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IRRIGATED AND VIRGIN SOIL COMPARATIVE CHARACTERISTIC IN THE MUGAN-SALYAN MASSIF

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СРАВНИТЕЛЬНАЯ ХАРАКТЕРИСТИКА ОРОШАЕМЫХ И ЦЕЛИННЫХ ПОЧВ МУГАНО-САЛЬЯНСКОГО МАССИВА

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Abstract. The article deals with the comparative analysis of irrigated and virgin soils in the Mugan-Salyan Massif. A main purpose of the work is to study the effect of intensive irrigation on the soil and the morphogenetic changes in the soil profile. Experimental researches are performed in the field, cameral and laboratorial conditions. Irrigated soils are distinguished from virgin soils by the following morphological features: biological processing, fertility, homogeneity of mechanical composition, formation of modern cultivated layer due to agroirrigation sediments characterized by gray color; heavier mechanical composition; absence of sharply expressed illuvial carbonate content, significantly lower carbonate profile, hardened subsoil formation.

Аннотация. В статье проведен сравнительный анализ орошаемых и целинных почв Мугано-Сальянского массива. Основной целью работы является изучение влияния интенсивного орошения на морфогенетические изменения почвенного профиля. Экспериментальные исследования проводились в полевых, камеральных и лабораторных условиях. Орошаемые почвы отличаются от целинных по следующим морфологическим признакам: биологическая переработанность, плодородие, однородность механического состава, формирование современного пахотного слоя за счет агроирригационных отложений, характеризующихся серой окраской; более тяжелый механический состав; отсутствие ярко выраженной иллювиальной карбонатности, значительно более низкий карбонатный профиль, упрочненное подпочвенное образование.

Keywords: irrigation, virgin soils, soil profile, morphogenetic diagnostics, morphological index.

Ключевые слова: орошение, целинные почвы, почвенный профиль, морфогенетическая диагностика, морфологический индекс.

The Mugan-Salyan massive is considered to be one of the most developed agricultural areas in terms of irrigated agriculture. The Mugan-Salyan massive, located in the southeast of the Kur-Araz lowland, is bordered by the Kur and Araz rivers to the north and northeast, the Kur river to the southeast, the Lankaran lowland to the south and Iran to the south and southwest. 252,5 thousand hectares of the total area (871,1 thousand hectares) are irrigated lands, and this is 17,78% of irrigated lands of the republic [5].

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The soils of Kur-Araz lowland were thoroughly studied by some researches [1-5].

Irrigation is one of the main factors ensuring soil fertility in arid climates. Irrigation water transports large amounts of water – soluble organic nutrients and other debris to the sowing areas and these cause radical changes in the genetic characteristics of the soil. As a result of perennial irrigation, an agro irrigation horizon rich in organic sediments is formed in the upper layer of the soil.

Realization of the different irrigation processes created various changes in the structure of land cover. The morphological structure, physico-chemical composition and other features of the natural and irrigated soils have been investigated comparatively. The positive and negative sides of irrigation are shown.

Materials and Methods

Natural and irrigated meadow-gray soils of Mugan-Salyan massive were taken as the object of research. During the field investigations 2 characteristic areas were selected. On natural (virgin) land in Khirmandali village of Bilasuvar region, with geographical coordinates of section 5 (39°27'28.64"N, 48°36'31.64"E); section 55 was placed on irrigated gray soils with the geographical coordinates of the region (39°26'45.32"N, 48°37'21.64"E). During the researches the physical and chemical analyses have been conducted on the basis of the method adopted in soil science: an amount of humus and total nitrogen by I.V. Turin's method, C:N ratio-CO_2 by Golubev's method, carbonate (CO_2) on the calcimeter device by Sheybler's method; granulomeric composition by pipette method of N.A. Kachinsky, total water weight following E.V.Arinushkina; hygroscopic humidity by thermic method at 105 °C.

Research consequences and discussion

Based on the fact that irrigation causes constant changes in soil composition, we need to study it comparatively. The virgin and ancient irrigated meadow-gray soils of the area differ sharply in morphological structure. Widespread use in agriculture and irrigation has led to different changes in the morphological structure of soils. Let's look at the morphological structures of the sections placed on virgin and irrigated soils to determine this difference.

