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PHYSICAL AND CHEMICAL PROPERTIES OF OLD IRRIGATED MEADOW-ALLUVIAL SOILS OF THE BUKHARA OASIS

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Аннотация. Ушбу маколада текширилаётган ўтлоқи аллювиал тупроқларнинг сув ўтказувчанлиги, ҳажм ва солиштирма массаси, ғоваклигини яхшилаш тадбирларидан алмашлаб экиш, гўнг солиши, тупроқни органик моддалар билан бойитиш, чуқур ҳайдаш ва юмшатиш, оғир механик таркибли тупроқларни енгиллатиш, енгилларини оғирлаштириш масалалари атрофлича ёритилган.

Ўрганилган қадимдан суғориладиган ўтлоқи-аллювиал тупроқларнинг генетик горизонтларида Fe_2O_3, Al_2O_3, CaO, MgO, TiO_2, MnO оксидларнинг микдорлари сезиларли даражада ўзгармаслиги хамда SiO_2:R_2O_3, SiO_2:Al_2O_3, SiO_2:Fe_2O_3 ларнинг тупроқ қатламларида бир-биридан унчалик фарк қилмаслиги бу тупроқларнинг агроирригацион тупроқ ҳосил бўлиш жараёни таъсирида ривожланганлигининг яна бир исботидир. Шу билан бир каторда Бухоро воҳаси қадимдан суғориладиган ўтлоқи-аллювиал тупроқлар таркибида P_2O_5, K_2O_3, MgO ва SO_3 оксидларнинг тўпланиши, тупроқда ўсимликлар учун зарур булган асосий озиқ элементлар борлигини кўрсатади.

Калит сўзлар: озиқ элементлар, суғориладиган ўтлоқи-аллювиал тупроқлар, агроирригацион, генетик горизонт, тупроқларнинг сув ўтказувчанлиги.

Аннотация. В данной статье подробно освещены такие мероприятия улучшения водопроницаемости, объемной и удельной массы, пористости исследуемых лугово-аллювиальных почв, как, севооборот, внесение навоза, обогашение почв органическими веществами, глубокая вспашка и рыхление, облегчение почв с тяжелым механическим составом, и утяжеление почв с легким механическим составом.

Незначительное изменение содержания оксидов Fe_2O_3, Al_2O_3, CaO, MgO, TiO_2, MnO в генетических горизонтах староорошаемых лугово-аллювиальных почв, а также слабое отличие друг от друга SiO_2:R_2O_3, SiO_2:Al_2O_3, SiO_2:Fe_2O_3 в почвенных слоях, является еще одним доказательством того, что данные почвы развиты под влиянием агроирригационных почвообразуюших процессов. Вместе с этим, аккумуляция оксидов P_2O_5, K_2O_3, MgO и SO_3 в составе староорошаемых лугово-аллювиальных почв Бухарского оазиса, указывает на то, что в почве содержатся основные питательные элементы, необходимые растениям.

Ключевые слова: питательные элементы, орошаемые лугово-аллювиальные почвы, агроирригационный, генетический горизонт, водопроницаемость почв.

Annotation. In this article, the issues of water permeability, volumetric and specific mass, and porosity of investigated meadow-alluvial soils, including crop rotation, fertilization, soil enrichment with organic substances, deep plowing and softening, lightening of heavy mechanical soils, and weighting of light ones, are discussed in detail.

A slight change in the content of oxides Fe2O3, Al2O3, CaO, MgO, TiO2, MnO in the genetic horizons of old-irrigated meadow-alluvial soils, as well as a slight difference from each other SiO2:R2O3, SiO2:Al2O3, SiO2:Fe2O3 in soil layers, is another evidence the fact that these soils are developed under the influence of agro-irrigation soil-forming processes. At the same time, the accumulation of oxides P2O5, K2O3, MgO and SO3 in the composition of old-irrigated meadow-alluvial soils of the Bukhara oasis indicates that the soil contains the main nutrients needed by plants.

Key words: nutrients, irrigated meadow-alluvial soils, agro-irrigation, genetic horizon, water permeability of soils.

