Abstract. The most widespread soils in the Republic of Azerbaijan are mountain-meadow soils. The aim of the research was a comprehensive and comparative study of morphodiagnostic parameters, physical and chemical properties, as well as the biochemical activity of natural and anthropogenically modified biogeocenoses of the Kedabey region. The area has unique flora and fauna. Surroundings of the villages Gara Murad, Kichik Garamurad, Saratovka and others were investigated. The research was carried out on virgin and cultivated lands in villages. The degree of mineralization of the rivers Zayamchay and Chekhrichay ranges from 140 to 430 mg. The groundwater level in these areas exceeds 2 m, salinization processes are active. A herbarium was collected and the floristic composition of natural cenoses was determined. Invertebrates were also collected and the dominant composition of the fauna of natural cenoses was determined. Of the saprophages in these biocenoses, woodlice of the genus Hemilepisthus and Armadillidium are widely used. The most intensive decomposition of the remains of cereal vegetation is observed in the soil of the coastal strip (65.9%). In the natural cenosis, the rate of destruction of saltwort and salt-tolerant grass vegetation reaches 44.3%. The main role in the destruction of plant remains is played by a group of saprophages, which actively use plant litter. The decomposing material reaches its final stage of microbiological transformation. The duration and amount of CO2 in different soil horizons were also studied. It has been established that with increasing depth, the amount of carbon dioxide decreases. The hydrolytic activity of invertase and urease enzymes in the studied soils can be assessed as very weak. Comparative results of all these agrochemical studies helped to develop virgin soils in agriculture on the plains and achieve high productivity.

Keywords: humification, decomposition, chemical parameters, classification, salinization, invertebrates.

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ЭКОЛОГИЧЕСКИ ЗНАЧИМЫЕ ПОКАЗАТЕЛИ ГОРНО-ЛУГОВЫХ ПОЧВ АЗЕРБАЙДЖАНА

Талиби С.М., Гасанова Т.А.

Abstract. The most widespread soils in the Republic of Azerbaijan are mountain-meadow soils. The aim of the research was a comprehensive and comparative study of morphodiagnostic parameters, physical and chemical properties, as well as the biochemical activity of natural and anthropogenically modified biogeocenoses of the Kedabey region. The area has unique flora and fauna. Surroundings of the villages Gara Murad, Kichik Garamurad, Saratovka and others were investigated. The research was carried out on virgin and cultivated lands in villages. The degree of mineralization of the rivers Zayamchay and Chekhrichay ranges from 140 to 430 mg. The groundwater level in these areas exceeds 2 m, salinization processes are active. A herbarium was collected and the floristic composition of natural cenoses was determined. Invertebrates were also collected and the dominant composition of the fauna of natural cenoses was determined. Of the saprophages in these biocenoses, woodlice of the genus Hemilepisthus and Armadillidium are widely used. The most intensive decomposition of the remains of cereal vegetation is observed in the soil of the coastal strip (65.9%). In the natural cenosis, the rate of destruction of saltwort and salt-tolerant grass vegetation reaches 44.3%. The main role in the destruction of plant remains is played by a group of saprophages, which actively use plant litter. The decomposing material reaches its final stage of microbiological transformation. The duration and amount of CO2 in different soil horizons were also studied. It has been established that with increasing depth, the amount of carbon dioxide decreases. The hydrolytic activity of invertase and urease enzymes in the studied soils can be assessed as very weak. Comparative results of all these agrochemical studies helped to develop virgin soils in agriculture on the plains and achieve high productivity.

