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INFLUENCE OF ALYUMOSILICATE CLAYS ON ECOLOGICAL CONDITION OF APSHERON LANDS**Z.R.Agayeva, B.G.Mammadova*, E.M.Kazimova**, I.A.Talibli, S.G.Efendiyeva, Ch.M.Shabanova***M.Nagiyeu Institute of Catalysis and Inorganic Chemistry NAS of Azerbaijan*** Institute of Soil Science and Agrochemistry NAS of Azerbaijan****Azerbaijan University of Architecture and Construction**agayeva-zenfira@mail.ru*

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In the paper it is shown the results of research, focused on bentonite clay, deposited on the background of mineral fertilizers. This mineral is used to improve the ecological environment of the soil and increases the efficiency of mineral fertilizer application into it. Reducing soil degradation, in addition to improving plant productivity, bentonite has also a significant impact on the improvement of water, physical and agrochemical conditions of the soil and creates favorable conditions for improving plant growth and increased amount of phosphorus absorbed in the soil.

Keywords: gray-brown soil, rocks, montmorillonite, bentonite clay, eggplant.

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Increased industry development, intensive mining, individual branches of engineering and energy led to large-scale environmental pollution: air, water and soil. In this case soil, under the conditions of anthropogenic impact on the ecosphere, acts as a receiver of pollutants. The problem of cleaning the soil is one of the most important and at the same time it is difficult to resolve these problems. Despite the intensive efforts of scientists and entrepreneurs who conducted research in this area, this problem still has no concrete solution. This problem, which consists in cleaning the soil, including oil-polluted lands, and restoring its original structure, is still in demand and requires its own specific completion. Among the numerous proposed solutions aimed at eliminating these negative phenomena, a clear preference is given to the use of inorganic sorbents of natural origin. It should be noted that the territory of the Absheron Peninsula is exposed to the greatest pollution. At the same time, there is a need for relentless control over the oil contamination of the land and the Caspian oil and gas development sector, since this is directly related to the issues of industrial ecology and safety of life activity of living organisms. According to the monito-

ring data, a significant amount of iron (up to 0.140–0.178 mg/l), zinc (0.126–0.166 mg/l) and also several transboundary concentrations of heavy metals in the soil: iron (10.6 g/kg) were detected in samples of the water of the Caspian Sea soil), nickel (up to 0.756 g/kg of soil) and copper (up to 0.068 g/kg of soil).

For the purpose to develop the above task, and test for profitability, we studied the clay rocks of the Absheron field as sorbents. In the study of the chemical and mineral composition of these rocks, it was found that this composition contains, unlike the bentonite rocks of other deposits (Dash-Salakhly, Hizi, Alibayramly, etc.), an insignificant amount of montmorillonite-45%. It was of scientific and practical interest for further use of the above clay minerals for the indicated purposes [1–2]. When selecting effective sorbents, it was also taken into account that natural clay minerals have the property of significant swelling during hydration [3–4]. At the same time, in the space limited for free swelling, in the presence of water, a dense gel is formed, which prevents further penetration of moisture and prevents its evaporation at high ambient temperatures. Such clay minerals, when added to the “light” soils as

a meliorative sorbent, improve the soil structure and increase its fertility. The energy inhomogeneity of the surface of mineral particles leads to differences in the adsorption activity and selectivity of filling certain areas of the surface. On the surface of soil mineral particles, active sites form mosaic patterns from hydrophilic and hydrophobic sites where selective sorption takes place. Due to the irreversibility of the process, the soil loses its ability to retain moisture for vegetation, and the process of reproduction of biomass is disturbed. It was found that the application of clay minerals to the soil improves the water regime of dry suspended soil.