Introduction: In our Republic questions of improvement of the soil, including change of water-physical features of the irrigated soils in the Bukhara oasis as a result of irrigation and their further improvement are considered as an actual problem of today. Therefore studying of water-physical features of the soil has great value.

Morphology, genesis and genetics of the irrigated soils of the Bukhara oasis, their geographical prevalence are studied by many scientists (1-4, 6). Till this time the irrigated soils of the Bukhara oasis, especially after the beginning of an irrigation waters of Amu-Bukhara channel, water-physical features of these soils are studied very little.

Methods and object of research. Samples of the soil of layers depth of two meters and its mechanical structure turn out is studied by means of salt - sodium hex metaphosphate by Bratchev method, relative density and soil reference points are defined by a method dens meter, general porosity is defined by calculation (5). As object of research the irrigated soils extended on the territory of Jandar, Romitan, Peshku, Korakul Districts of Bukhara Region are chosen.

Gained results. The Bukhara soils with which we conducted research, have original water-physical features, are allocated with the variety. They multilayered, are salted in different degree, their mechanical structure the heavy, average and easy sandy.

New irrigated weak, medium salted, pasturable soils with an average mechanical structure have satisfactory soil permeability as they have rather bad structure, density and a close arrangement subsoil flow waters to soil surface.

As a result of the wrong organization of agro technical and meliorative works in the irrigated alluvial soils, their anthropogenous influences of granular structural condition is broken that worsens soil permeability. In such soils layers are condensed absorption of waters in the bottom layers becomes difficult.

Historically irrigated pasturable alluvial soils are the most widespread soils in the Bukhara oasis. Through many centuries because of agricultural activity, in these parts the processes creating primary and natural soil, have sharply changed.

As a result of clarification and a congestion of irrigated channels, also channel Shokhrud and its inflows under the influence of standing alluvial deposits of Zarafshan river, round them there are heights of 3-4 meter height. Among this micro-upland and ponds harm fields there are occurred low plains.

Around of Shokhrud Channel of Bukhara oasis there are historically irrigated pasturable alluvial soils with mechanical structure of heavy sandy and clay. These soils are characterized by presence of large particles of a dust in the structure (0,05 - 0,01 mm). The quantity of this indicator remains to 2.5 meters of depth of a profile of soil. Through many centuries as a result of an irrigation in soil horizons small dusty and clay particles were increased.

The quantity of physical clay on the top sowing layer of the earth makes 48,3%, their quantity on the average and bottom earth horizons increases to 60,0 - 62,4%. The Principal cause of multiplication of physical clay in a soil profile is the increase in quantity of a fine dust and clay in average and bottom inflows with a distance from the channel (<0.001 mm), is directly connected with increase in their quantity in structure of stable alluvium.

It is known that water-physical are considered as the important factor defining its efficiency and fruitfulness. As under the influence of this factor in a soil profile change water, air, heat, feeding modes and microbiological processes and this has a huge and significant importance at growth of agricultural plants.

The Bukhara oasis influences relative density and volume weight of historically irrigated pasturable alluvial soils, water-physical properties of horizons of a soil profile, provides various an indicator of their general porosity and hygroscopic, maximum molecular humidity and the general capacity of a moisture. The volume weight of soil on horizons increases from 1.32 g/cm^3 till 1.51 g/cm^3, the highest indicator (1.48-1.51 g/cm^3) is observed on under a sowing layer. The general porosity of soil decreases in these horizons. (42-48%).

In historically irrigated pasturable alluvial soils of the Bukhara oasis quantity of carbonates, plaster and the absorbed alkalis a miscellaneous.