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Аннотация. Наиболее распространенными почвами в Азербайджанской Республике являются горно-луговые почвы. Целью исследований стало комплексное и сравнительное изучение морфодиагностических параметров, физико-химических свойств в также биохимической активности естественных и антропогенно измененных биогеоценозов Кедабейского района. Район имеет уникальную флору и фауну. Были исследованы окрестности сел Гара Мурад, Кичик Гарамурад, Саратовка и другие. Исследования проводились на целинных и обрабатываемых землях в сферах. Степень минерализации рек Заямчай и Чехричай колеблется от 140 до 430 мг. Уровень грунтовых вод в этих районах превышает 2 м, процессы засоления идут активно. Был собран гербарий и определен флористический состав природных ценозов. Также были собраны бес позвоночные и определен доминирующий состав фауны природных ценоц. Испрофагов на этих биоценозах широкое распространение получили мокрицы рода Hemilepisthus, Armadillidium. Наиболее интенсивное разложение отстатков злаковой растительности отмечается в почве прибрежной полосы (65.9%). На естественном ценозе темпы деструкции солянковый и солеустойчивой злаковой растительностью достигает 44.3%. В деструкции растительных остатков главную роль играет группа сапрфагов, которые активно используют растительный опад. Разложившийся материал достигает своей конечной стадии микробиологического превращения. Также изучались продолжительность и количество CO2 в разных горизонтах почвы. Установлено, что с увеличением глубины количество углекислого газа уменьшается. Гидролитическую активность ферментов инвертазы и уреазы в изучаемых почвах можно оценить как очень слабую. Сравнительные результаты всех этих агрономических исследований помогли оценить целевые почвы в земледелии на равнинах и добиться высокой продуктивности.

Ключевые слова: гумификация, разложение, химические показатели, классификация, засоление.

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Introduction. Azerbaijan possesses 9 of 11 world climatic zones, which are characterized by the development of unique and endemic soil types [1; 9; 11].

The meadow soil type was first studied in 1908 in Central Asia. The formation of mountain meadow soils is mainly on lyos rocks [8; 10].

The latitude and longitude of the study area is in this range E 45° 0’-47° 08’ N41° 17’-40° 19’. Average annual humidity 75%, annual precipitation 600-900 mm. The average annual wind speed is 2.2 m/s [9]. Possible evaporation occurs at a distance of 1169-1119 mm from the surface of the coating. From April to November, there is more evaporation than precipitation, and the soil during this period experiences a lack of moisture. The groundwater level is deep [20].

Experimental part. Gadabay has its unique flora and fauna. Studies were carried out in the villages of Gara Murad, Saratovka, Slavyanka, Kichik Garamurad and river valleys (in 2017-2019 years). Herbarium materials were collected and the floristic composition was determined, soil samples were also taken from cuts up to 1.80 meters deep for laboratory analysis. In order to highlight the important role of vegetation in the process of soil formation and especially in the formation of humus, the surface phytocomplex and root mass of plants were determined in different seasons of the year. The amount of phytomass was determined once a year during the period of maximum vegetation development (end of May). The determination of the aerial parts of plants was collected 5 times in repetition from 1 m² of area. The grass was cut 2 cm above the soil surface, sunflowers and grapes were harvested, dried in the open air, and the dry weight was determined. The number of plant species prevailing in the collected herbarium materials was determined. There is no forest cover in the river basin. Water samples were taken with a bathometer in the part of the river Zayamchay, Cehrichay passing through the study area, mineralization and quality analyzes were carried out in the laboratory to determine their suitable for irrigation [21]. Both of them a stormy and abounding river. At each selected site, soil sections were laid down to the depth of the parent rock. In quiet sections, samples were taken for soil analysis (fig. 1, 2). Totally 15 land plots were laid. Some of the physical and chemical parameters characteristics are shown in the following tables (tabl.).

| Soil depth | Humus | P   | Na  | N   | pH | SO₄ | Ca  | Mg  | Cl  |
|------------|-------|-----|-----|-----|----|-----|-----|-----|-----|
| 0-16 sm    | 3.27  | 0.26| 2.35| 0.39| 7.8| 1.895| 0.010| 0.005| 0.32|
| 16-37 sm   | 2.32  | 0.22| 2.12| 0.23| 7.9| 2.394| 0.008| 0.002| 0.4 |
| 37-58 sm   | 1.81  | 0.20| 2.97| 0.37| 7.5|       |       | 0.012|     |
| 58-77 sm   | 1.17  | 0.13| 2.13| 0.21| 7.4| 0.167|       |       |     |
| 77-118 sm  | 0.68  | 0.09| 2.18| 0.32| 7.5|       |       | 0.021| 0.004|
In several villages of the Gadabay region, soil samples were taken from soil crops and their physico-chemical properties were studied. The studies were carried out in different seasons of the year both in natural and cultivated cenosis. At the same time, the quality of river water passing through the territory of the Gadabay region and used as irrigation water was studied [5; 7].