Various agrotechnical, meliorative measures are currently realized in Azerbaijan to improve the ecological environment of cultivated lands used in agriculture, to obtain clean and abundant crops from plants. One of the most important of these measures is the use of organic and mineral fertilizers as well as the use of natural soil improvement minerals. It is known that 75–85% of the needs of agricultural crops are covered by land resources. The main environmental problem is the replacement of nutrient deficiencies by mineral fertilizers. Therefore, it is of utmost importance to reduce soil degradation, as well as to increase the productivity of plants and use of non-traditional land improvers that have a significant impact on the water-physical and agro-biological regime of soil. Such non-traditional mineral resources can be represented by bentonite, seolite, perlite, tea and serpentinite. In recent studies, serpentinite from non-traditional soil improvers has been found in grass-grass and grass-gray soils in the Shirvan, Mil, Mugan and Garabagh plains of Kura, that was used under the plant. Currently, extensive research has been done on bentonite clay in many countries. It is of utmost importance that the bentonite clay containing calcium, magnesium, potassium, and several microelements is used to improve the physical,

chemical and agrochemical properties of the soils [5]. The results of several studies have shown that the use of bentonite clay in different types of soil has had a good effect on the growth of agricultural crops [6].

It was determined the 3-years use of the Montmorillonite bentonite clay on the black soil by the fact that the bentonite clay improved the physical, chemical and agrochemical properties of the soil so that the vacuum productivity increased by 0.61 t / h or 16%. Taking into account these studies, we aimed to explore the replication of the bentonite clay in our country in the agricultural sector.

Results and discussion

The general physical and chemical properties of the bentonite clay and the effects of bentonite clay on the agrochemical and chemical properties of the soil and the improvement of the ecological environment of the plant have been studied. The bentonite rocks are located in the territory of Dash Salahli village of Gazakh region and Gusdek on Absheron peninsula. Bentonite clay on the Absheron Peninsula is located at the depth of 5m below the carbonate rocks in the Guzdek village. Bentonite clay was taken from that area. The aim of the research was to carry out experiments to improve soil ecological state, to increase the efficiency of mineral fertilizers to soil, and to explore the effects of bentonite clay on the background of mineral fertilizers on the background of plant-rich growth and the amount of monoculture phosphorus in the soil to obtain cleaner crops. As the pilot object it was selected the experimental area of the Agricultural Institute located on the Absheron peninsula and soil samples were taken. Obtained initial data and coordinates of the slices is given in the Table 1.

Field samples taken from the slaughterhouses of the Institute of Agriculture have been assigned field drainage and are listed in the Table 2 below.

Table 1. Characteristics of slices

k-1	40° 31' 49,4 "N	49° 51' 39,3 "E	Poor nutrition of the grain 22–28 cm.
k-2	40° 31' 48,5 "N	49° 51' 39,2 "E	Average yield of grain is 32–37 cm.
k-3	40° 31' 47,3 "N	49° 51' 42,2 "E	Very poor output of grain is 15–20 cm.
k-4	40° 31' 51,9 "N	49° 51' 54,6 "E	The best output of the grain is 112–128 cm.

Table 2. Ground-brown soil condition of the Absheron region

SN	Sample name	Depth cm	Sample N	Sample empty weight	Sample with ground weight	Sample with dry ground weight	loss	Medium loss	Clean dry land	Medium loss	Medium loss %
1	4	0–27	202 016 365	22.5491 21.6803 21.9793	36.5385 36.2984 36.2104	35.2612 34.7072 34.6737	1.28 1.59 1.54	1.47	13.99 14.62 14.84	14.29	10.29
2		27–61	153 345 178	21.2731 22.3476 21.9648	34.7765 33.0938 33.5253	33.1812 31.6710 32.2272	1.60 1.43 1.30	1.45	13.46 10.75 11.56	11.93	12.15
3		61–139	203 384 204	21.8908 21.8911 22.1565	30.3720 32.8886 33.7366	29.3649 31.7252 32.3549	1.01 1.17 1.39	1.19	8.49 11.0 11.5	10.33	11.52
4		139–186	391 218 098	22.3590 22.7610 20.9774	35.4916 37.4133 33.4894	34.0092 35.7720 32.1087	1.49 1.65 1.29	1.48	13.14 14.66 12.52	13.44	11.01