Section №5

AYa'vzca 0-20 cm	dark gray, heaplike, granular, soft, medium porous, root, rootlet, small pores are high, the insect paths are clearly visible,weakly moist, the transition is clear, it boils violently
AYa"caz 20-40 cm	mean clayey, bright-gray, crumby, cloddy, soft weak-dense, root, rootlets, porous, the insect tracks are clearly, visible, humid, passage is gradual, boils severely
ABca 40-70 cm	mean clayey, dark gray shaded, crumby, granular, soft weak-dense, root, large-cane root, white single spot, whitish carbonate stained, small rootlets, moist, passage is clear, boils severely
BTcas 70-95 cm	Heavy loamy, bright gray shaded, light loamy, soft dense whitish carbonate stained, small root and rootlets, moist, passage is clear, boils severely
BT/Ccags 95-120 cm	Weak loamy, yellowish, bright gray shaded, light loamy, softish weak-dense, carbonate remnants, blueish stained moist, passage is gradual, boils severely

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The morphological description of the section shows that AYa'vzca (0-20 cm) layer is dark gray, heaplike, granular. Subsoil AYa"caz (20-40 cm) has a light gray shade, crumy, heaplike, clody structure. Crystalline salt stains often begin to appear in the lower layers. Thus, BTcas (70-95 cm), BT/Ccags (95-120 cm) depth also shows signs of gleying. Crystalline salt heaps are clearly distinguished at depth of BTcas, BT/Ccags and C/cas. Carbonate is felt in all layers of the section.

Section №55

AYa'vzcas 0-22 cm	Dark-gray shaded, heavy clayey, crumby, hard, root, rootlet, whitish salt sports are visible, weak-humid, passage is clear, boils severely
AYa"vzca 22-40 cm	yellowish-gray shaded, mean clayey, crumby-like, hardish, root, rootlet, weak-humid, gradual, severely boils
A/BTca 40-55 cm	gray-cinnamonic, light-clayey, sandy, soft, root, rootlet is more moist, passage is clear, severely boils
A/BTca 55-70 cm	gray-cinnamonic shaded, fine sandy, light clayey, softish, root, rootlets are thinned, moist, passage is clear, severely boils
BTcag 70-97 cm	Bright-gray shaded, light gleyey, granular, soft, root, rootlets are dispersed, moisture passage is gradual, severely boils
BT/Ccags 97-130 cm	Blueish rust sports, gleyey granular-cloddy, hardish, single rootlets are available, there are whitish salt spots, moist, passage is clear, severely boils
C/cags 130-170 cm	Blue shaded, clayey, granular-cloddy, softish, white salt spot, blue-cinnamonic rust spot, boils

It is seen from the morphological description of the section that the crystalline salt heaps are distinguished clearly at the depth of AYa'vzcas (0-22 cm) and BT/Ccags (97-130 cm). The gleying signs are cleary noticed at the depth of BTcag (70-97 cm), BT/Ccags (97-130 cm). Here, AYa'vzcas (0-22 cm) layer is dark gray, clody structural, biologically active. Soil-forming rocks are composed of alluvial sediments of the Kur and Araz rivers.

Unlike irrigated meadow-gray soils, virgin soils have a high content of humus in the upper layer. Irrigated soils are distinguished from virgin soils by the following morphological features: biological processing, fertility, homogeneity of mechanical composition, formation of modern cultivated layer due to agro-irrigation sediments characterized by gray color; heavier mechanical composition; absence of sharply expressed illuvial-carbonate, significantly lower carbonate profile, hardened subsoil formation. Section 5 shows that in irrigated meadow-gray soils, silt particles vibrate between 8,40-53,20% and physical clay 61,60-86,0% along the profil. The most complication was observed in the amount of silt particles and physical clay on the 95-120 cm layer. A quantity of humus and nitrogen changed by 0,84-1,60; 0,09-0,13% in the profile. The change in the amount of humus is closely related to the thickness, of soil layer, which determines the degree of the soil cultivation, the composition of the planted crops, application of the organic and local fertilizers. The reduction in the amount of humus is felt along the profile. Their decrease towards the lower layers is gradual. Along the profile hygroscopic humidity vibrated in the range of 4,77-6,89%, but C:N 5,41-7,14%. Here, the amount of $CaCO_3$ decreases slightly in the middle layers and gradually decreases in the lower layers. It is quantity is 3,34-8,39 % along the profile. Majority of carbonate amount in the soil causes increase of solonetzification process. An amount of carbonates decreases in the soil as a result of intensive irrigation of the cotton and grain crops. The increase in carbonation in the soil is due to the approach of groundwater to the surface. Here, pH index was

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7,56-7,81 along the profile. Section 55 shows that the silt particles are 6,80-21,60% and physical clay 30,0-52,86% in meadow-gray (virgin) soils. But an amount of humus and nitrogen changed by 0,64-3,05; 0,07-0,22 % in the profile. (Table). It should be noted that, high humus content is one of the main indicators for virgin soils. In irrigated soils, humus relatively grows on the low layers. Because irrigation water washes the humus in to the deeper layers. Here, $CaCO_3$ was 3,34-4,18% along the profile. But pH index vibrated by 7,38-7,93 along the profile.