Gravitational analysis of water (brief and complete) – E.B. Arinushkina, water-physical properties (hygroscopic moisture) – N.A. Kaczynski; absorbed bases – K.K. Hedroits; carbonates CaCO$_3$ and CO$_2$ – with a calcimeter; The content of total nitrogen and humus – Tyurin's method; with pH ionometer-pH meter; ratio C:N – CO$_2$ according to the Tolubev method [17-21].

**Discussion of the results.** The most intensive decomposition of the remains of cereal vegetation is observed in the soil of the coastal strip – 65.9%. Such an intense decomposition of the substance can be explained by sufficient aerozation of soil horizons and the active oxidization of plant residues by atmospheric oxygen. In the natural cenosis, the destruction rate of saltwort and salt-tolerant grass vegetation reaches 44.3% in the processing of plant residues, the main role is played by a group of saprophages Hemilepistus woodlice, which actively drag the plant decay and the decomposed material reaches its final stage of microbiological transformation [12-15].

Carbonization is observed along the profile, starting from the surface of 0-25 cm. The rest of the salts and compounds were washed off the profile. Gray soils are prone to salinization. The soils of these and other territories differ depending on the conditions of soil formation and the natural cenosis. The results of the analysis of seasonal studies of the content of nutrients in dependent particles of irrigation water show that a significant amount of nutrients is introduced to the fields by dependent water particles. This has a positive effect on the fertility of irrigated lands and an increase in their productivity Saratovka, 1340 m above sea level. 250 m east of the gorge southwest gentle undulating slope, rocky pastures [16].

Ca$^{++}$ and Mg$^{++}$ in mountain meadow soils gradually increases from the upper horizons 0.010-0.002%, to the lower 0.027-0.004%. The Na$^+$ content also increases from the upper horizons of 2.27% to the lower ones, amounting to 3.08 %. On the agrocenosis of forage plants, the content of Ca$^{++}$ and Mg$^{++}$ cations along the profile is much higher than in virgin soils of the natural cenosis. The total amount of Na$^+$ and K$^+$ increases both in the upper horizons and in the lower horizons. In mountain meadow soils of natural and cultivated cenoses, the pH changes between 7.3-7.8.

The following chart shows the percent of humus, dry residue and total salts in mountain meadow soils of Gadabay region (fig. 1, 2).

The activity of the catalase enzyme involved in the oxidation reactions of organic residues in the soil with sagebrush-ephemeral vegetation – 2.30 ml O$_2$/g. soil. Indicators of the enzyme invertase gradually increase in biotopes far from populated areas and reach 3.40 mg.gluc./g.soil in 24 hour. Determination in
soil samples of the same biotopes of the activity of another hydrotic enzyme urease involved in the transformation of more complex compounds. if in the soil developing under saline vegetation its indicators (in a 0-30 cm layer) vary between 0.2-0.6 mg, then in the soil under halophyte grass vegetation, the activity of the enzyme increases to 0.4-1.1 mg NH₃/g.soil in 24 hour. In general, the hydrolytic activity of invertase and urease enzymes in the studied soils can be assessed as very weak.

The activity of the enzyme was significantly influenced by the growing vegetation, the root system of which and their remains not only improve the soil structure and aerobicity, but also enrich the soil with organic components stimulating biochemical processes and their oxidative-hydrolytic transformation [17-19].

Fig. 2. Points of soil cuts and collected phytomass in the villages of Gadabay region

From 1 kg of soil at a depth of 0-25 cm, 8.2 mg of CO₂ was released, at a depth of 6.8 mg of CO₂ 20-50 cm in 1 hour. From a characteristic sample of soil crops laid on dark mountain meadow soils, 14.6 mg/kg.h of CO₂ was isolated from a depth of 0-25 cm, and 11.0 mg/kg.h from a depth of 25-50 cm. In irrigated meadow soils, from a sample taken from a depth of 0-25 cm and from a depth of 25-50 cm, CO₂ was released 17.6 and 11.9 mg/kg.h. As depth increases, the amount of carbon dioxide decreases.