Table 3. Compared with the bentonite clay superphosphate

Practice scheme	21.05	19.05	06.05	13.05	20.06
Control	8.5	9.6	11.2	12.8	13.2
100qt + back ground (0.5qs / f)	9.2	10.5	12.8	13.3	14.6
100qt + back ground + 2q bentonite clay	9.9	10.8	13.9	14.4	16.7
100qt + 2q bentonite clay	8.1	9.5	12.1	12.9	13.9

Soil samples taken from the experimental areas of the Institute of Agriculture were placed in containers for experiments in laboratory conditions and experiments under 2 repeated eggplant plants.

Practice scheme

1. Control option
2. Fon (100kg + 0.5g.superphosphate)
3. Fon + 2q. bentonite clay
4. 100 kg of soil + 2q. bentonite clay

The result of the study showed that, when serpentinite was deposited in the background of mineral fertilizers, it created a favorable water-resistant aggregate in the soil, reduces the soil's inflatable ability, improves dehydration, and also weakens serpentinite superphosphate to a hard-digested soil. Generally, the serpentinite in the background of mineral fertilizers is the nutritional elements used in the soil not only during the vegetation period, but even after the end of the vegetation period.

The results obtained from the experiments were analyzed as follows:

1. During the experiment, the height of the plants was monitored and measured once a week.
2. Determination of hygroscopic moisture in soil samples taken from plants at the end of the experiment
3. Determination of pH

4. Determination of the amount of volatile phosphorus in the soil by the technique of migration.

The effect of the bentonite clay on the growth of the eggplant plant is given in Table 3. The height of the eggplant plant (in cm).

The bentonite clay is clearly visible in the dynamics of plant growth. For example, if the size of the eggplant is 13.2 cm in the control version, the height of the eggplant has been 16.7 cm in the variant of the bentonite clay with the superphosphate. Comparison of plant height shows the favorable conditions for plant growth with the bentonite clay in the soil.

As shown by the results obtained, the bentonite clay superphosphate, as well as the option given alone, shows the amount of gentle cortex of the hygroscopic humidity. Thus, if the amount of hygroscopicity was 1.30% in the control variant, the bentonite clay with the superphosphate was 1.38%, alone compared with 1.39% in the version. As seen from the results, the amount of P_2O_5 compared with the control version was 26.67 mg/kg, with the superphosphate in the 2q bentonite clay version of 140.34 mg/kg. The obtained results show the effect of bentonite clay on the amount of persistent phosphorus in the soil. The soil's pH alkaline environment has not changed much by the effect of the bentonite clay.

Table 4. Determination of the gray-brown soil's hychrosopic moisture in the Absheron region

Experience scheme	Sample N	Sample empty weight	Sample with ground weight	Sample with dry ground weight	loss	Clean dry land	%	Medium %
1	348 329	22.9658 23.1423	32.4244 33.8218	32.3038 33.6820	0.1207 0.1398	9.3380 10.5397	1.29 1.32	1.30
2	373 327	22.9000 22.8659	34.2749 34.7694	34.1308 34.6167	0.1441 0.1527	11.2308 11.7508	1.28 1.29	1.28
3	375 309	23.2277 24.0046	34.0137 33.7764	33.8667 33.6428	0.1470 0.1336	10.6390 9.6382	1.38 1.38	1.38
4	400 333	22.8578 22.9621	32.0759 31.6048	31.9596 31.4858	0.1263 0.1190	9.1018 8.5237	1.39 1.39	1.39

Conclusion

It is important to reduce the soil degradation rate, as well as to increase the productivity of plants, as well as the use of non-traditional land improvers that have a significant impact on the water-physical and agro-ecosystems of the soil.