Table

Quantity of carbonates, plaster and the absorbed alkalis in historically irrigated pasturable alluvial soils of the Bukhara oasis

Horizons and depth, cm	$CaCO_3$	$CaSO_4$	Mg-eqv. In 100 g of soil				In%			
			Ca^{KK}	Mg^{KK}	K^{KK}	Na^{KK}	Ca^{KK}	Mg^{KK}	K^{KK}	Na^{KK}
Aa_1 0-28	9.04	0.325	3.59	1.81	0.60	0.35	56.6	28.5	9.5	5.5
Aa_2 28-40	9.25	0.415	3.65	1.26	0.46	0.26	64.8	22.3	8.3	4.6
Aa_3 54-85	9.85	0.503	3.15	1.52	0.46	0.15	59.7	28.8	8.7	2.4
Aa_4B_1a 85-153	10.01	0.610	3.86	1.25	0.41	0.20	67.5	21.8	7.2	3.5

As a result of centuries-old use of these soils in irrigated agriculture, quantity of carbonates stable alluvions, under the influence of anthropogenous soil-forming factors, accumulate less on the top horizons (9.04%), and their quantity grows in average and bottom layers (10.01%). Similar or similar changes, also are observed in process of gathering of plaster in layers of a profile of soil. The greatest quantity of the absorbed alkalis as a part of historically irrigated pasturable alluvial soils makes Ca^{KK} cation (56/6-67/5%), second place takes Mg^{KK} cation (21.8-28.5%). In opinion of N V. Kimberg, rather the magnesium considerable quantity can lead to development of the magnesian salted alkaline soils in Bukhara and Karakul oases.

In the basic horizons of historically irrigated pasturable alluvial soils extended in the Bukhara oasis (Aa_1, Aa_2, Aa_3 etc.) quantity SiO_2 makes 67-70%, in gley soil layer (G_1) its quantity decreases (66.25%) a little. SiO_2 oxide appears as a result of washing of under sowing layer (28-40 cm), also the porosity considerable quantity in this layer (1.51 g/cm3) interferes with transition of SiO_2 in the structure of clay nutrients to lower horizons.

In horizons of studied historically irrigated pasturable alluvial soils non-change of quantity of Fe_2O_3, Al_2O_3, CaO, MgO, TiO_2, MnO oxides in considerable amount and insignificant difference of SiO2:R2O3, SiO2:Al2O3, SiO2:Fe2O3 each from other is the additional proof of that these soils develop under the influence of occurrence process of agro-irrigation soils. At the same time, in structure of historically irrigated pasturable alluvial soils of the Bukhara oasis accumulate such oxides as P_2O_5, K_2O_3, MgO and SO_3 testifies presence of the basic nutritious elements of the soil necessary for plants.

It is established that from time immemorial in the pasturable alluvial soils, occurrence of dense beds under plowings and cation sodium in volume absorption was rather more, in the salted soils soil permeability has worsened.

During the researches, it is established that agro-irrigational layers of the soil on a development condition, degree of soil permeability is different. In the irrigated pasturable alluvial soils, depending on a moisture of the soil, time of ploughing and applied agro technical actions, soil permeability has been changed in soil layers. For example, in soil layers with good soil permeability during deposits and an irrigation through damp capillaries of the soil they quickly move downwards and is provided with enough water. In the soils with very high soil permeability, as a result of excessive ploughing, absorption of water parts in irrigated points to the bottom, level subsoil flow waters rises, which leads to salting of the ground and swamping.

Salting as a result of anthropogenous factors (secondary) is degradation process, more extended in the irrigated soils, and it is without fail formed in files where mineralized (3-50 g/l) subsoil flow waters rise as a result of infringement of integrity of natural development of the soil, techno genic and agro gene pollution or as a result of change of directions of natural geochemical processes. Minor settling - natural salting of parodies forming the soil are connected with expansion of the area of the salted soils as a result of an irrigation, and land development with salt layers and detection (lifting on an soil surface) at works of alignment for preparation for an irrigation. The most part automorphic soils, even in 50-100 or 100-200 cent metric layers of section prolific grey soils there are salt large supplies, such poorly salted or even not salted soils, as a result of alignment of the soils, have turned in strongly salted soils.

