, wheat, cotton.

INTRODUCTION

Physical properties of soils are one of the factors determining soil fertility. The leading place is the soil density and the structural condition of the driving layer. The density of the soil layer determines the aggregate index, water-air ratio and heat exchange in the soil, the ratio of solids and voids, the amount of particles and their relationship to each other. The density of the soil layer depends on its quantitative composition, the ratio of aggregates of different sizes and granulometric composition. The density of the soil layer accurately represents the rate of human impact on the soil [3, 4].

Since recent years, technologies that restore soil fertility, reduce costs, have a slightly lower impact of anthropogenic factors, and use less soil processing technologies.

The transition to the system of low tillage was also emphasized in the declaration of the "First World Minimum Technology in Agriculture" congress held in Madrid on October 1-5, 2001 [1;2;7;8].

Low tillage (Mini-till) is one of the resource-saving technologies, which leads to the optimization of the agrophysical properties of the soil and the restoration of the structure, the improvement of the condition of water-resistant aggregates, the restoration of the natural fertility of the soil, ecological stabilization, and the increase of the qualitative and quantitative parameters of the soil [1 ;2;3;4;5;6;7;8;9;10].

The following types of low tillage are currently available in North American countries: mulch-till, strip-till, no-till, reduced tillage give (reduced-till) [1;2;7;8].

In the research conducted by R. Kurvontoev and A. Musurmanov, mulching (straw, cotton stalks, manure, sweet potato waste) and low tillage technology were introduced to increase the productivity of the irrigated soils of the Mirzachol oasis. As a result, in irrigated gray-meadow soils, mulching with organic residues (straw, cotton stalks, manure, sweet potato waste) and low-tillage technology, compared to the traditional method, yielded 3 more wheat per hectare ,1-10.4 quintals, 1.3-1.5 quintals of mash were obtained and increased profitability by 20.2-32.7%, 2.6-4.7 quintals of cotton per hectare an additional harvest was obtained and allowed to increase the yield by 18.0-25.9% and made it possible to develop a number of reasonable conclusions on the improvement of the soil fertility of the region [3;4;5;6;7].

The main interest in our research work is the density of its layer, and the effect of the change of density layers on its physical properties, especially in the case of low processing compared to normal processing. Compared to the traditional one, the density of the soil under the low-tillage technology planted in cotton was equal to the optimal density in the variants planted with cotton and wheat after planting in the plow layer (Table 1).

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Table 1.

Changes in density and total porosity of irrigated gray-meadow soils under the influence of low tillage

Variant	Layer depth, cm	At the beginning of vegetation		At the end of the vegetation	
		HO, g/sm^3	UG‘, %	HO, g/sm^3	UG‘, %
Cotton field					
Control	0-15	1,29	51	1,33	50
	15-30	1,38	48	1,39	48
	30-50	1,45	46	1,55	42
Undertreated	0-15	1,20	55	1,26	53
	15-30	1,32	50	1,36	49
	30-50	1,49	44	1,51	43
Wheat field					
Control	0-15	1,24	51	1,28	50
	15-30	1,43	46	1,46	45
	30-50	1,50	44	1,57	41
Undertreated	0-15	1,21	54	1,25	53
	15-30	1,40	47	1,45	46
	30-50	1,43	46	1,49	44

According to the experimental data on irrigated gray-meadow soils, the effect of low tillage in the first years of the growing season is not very visible, but it changes significantly in the following years (Table 1).

The density of the soil in all options is somewhat denser under the influence of hydromorphism, especially in some options it can be seen that the density of the subsoil layer is higher than the acceptable density (Table 1).

In the years of the experiment, in the control option planted with cotton at the beginning of the growing season, the density of the plowed layer was 1.29-1.38 g/cm3, and at the end of the growing season, this indicator was 1.33-1.39 g/cm3. It was found that it changed up to cm3, which means that it has become denser under the influence of agrotechnical measures. At the beginning of the growing season, the density of the plowed layer was 1.20-1.32 g/cm3, and at the end of the growing season, this indicator was 1.26-1.36 g/cm3. , where we can see the effect of undertreatment on the density, that is, in the undertreated variant, the density was observed to decrease by 0.3-0.7% (Table 1).