Table

PHYSICO-CHEMICAL INDICATORS OF IRRIGATION AND VIRGIN SOILS

Index of soil	*Genetic layer, cm*	*%*						*<0,001 mm*	*<0,01 mm*	*pH*
		humus	*Nitrogen*	*C:N*	*$CaCO_3$*	*CO_2*	*Hig. humid*			
Section №5 (Irrigated soil)										
AYa'vzca	0-20	1,60	0,13	7,14	5,77	2,40	6,02	19,2	62,0	7,66
AYa"caz	20-40	1,46	0,13	6,65	5,84	2,40	6,44	18,4	65,6	7,75
ABca	40-70	1,34	0,12	6,48	3,52	1,48	5,04	26,0	61,6	7,56
BTcas	70-95	1,26	0,11	6,64	6,30	2,59	6,85	29,2	64,0	7,80
BT/Ccags	95-120	1,14	0,10	6,61	5,41	2,22	6,89	53,2	86,0	7,81
C/cas	120-150	0,84	0,09	5,41	8,39	3,51	4,77	-	-	7,70
Section №55 (Virgin soil)										
AYa'vzca	0-22	3,05	0,22	8,43	4,18	1,84	3,92	21,6	48,0	7,38
AYa"vzca	22-40	1,60	0,13	7,14	4,18	1,84	3,55	19,2	52,8	7,90
A/BTca	40-55	1,24	0,11	6,54	3,77	1,66	2,18	10,0	42,0	7,93
A/BTca	55-70	1,06	0,10	6,15	4,18	1,84	3,76	6,80	30,0	7,90
BTcag	70-97	0,85	0,09	5,48	4,18	1,84	2,81	8,40	34,0	7,81
BT/Ccags	97-130	0,64	0,07	5,30	3,34	1,47	5,96	12,0	42,8	7,93

Conclusion

It was determined during the research that the following changes happened in the profile of irrigation meadow-gray soil as a result of the intensive irrigations and cultivations: cultivated, especially thickness of the tillage layer rose, structure dusted; level of the calcareous, salty layers reduced.

References:

1.Babayev, M. P., Hasanov, V. H., & Jafarova, Ch. M., Huseynova S. M. (2011). Morphogenetic diagnostics, nomenclature and classification of Azerbaijani lands. Baku. (in Azerbaijani).

2. Babaev, M. P., Ramazanova, F. M., Najafova, S. I., & Gurbanov, E. A. (2019). Soils of the Republic of Azerbaijan (Irrigated soils of the Kura-Araks lowland and their productive capacity). Moscow. (in Russian).

3. Jafarova, Ch. M. (2013). Morphogenetic indicators of cultivate soils of Mughan-Salyan steppe. *Soil Science and Agrochemistry*, *21*(2), 371-376. (in Russian).

4. Mammadova, A., Aliyev, S., & Suleimanova, A. (2021). Current State of Granulometric Composition of Irrigated Meadow-Serozem Soils of Azerbaijan. *Bulletin of Science and Practice*, *7*(12), 69-72. (in Russian). https://doi.org/10.33619/2414-2948/73/08

5. Mustafayev, M. G. (2019). Modern condition of lands in Mughan-Salyan massif and scientific bases of their improvement. Baku. (in Azerbaijani).

Список литературы:

1. Бабаев М. П., Гасанов В. Х., Джафарова Ч. М., Гусейнова С. М. Морфогенетическая диагностика, номенклатура и классификация Азербайджанских земель. Баку, 2011.

2. Бабаев М. П., Рамазанова Ф. М., Наджафова С. И., Гурбанов Э. А. Почвы Азербайджанской Республики (Орошаемые почвы Кура-Араксинской низменности и их производительная способность). М.: LAP-LAMBERT Academic Publishing. 2019.

3. Джафарова Ч. М. Морфогенетические показатели окультуренных почв Мугано-Сальянской степи // Почвоведение и агрохимия. 2013. Т. 21. №2. С. 371-376.

4. Мамедова А. С., Алиев С. П., Сулейманова А. В. Современное состояние гранулометрического состава орошаемых лугово-сероземных почв Азербайджана // Бюллетень науки и практики. 2021.Т. 7. №12.С. 69-72. https://doi.org/10.33619/2414-2948/73/08

5. Мустафаев М. Г. Современное состояние земель Мугано-Сальянского массива и научные основы их совершенствования. Баку, 2019.

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