Conclusion. River Cehrichay has 7 tributaries, the self-regulation coefficient is 0.67. The volume of annual imports is 28.000 tons. The degree of mineralization river Zayamchay varies from 140 to 430 mg. The waters of these rivers are irrigation waters, which are dominated by calcium carbonate. In river sediments, the content of absorbed bases does not change in contrast. The content of Mg⁺² and Ca⁺² cations is 4.3 mg/ekv and 9.6 mg/ekv. It was revealed that the activity of catalase in natural cenoses of the studied soils varies between 2.03-2.80 ml O₂/g.soil, invertase 3.80-6.90 mg.gluc./g.soil and urease 2.88 mg.NH₃/g.soil. A close correlation was found between soil moisture and enzymes (catalase, invertase) respectively, for cenoses 0.59-0.84; 0.66-0.89; and 0.74-0.94; 0.67-0.98 and 0.7-0.80. Average annual humidity 75%, annual precipitation 600-900 mm. The average annual wind speed is 2.2 m/s. Ca⁺² and Mg⁺² in mountain meadow soils gradually increases from the upper horizons 0.010% – 0.002%, to the lower 0.027% – 0.004%. The Na⁺ content also increases from the upper horizons of 2.27% to the lower ones, amounting to 3.08%. On the agrocenosis of forage plants, the content of Ca⁺² and Mg⁺² cations along the profile is much higher than in virgin soils of the natural cenosis. The total amount of Na⁺ and K⁺ increases both in the upper horizons and in the lower horizons. In mountain meadow soils of natural and cultivated cenoses, the pH changes between 7.3-7.8.

The herbarium was collected and the dominant floristic composition of natural cenosis was determined: *Vicia faba* L., *Taraxacum officinale* F.H. Wigg., *Artemisia vulgaris* L., *Anthemis candidissima*
Invertebrates were collected and the dominant composition of the fauna of natural cenoses was determined: Tetrigonidae, Hemiptera, Cerambucidae, Tenebrionidae, Coccinellidae, Cryllidae, Castropoda, Arachnidae, Alleculidae, Diptera, Isopoda, Lumbricidae, Carabidae, Curculionidae, Lepidoptera and others.

Therefore, agriculture has a positive effect on soil processes. The roots of vegetables and cereals determine the high productivity of the aboveground mass.

