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Physico-Mechanical Properties of the Soil Arable and Subsoil Layers

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ABSTRACT: One of the properties of serozems is biological accumulation of potassium and phosphorus. Soils of this type contain a lot of easily hydrolysable nitrogen compounds. In agriculture, black soil can be used subject to special irrigation measures. To improve the quality of Chernozem soils, in addition to irrigation, measures aimed at preventing secondary salinization are recommended.

KEYWORDS:physical and mechanical properties of soil, soil, soil-forming rocks, loess-like loam, serozem, fine earth, humus, gypsum, wheat, corn, cotton.

I.INTRODUCTION

Of the total area of irrigated soils in Central Asia, about half belongs to the gray, the other to the meadow. Parent rocks of the gray soils are mainly loess, sediment leaching. For serozems characterized by low humus content (0.5...3%), high carbonation, saturation of the absorbed complex loess alkaline earth bases, so that they have a slightly alkaline reaction. Gray soils are mainly in the foothill plains. For their formation, loess-like loam and loess with a litter of pebbles are necessary.

II. SIGNIFICANCE OF THE SYSTEM

Stony structures and fine-grained soils were also found in the composition of their soil-forming rocks. Plain gray soils formed in clayey and loamy deluvial and alluvial rocks. The vegetation cover of zones with serozems is characterized by a pronounced zonality. At the lower level, as a rule, there is a semi-desert with bluegrass and sedge. The peculiarity of the conditions in which the serozems are formed is the hydrothermal regime, in which the spring stage of sufficiently high humidity and moderate temperature is replaced by summer – dry and hot. That is why in the spring there is an intensive formation of humus substances, which is accompanied by active mineralization of organic components. The result of such a rapid biogenicity of soil formation process is the depletion of soil humus. In addition, in the spring in the gray soils occurs vigorous weathering of primary aluminosilicates and flinching as a result of soil horizons. In the profile of serozems, such horizons are distinguished: humus (thickness from 12 to 17 cm); transition (thickness from 15 to 26 cm); carbonate illuvial (thickness from 60 to 100 cm); silty-loamy with inclusions at a depth of more than 1.5 m of fine-grained gypsum. For serozems is characterized by a relatively low content of humus substances – from 1 to 4%. In addition, they are characterized by an increased level of carbonates. This alkaline soil with minor indicators of absorptive capacity. In their composition there is a certain amount of gypsum and easily soluble salts.

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III. LITERATURE SURVEY

One of the properties of serozems is biological accumulation of potassium and phosphorus. Soils of this type contain a lot of easily hydrolyzable nitrogen compounds. In agriculture, gray soils can be used subject to special irrigation measures. Most often they grow cotton. In addition, in areas with serozems can be successfully cultivated beets, rice, wheat, corn and melons. To improve the quality of gray soils, in addition to irrigation, measures aimed at preventing secondary salinization are recommended. It will also require regular application of organic and mineral fertilizers, the formation of a deep arable layer, the use of the method of alfalfa-cotton crop rotation and seeding of green manure. The type of gray soils includes soils of the following subtypes: gray, typical and dark.

Meadow soils differ from serozems somewhat high content of humus, especially in the upper layers. In the middle and lower parts of the river valleys, these soils are subject to salinization, while cotton cultivation is associated with pre-irrigation. Meadow soils are widespread in river deltas and valleys, as well as in the lowlands near the foothills. They are formed under tugai forests and meadows with rhizomatous cereal plants. The basis for them are Delta, pebble alluvial, layered fine-grained and proluvial structures. The main condition for the formation of this type of soil is continuous capillary moistening. The depth of groundwater is usually 1-2.5 m. In the profile of meadow soils, the following horizons can be determined: humus sod (up to 20 cm thick); humus (20 to 40 cm thick); carbonate; gley. In soils of meadow-gray soils contain up to 6% of humic substances. This soil belonging to the group of alkaline. In all layers the presence of gypsum inclusions and easily soluble salts is possible. For agriculture, those meadow soils are important, the quality of which is supported by irrigation activities. The type of meadow soils includes the following subtypes: meadow (typical) and wet-meadow (swampy-meadow).

As it is known, cotton-growing regions of Uzbekistan are divided into three zones according to soil-climatic conditions, mechanical composition of soil, technology of its processing and agricultural machinery [1].

Zone one. Non-saline gray soils with deep groundwater table and the relatively large amount of precipitation. Cotton seedlings receive natural moisture. The area of this zone is 25 % of all cotton crops.

Second zone. More powerful non-saline gray soils with less rainfall, they do not provide normal germination of cotton on stestvenno moisture without holding spare or preplant irrigation. The specific area of this zone is 17 %.

Third zone. Soils have different degrees of salinity. To obtain the normal germination of cotton required washings glaze. The specific area of this zone is 58 %. Climatic features of the described zones cause differences in soil preparation for sowing, in the set of machines and tools used. The technology of cotton cultivation in the subzones is the same, except for the number of irrigation and inter-row treatments, which in the third zone is required less than in the second and first [2].