One more reason of multiplication of again salted ground areas is the irrigation of cultures by mineralized drainage waters because of water lacks. Use of such salted soils makes active salting the new and old irrigated soils even more. Formation of process secondary salting is connected with many reasons, despite genesis of its occurrence, secondary salting negatively influences growth and development of plants and worsens properties of the soil, breaks soil structure, worsens water-physical and physical-chemical properties, will affect microbiological activity and a meliorative condition of soil, to these there is a soil degradation.

Superfluous humidifying of the old areas (watering) is considered the second core of processes of the degradation, which widespread among the irrigated soils. As a result of absence of the control and an excessive irrigation level lifting subsoil flow waters, strengthening of cases heteromorphism, in territories, especially

in low bogs, near to channels and large irrigated networks in weak natural and artificial drain places, massifs of subsoil flow waters located stably above (1-2 meter) is observed. Process of superfluous humidifying is usually formed according to process of salting, properties of the irrigated soils negatively influence their water, air and salt schedules. The excessive moisture in regions of accumulation of drainage waters, on the soils out of irrigated files, and also as a result of an irrigation hypsometrically highly located soils, is observed flooding of low regions.

Deserting it is considered one of dangerous degrees of degradation, which is connected, with sharp infringement soil-water order of the region as a result of lack of water (humidity). Often Deserting it is formed as a result of mismanagement (distribution) of water resources, as a result of decrease in level of elevated and underground waters, level of subsoil flow waters sharply decreases also this process again becomes more active.

It is known that granules in structure of the units which have arisen naturally, their specific and volume weight, formation of porous layers of the soil, maximum molecular and the field volume of humidity, a stock of a useful moisture defines their mechanical structure. The scientific researches spent in Jandar, Romitan, Peshku, Korakul Districts of Bukhara Region show that, in key territories a layer of the soils under sowing layers are strongly condensed.

Relative density under the influence of a strong irrigation as a result of smashing of primary minerals, as a result of occurrence of secondary heavy minerals, is observed increase in relative density of the soil. In soil there is a process of formation of such heavy minerals, as magnetite, hematite. As a result of processing of irrigated pasturable alluvial soils, work heavy technical equipment dung year, an soil irrigation soil units are made small, the condition and structure is broken. As a result of a soil granule are condensed, porosity decreases also weight of volume raises (1.63-1.74 g/cm^3). According to some scientists (3) weight of volume of soil on the average should make 1.30-1.35 g/cm^3, and under sowing layers - 1.35-1.40 g/cm^3.

In these soils, the indicator connected with relative density and weight of volume is a porosity. Porosity of soil are factors, which positively influence aeration and their water movement. Porosity of the irrigated pasturable alluvial soils have porosity of 34.9-46.7%, which was observed in Jandar, Peshku District soils. However it is necessary to notice that porosity of soil very changeable, especially in the top layer of irrigated pasturable soils porosity makes 47.9%, and in the pasturable marsh and salted soils - 46.1%. In the bottom layers of the soil porosity sharply decreases. And it shows decrease in fruitfulness of soil.

In above-mentioned the irrigated soils of the Bukhara oasis, for improvement of the general physical negative cases, it is necessary to group soils and to make fluid (capital) alignment, to use more than organic fertilizers and the plants enriching soil by organic substances. In the soils where current alignment is made, with increase agricultural products, quantity of water and fertilizers on them decreases, as a result of uniform distribution on the areas, fruitfulness efficiency of soil raises also improves.

Physical characteristics of soil form the scientific basis for realisation of the actions directed on increase of fruitfulness of soil, processing, fertilizer, an irrigation, de-salting, prevention of erosion and salting. It is necessary to notice that the mineral and organic fertilizers used without physical indexes of soil, de-salting, and even the basic crops do not give effect. At the same time, crops of agricultural plants, definition of terms of an irrigation are carried out on the basis of physical indexes of soil. At increase, management and protection of efficiency of the irrigated soils, its physical indexes have the important role.

In quality the conclusion we can tell that crops of plants, fertilizer, soil enrichment by organic substances, deep a deep ploughed land and softening, simplification of heavy mechanical structure, hardening of easy mechanical structure are expedient, using actions for improvement of soil permeability the checked pasturable alluvial soils, their volume and specific weight.

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