REFERENCES

1. Askerova, G. F. (2019). Vnedrenie biologicheskoi aktivnykh veshchestv i biogumusa dlya vosstanovleniya plodorodiya oroshaemykh lugovo-serozemnykh pochv. Ekologicheski vestnik Severnogo Kavkaza, 15(3), 22-25.
2. Hasanova, T., Mammadova, G., & Asgarova, G. (2021). Phytomass of Gray-Brown Soils Forming in Arid Ecosystem of Azerbaijan. Bulletin of Science and Practice, 7(9), 110-115. (in Russ.). https://doi.org/10.33619/2414-2948/70/11
3. Basiouny, A. (2021). Enzymatic efficacy of Nimbecidine®, a neem extract, against the phosphatases in certain tissues of the desert locust Schistocerca gregaria (Forskal)(Orthoptera: Acrididae). Archives of Agriculture Sciences Journal, 4(1), 127-147. https://doi.org/10.21608/aasj.2021.62324.1054
4. Blanco-Canqui, H., & Benjamin, J. G. (2013). Impacts of soil organic carbon on soil physical behavior. Quantifying and modeling soil structure dynamics, 3, 11-40. https://doi.org/10.2134/advagricsystmod3.c2
5. Bogoeva, A. L., & Durakova, A. G. (2020). Sorption characteristics of full-fatted grape seeds flour of Bulgarian origin. Journal of Agriculture and Food Research, 2, 100026. https://doi.org/10.1016/j.jafr.2020.100026
6. Bull, J. W. (2002). Soil-Structure interaction: numerical analysis and modelling. CRC Press.
7. Busse, M., Giardina, C., Morris, D., & Page-Dumroese, D. (2019). Global Change and Forest Soils: Cultivating Stewardship of a Finite Natural Resource. Elsevier.
8. Castellini, M., & Iovino, M. (2019). Pedotransfer functions for estimating soil water retention curve of Sicilian soils. Archives of Agronomy and Soil Science, 65(10), 1401-1416. https://doi.org/10.1080/03650340.2019.1566710
9. Chopde, S., Datir, R., Deshmukh, G., Dhotre, A., & Patil, M. (2020). Nanoparticle formation by nanospray drying & its application in nanocapsulation of food bioactive ingredients. Journal of Agriculture and Food Research, 2, 100085. https://doi.org/10.1016/j.jafr.2020.100085
10. Fukumasu, J., Jarvis, N., Koestel, J., Kätterer, T., & Larsbo, M. (2022). Relations between soil organic carbon content and the pore size distribution for an arable topsoil with large variations in soil properties. European Journal of Soil Science, 73(1), e13212. https://doi.org/10.1111/ejss.13212
11. Fukumasu, J. (2022). Relations between soil organic carbon, soil structure and physical processes in an agricultural topsoil: The role of soil mineral constituents.
12. Hasanova, T.A. (2021). Application Ict To Research The Influence Of Flooding Of The Kish River On Agroecological Indicators Of Irrigation Water And Soils Of Natural Senoses. Journal of Academic Research, 59(2), 68-74.
13. Hasanova, T.A. (2015). Complexes (Ecogroups) of the invertebrates, phytomass and dynamics of microbiological population and their importance at grey-brown soils diagnostics in Azerbaijan. Universal Journal of Agricultural Researches, 3(4-2015), 130-134.
14. Hasanova T.A. (2021). Fundamentals of fertilizers on gray-meadow soils of the Gadabay region of Azerbaijan // Biology, Plant Ecology. №10.
15. Hasanova, T. A., & Hasanov, A. B. (2021). Soil-melioration peculiarities in basin of Kish river. Annals of Agrarian Sciences, Georgia, 19(2), 126-135.
16. Hasanova, T. A., & Mammadova, G. I. (2021). Importance of biodiagnostics and irrigation grey-brown soils. Universal Journal of Agricultural Research, (13).
17. Hatten, J., & Liles, G. (2019). A ‘healthy’balance–The role of physical and chemical properties in maintaining forest soil function in a changing world. In Developments in Soil Science (Vol. 36, pp. 373-396). Elsevier. https://doi.org/10.1016/B978-0-444-63998-1.00015-X
18. Mammadov, E., Nowosad, J., & Glaesser, C. (2021). Estimation and mapping of surface soil properties in the Caucasus Mountains, Azerbaijan using high-resolution remote sensing data. Geoderma Regional, 26, e00411. https://doi.org/10.1016/j.geodrs.2021.e00411
19. Pachepsky, Y., & Rawls, W. J. (Eds.). (2004). Development of pedotransfer functions in soil hydrology (Vol. 30). Elsevier.
20. Singh, B., & Grafe, M. (Eds.). (2010). Synchrotron-based techniques in soils and sediments. Elsevier.
21. Tan, K. H. (1995). Soil sampling, preparation, and analysis. CRC press.