In our experiment, the total porosity of the soil is important, the obtained results show that the total porosity of the soil in irrigated gray-meadow soils changes depending on its density. In the plow layer of the cotton-planted control variant, it showed a change from 48 to 51% at the beginning of vegetation, and it was found to be 48-50% at the end of vegetation. Naturally, in all options, the upper layers have high porosity, especially in the less processed options, this indicator was high (Table 1).

In the control option planted with wheat, the density of the plowed layer at the beginning of the growing season was 1.24-1.43 g/cm3, and at the end of the growing season, this indicator was 1.28-1.46 g/cm3, with less treatment in the given option, at the beginning of the growing season, the density of the driving layer was 1.21-1.40 g/cm3, and at the end of the growing season, this indicator was 1.25-1.45 g/cm3, the above cotton the regularity in the planted variant was repeated, it was observed that it was 0.1-0.7% less in the less cultivated variant.

It was found that the total porosity in the driving layer of the control option planted with wheat was 46-52% at the beginning of the vegetation and 45-50% at the end of the vegetation. In the less treated variant, it was 47-54% at the beginning of vegetation and 46-53% at the end of vegetation. In terms of total porosity, the above pattern was repeated, i.e. less processed variants prevailed (Table 1).

The region of gray soils is characterized by its lack of water-resistant aggregates. The increase in the amount of water-resistant aggregates in the soil is significant as a result of many years of application of organic fertilizers and irrigation, especially when growing perennial grasses [3;4;5;6;7].

Scientists say that soil granularity and dustiness are the most important technological parameters in flour processing. The amount of the most valuable aggregates (10-0.25mm) in irrigated gray-meadow soils is 45-70% before planting. Tillage quality is best when soil moisture is 14-17%. Before planting and during the growing season, the amount of valuable agronomic aggregates changes significantly, under the influence of agrotechnical measures, especially in case of low tillage.

It was found that the amount of water-resistant aggregates with a size of 3-2 and 5-3 mm in irrigated gray-meadow soils changes under the influence of low tillage. After planting, the amount of aggregates of 3-2 and 5-3 mm size was 5.58-5.75% in the control option planted with cotton in the driving layer, and 5.84-6.10% in the less processed option. it can be seen that he organized and prevailed. This is due to the fact that plant residues fall, soil porosity increases, and water-resistant aggregates are formed due to the action of adhesives (Table 2).

Table 2.

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Changes in the amount of water-resistant aggregates under the influence of low tillage on irrigated gray-meadow soils

Variant	Layer depth, cm	3-2 mm aggregates			5-3 mm aggregates		
		>1	1-0,25	Total aggregates	>1	1-0,25	Total aggregates
Cotton field							
Control	0-15	0,74	4,84	5,58	1,39	4,93	6,32
	15-30	0,82	4,93	5,75	1,40	5,05	6,45
	30-50	0,84	4,99	5,83	1,25	5,12	6,37
Undertreated	0-15	0,91	4,93	5,84	1,44	5,21	6,65
	15-30	0,98	5,12	6,10	1,55	5,27	6,82
	30-50	0,90	5,05	5,95	1,48	5,35	6,82
Wheat field							
Control	0-15	0,83	5,25	6,08	1,34	5,41	6,75
	15-30	0,95	5,36	6,31	1,45	5,44	6,89
	30-50	1,08	5,24	6,32	1,27	5,53	6,8
Undertreated	0-15	1,12	5,32	6,44	1,49	5,60	7,09
	15-30	1,10	5,24	6,34	1,52	5,52	7,04
	30-50	1,21	5,45	6,66	1,63	5,64	7,27

The amount of water-resistant aggregates of 5-3 mm size is more in all options compared to 3-2 mm. This is because the aggregates are highly water resistant in terms of size. The effect of soil treatment on aggregates of this size is repeated in the size of 3-2 mm (Table 2).

Conclusion

In conclusion, when low-tillage technology is used, as a result of the accumulation of organic matter on the pre-harvested piles and their decay, the aggregates of the soil are restored to a certain extent not only in the plow layer, but also in the sub-plot layers. This leads to recovery and increase of soil fertility.

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