It has been learned that the bentonite clay consisting of calcium, magnesium, potassium and several micronutrients combined with superphosphate has a beneficial effect on the physico-chemical and agrochemical properties of the gray-brown soil of the Absheron region and the growth of the plant.

References

1. Altunin D.A. Vliianie glinovaniia na povyshenie plodorodiia peschanykh pochv. Dostizheniia nauki i tekhniki APK. 2001. № 12. S. 31–33.
2. Agaeva Z.R. Ispolzovanie glinistyx mineralov - kak uvlazhnitelia pochv. Akademik M.Nağıyevin 110 illiyinə hısr olunmuş "Nağıyev günləri"

beynəlxalq elmi konfransın materialları, Bakı, 2018. S. 78.

3. Dzhaferova S.T., Gakhramanova E.B., Akhmedov M.M., Agaev A.I. Poluchenie katalizatorov v othode aluminievogo proizvodstva dlia izvlecheniia sery. Himicheskaiia promyshlennost segodnia, 2017. № 4. S. 26–33.
4. Məmmədova B.H., Mehdiyev H.C. C.Muğan düzü suvarılan boz-çəmən torpaqlarında mütəhərrik fosforun miqdarına serpentinitin 3 illik sonrakı təsiri Az.MEA Biologiya elmləri bölgəsi TAl XI X cild, Bakı. Elm. 2011. S. 91–95.
5. Agafonov E.V., Hovanskii M.V. Izmenenie agrohimicheskikh svoistv chernozema obyknovenogo i urozhainosti sorgo pod vliianiem bentonita. Problemy agrohimii i ekologii. 2010. № 3. S. 3–6.
6. Dzhabarov E.E., Agaeva Z.R., Imanova N.A., Mamedova S.G., Mamedov U.A., Iagubov A.I. Issledovanie himiko-minerologicheskogo sostava modifitsirovannykh sloistyx aliumosilikatov. Tezisycladov XIII Mezhdunarodnoi konferentsii "Problemy solvatatsii i komplekssoobrazovaniia v rastvorakh", Rossiia. g. Suzdal, 2018. S. 180–181.

ALÜMOSİLİKAT GİLLƏRİN ABŞERON TORPAQLARININ EKOLOJİ VƏZİYYƏTİNƏ TƏSİRİ

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Məqalədə torpağın ekoloji mühitini sağlamlaşdırmaq, torpağa verilən mineral gübrələrin səmərəliliyini artırmaq üçün mineral gübrə fonunda torpağa verilən bentonit gilinə istifadə edilir. Torpaqların deqradasiyalanmasının sürətini azaltmaq, eləcə də, bitkilərin məhsuldarlığını artırmaqla yanaşı, həmçinin torpağın su-fiziki və aqrofiziki rejiminə də əhəmiyyətli təsir göstərir. Torpağın su-fiziki, aqrokimyəvi xüsusiyyətlərinə və ekoloji mühitin sağlamlaşmasına əlverişli şərait yaradır ki, bu da bitkilərin boy artımını və torpaqda mütəhərrik fosforun miqdarını yaxşılaşdırır.

Açar sözlər: boz-qonur torpaq, süxur, montmorillonit, bentonit gili, badımcan bitkisi.

ВЛИЯНИЕ АЛЮМОСИЛИКАТНЫХ ГЛИН НА ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ АПШЕРОНСКИХ ЗЕМЕЛЬ

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В статье с целью улучшения экологической среды почвы и повышения эффективности внесения в нее минеральных удобрений используется бентонитовая глина, нанесенная на фон минеральных удобрений. Снижение деградации почв, помимо повышения продуктивности растений, также оказывает существенное влияние на оздоровление водно-физического и агрохимического состояния почвы и создает благоприятные условия для улучшения роста растений и количества поглощенного фосфора в почве.

Ключевые слова: серо-коричневая почва, горные породы, монтмориллонит, бентонитовая глина, сельскохозяйственная продукция баклажан.