To improve the technological process of tillage, it is necessary first of all to teach the physical and mechanical properties of the soil, with which the working bodies of tillage machines interact. V. P. Goryachkin, P. U. Bakhtin, G. M. Gologursky, were engaged in the study of physical and mechanical properties of soils as a medium for the work of tillage machines in relation to soil and climatic conditions of the European N.A.Kachinskiy and others.

G. M. Gologurskiy studying the resistance of the soil during its processing, P. U. Bakhtin-the nature of changes in the hardness of the soil, the coefficient of friction of metal on the soil depending on its moisture content, N.A. Kachinskiy – the dynamics of soil resistance to various deformations.

In the cotton growing zone G. M. Rudakov, R. I. Baymetov, V. A. Sergeenko and others were engaged in the study of physical and mechanical properties of soil.

Academician G. M. Rudakov studied soil moisture and hardness, friction coefficients of steel on the soil, soil on the soil and soil resistance to crumple on typical gray soils of Tashkent region on the background prepared for sowing.

Baymetov R. I. and H. B. Begimov investigated the humidity, hardness and density of the soil after the leaching and replacement of irrigation and after the implementation of certain agricultural operations in conditions of the Khorezm region.

V. A. Sergeenko investigated the coefficient of friction of the soil on steel, the resistance of a typical grey desert soils to shear deformation, rupture and collapse during the growing season of cotton.

Study of physico-mechanical properties of the soil subsurface layer were studied by M. Muradov, A. S. Shokh and N. S.Bebutov.

IV. METHODOLOGY

Thus, the physico-mechanical and technological properties of the soils of the subsurface layer during the main processing were studied only by the listed authors, which is not enough to use the results obtained by them in the

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studies necessary to solve the tasks set by us. We turned to the study of some physical and mechanical properties of the main types of soil during the main tillage.

Soil moisture is characterized by the amount of capillary and connected water contained in it. Its mechanical strength depends on it, which affects the quality of its processing and the traction resistance of the tillage tool. The hardness of the soil depends on its mechanical composition and humidity, the content of organic matter in it, the previous culture, the depth of the previous treatment, etc. the Hardness of the soil also reflects the structural state, depending on the type of soil, the rotation, the previous treatment and other factors.

The hardness of the soil was determined by the Alekseev hardness tester, with a conical tip with a base diameter of 11.3 mm (S=1 cm^2) and an angle at the top of 600 [3].

Humidity and hardness of the soil of arable and subsurface layers we determined during the main processing of its subsequent depths: 0-10; 10-20; 20-30; 30-40; 40-50 (table 1.a.b).

Characteristics of hardness and moisture of the soil during the main processing

Table 1.a.

№	Background and previous culture	Humidity (%) by layers,(cm)				
		0-10	10-20	20-30	30-40	40-50
According to N. S.Bibutov						
1.	Staromeska long-standing irrigation, the predecessor of cotton	18,4	18,7	18,4	13,4	9,3
2.	Staromeska ancient irrigation background after corn	13,6	12,7	13,1	12,9	11,0
3.	Staromeska long-standing irrigation, the predecessor of cotton	12,3	11,5	10,5	9,4	7,3
According to the author						
1.	Staromeska long-standing irrigation, the predecessor of cotton	13,5	14,2	17,3	14,2	10,3
2.	Staromeska long-standing irrigation, the predecessor of cotton	14,0	15,6	17,2	15,4	11,5
3.	Staromeska long-standing irrigation, the predecessor of cotton	13,4	15,5	17,8	16,8	12,1

Table 1.b.

№	Background and previous culture	Hardness (MPa) for the layers(see)				
		0-10	10-20	20-30	30-40	40-50
According to N. S.Bibutov						
1.	Staromeska long-standing irrigation, the predecessor of cotton	1,7	2,7	2,9	3,0	4,7
2.	Staromeska ancient irrigation background after corn	1,2	3,3	4,4	6,9	7,3
3.	Staromeska long-standing irrigation, the predecessor of	2,7	3,6	2,8	3,5	3,9

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	cotton					
According to the author						
1.	Staromeska long-standing irrigation, the predecessor of cotton	1,90	2,90	3,55	4,15	4,85
2.	Staromeska long-standing irrigation, the predecessor of cotton	1,92	2,85	3,67	4,97	5,87
3.	Staromeska long-standing irrigation, the predecessor of cotton	1,90	2,89	3,80	4,86	5,91

The relief of the fields is flat. The soil is heavy in mechanical composition. As you can see from the table.1.a,b the humidity of the subsurface layer of the soil during its main processing is lower than the humidity of the arable layer and ranges from 10.3...16.8%. From the obtained data it follows that the soil hardness of the subsurface layer is 1.62...1.93 times higher than the arable and reaches up to 4.15...5.91 MPa.

V. CONCLUSION

Therefore, it can be argued that the working conditions of the deep-silencer on such soils are much heavier than the plough hulls.

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