ЛИТЕРАТУРА

1. Аскерова Г.Ф. Внедрение биологически активных веществ и биогумуса для восстановления плодородия орошаемых лугово-сероземных почв // Экологический вестник Северного Кавказа. 2019. Т. 15. №3. С. 22-25. 2.
2. Гасанова Т.А., Маммадова Г.И., Аскерова Г.Ф. Фитомасса серо-бурых почв, формирующаяся в аридной экосистеме Азербайджана // Бюллетень науки и практики. 2021. Т. 7. №9. С. 110-115. https://doi.org/10.33619/2414-2948/70/11 11.
3. Basiouny A. Enzymatic efficacy of Nimbecidine®, a neem extract, against the phosphatases in certain tissues of the desert locust Schistocerca gregaria (Forskal)(Orthoptera: Acrididae) // Archives of Agriculture Sciences Journal. 2021. Vol. 4. №1. P. 127-147. https://doi.org/10.21608/aasj.2021.62324.1054 3.
4. Blanco-Canqui H., Benjamin J.G. Impacts of soil organic carbon on soil physical behavior // Quantifying and modeling soil structure dynamics. 2013. Vol. 3. P. 11-40. https://doi.org/10.2134/advagricsystmodel3.c2 4.
5. Bogoeva A.L., Durakova A.G. Sorption characteristics of full-fatted grape seeds flour of Bulgarian origin // Journal of Agriculture and Food Research. 2020. Vol. 2. P. 100026. https://doi.org/10.1016/j.zafr.2020.100026 1.
6. Bull J. W. Soil-Structure interaction: numerical analysis and modelling, CRC Press, 2002. 15.
7. Busse M., Giardina C., Morris D., Page-Dumroese D. Global Change and Forest Soils: Cultivating Stewardship of a Finite Natural Resource. Elsevier, 2019. 5.
8. Castellini M., Iovino M. Pedotransfer functions for estimating soil water retention curve of Sicilian soils // Archives of Agronomy and Soil Science. 2019. Vol. 65. №10. P. 1401-1416. https://doi.org/10.1080/03650340.2019.1566710 6.
9. Chopde S., Datir R., Deshnukh G., Dhotre A., Patil M. Nanoparticle formation by nanospray drying & its application in nanoencapsulation of food bioactive ingredients // Journal of Agriculture and Food Research. 2020. Vol. 2. P. 100085. https://doi.org/10.1016/j.zafr.2020.100085 7.
10. Fukumatsu J. Relations between soil organic carbon, soil structure and physical processes in an agricultural topsoil: The role of soil mineral constituents. 2022. 18.
11. Fukumatsu J., Jarvis N., Koestel J., Kätterer T., Larsbo M. Relations between soil organic carbon content and the pore size distribution for an arable topsoil with large variations in soil properties // European Journal of Soil Science. 2022. Vol. 73. №1. P. e13212. https://doi.org/10.1111/ejss.13212 17.
12. Hasanova T.A. Application Ict To Research The Influence Of Flooding Of The Kish River On Agroecological Indicators Of Irrigation Water And Soils Of Natural Senoses // Journal of Academic Research. 2021. Vol. 59. №2. P. 68-74. 8.
13. Hasanova T.A. Complexes (Ecogroups) of the invertebrates, phytomass and dynamics of microbiological population and their importance at grey-brown soils diagnostics in Azerbaijan // Universal Journal of Agricultural Researches. 2015. Vol. 3. №4-2015. P. 130-134. 9.
14. Hasanova T.A. Fundamentals of fertilizers on gray-meadow soils of the Gadabay region of Azerbaijan // Biology, Plant Ecology. 10.
15. Hasanova T.A., Hasanov A.B. Soil-melioration peculiarities in basin of Kish river // Annals of Agrarian Sciences, Georgia. 2021. Vol. 19. №2. P. 126-135. 12.
16. Hasanova T.A., Mammadova G.I. Importance of biodiagnostics and irrigation grey-brown soils Universal Journal of Agricultural Research. 2021. 13.
17. Hatten J., Liles G.A ‘healthy’balance–The role of physical and chemical properties in maintaining forest soil function in a changing world // Developments in Soil Science. Elsevier, 2019. Vol. 36. P. 373-396. https://doi.org/10.1016/B978-0-444-63998-1.00015-X 14.
18. Mammadov E., Nowosad J., Glaesser C. Estimation and mapping of surface soil properties in the Caucasus Mountains, Azerbaijan using high-resolution remote sensing data // Geoderma Regional. 2021. Vol. 26. P. e00411. https://doi.org/10.1016/j.geodrs.2021.e00411 19.
19. Pachepsky Y., Rawls W. J. Development of pedotransfer functions in soil hydrology. Elsevier, 2004. Vol. 30. 20.
20. Singh B., Grafe M. Synchrotron-based techniques in soils and sediments. Elsevier, 2010. 21.
21. Tan K.H. Soil sampling, preparation, and analysis. CRC press, 1995. 16.

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