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AGROCHEMICAL INDICATORS OF AREAS CLOSE TO MINE ORES OF MARTAKERT REGION OF ARTSAKH

Tatevik A. Jhangiryan
Armenian National Agrarian University
74 Teryan St, 0009 Yerevan
tjhangiryan@mail.ru
ORCID iD: 0000-0002-6557-9303
Republic of Armenia

Surik A. Hunanyan
Armenian National Agrarian University
74 Teryan St, 0009 Yerevan
hunanyansuren4@gmail.com
ORCID iD: 0000-0001-6370-3377
Republic of Armenia

Marina H. Barseghyan
Armenian National Agrarian University
74 Teryan St, 0009 Yerevan
barseghyanmar83@mail.ru
ORCID iD: 0000-0002-0127-4834
Republic of Armenia

Arevik Sh. Eloyan
Armenian National Agrarian University
74 Teryan St, 0009 Yerevan
elarev@mail.ru
ORCID iD: 0000-0002-1381-2257
Republic of Armenia

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Abstract

The agro-chemical and physicochemical properties of the soils of the areas adjacent to the iron ores of Artsakh were studied.

And despite the fact that mine exploitation did not negatively affect the agrochemical indicators of the soils of the surrounding areas and minor differences observed in the control and adjacent areas are due to the relief, location and other ecological factors of the area. The results of the research show that the soils have less favorable agrochemical and physicochemical properties for plant growth and development and complex application of mineral and organic fertilizers is necessary to obtain high and ecologically clean crops.

Key words: soil, agrochemical index/indicator, fertility, mine, impact.

Intriduction

The soil, as a natural body and the main means of agricultural production, is a complex and constantly changing dynamic system. All human activity, fauna and flora, global and regional atmospheric processes and physical phenomena, to one degree or another, primarily affect the upper layer of the earth's crust the soil. There is a direct correlation between the main agrochemical properties of the soil and crop yields. A decrease in fertility parameters, expressed in humus content, the content of available nutrients, etc., inevitably leads to a steady depression in the productivity of agro products. With low reserves of organic matter, excessive acidity or alkalinity, deficiency of mobile forms of macro- and microelements and soil compaction, plants are highly susceptible to depression, especially under adverse weather conditions during the growing season [1].

Soil and land cover development, as well as fertility formation, are closely related to natural soil-forming factors. Soil as a basic component of the environment performs a number of functions: ecological, natural regulatory and production, as well as sanitary. Due to the high self-cleaning property of the soil, the biota living in it is ensured to disinfect a number of pathogens and toxicants, which positively affects the quality of agricultural products and the state of the environment.Soil acts as a biochemical barrier capable of absorbing various compounds, including toxic substances and preventing their accumulation in agricultural products. Thus, the soil solution contains both dissolved organic, organic-mineral and mineral compounds the quantitative and qualitative composition of which is different in different soils. One of the important properties of the soil solution is the nature of its reaction which is governed by the buffering properties of the soil [2]. There is a direct relationship between the main agrochemical parameters of the soil and crop yield. Due to low reserves of organic matter, excessive acidity or alkalinity, lack of mobile forms of macro and microelements and soil composition plants are subject to stress, especially during the growing season and particularly in adverse weather conditions. The main property of the soil is its fertility which is able to provide plants with water, food and other earthly conditions for their growth and development: air, heat, environmental reaction, etc. [3].

Soil studies in the pastures, arable lands and grasslands of Askeran region of the Republic of Artsakh have recently shown that the available amounts of basic nutrients in these soils are not high, while humus in the AB horizons of individual sections reaches 4-6% [4].

In order to improve the amount of available nutrients, it is necessary to use mineral and organic fertilizers the selection of doses of which depends on the amount of organic matter in the soil (humus), the reaction of the soil solution, the mechanical composition, the amount of total and mobile nutrients, as well as the buffering capacity [5].

Buffering is the property of a soil by which it resists processes that tend to change the reaction nature of the soil. The property of buffering depends on the content of colloids in the soil, the amount of organic matter (humus), the composition of absorbed cations etc. The buffering capacity of the soil, its nature and degree mainly depend on the solid phase and the degree of dispersion of colloids, as well as absorbed cations. In soils rich in clay and humus, the buffering capacity of the soil is strongly expressed. The degree of buffering capacity of sandy soils is low [6].

The buffering capacity of the soil solution is caused by carbonates, sulphates and phosphates of alkali and alkaline earth metals. Atmospheric precipitation, ground and irrigation water can change the reaction of the soil, if the latter had no buffering capacity.

Plants are sensitive to changes in the soil and the buffering property plays a major role in their growth and development. Buffering can be increased by using organic fertilizers [7].

Conflict setting

The problem of preserving and increasing soil fertility in the Republic of Artsakh has been and remains relevant, especially in connection with the deterioration of their condition, general anthropogenic degradation and created in connection with the post-war situation. Today, more than ever, it is necessary to implement comprehensive agro-technical measures, which will make it possible to effectively use the limited land resources of the Republic of Artsakh. Taking into account the created post-war conditions, a need has arisen on the basis of previous research [8], 2020-2021: to carry out new studies in Martakert region, to include new agricultural lands in circulation for which it is necessary to perform soil scientific and agrochemical studies.

Materials and methods

The studies were carried out in the areas close to the mines of Martakert region/Drombon and Kashen iron ores. The goal was to study the agrochemical indicators of the soils of these areas in order to include them in agricultural circulation. Occupying the northern part of the republic, the lowlands of the region are included in the lands of the mountain forest zone which are mostly spread within the height range of 1000-2000m [9,10]. The dominating type is the forest-brown soil type which appear in the form of–«released from lime», typical and carbonate types.According to E. M. Hayrapetyan (2000) forest brown soils are characterized by existence of a 2-3 cm thick forest cover, walnut-like structure, high humus content in the upper layers of the soil (5-8%), have a clay-sand, in some places clay mechanical composition. However, studies on agrochemical indicators of soils (particularly soils close to iron ores) are few, therefore the research of physicochemical parameters of the lands close to the technogenic objects (Drmbon, Kashen) has an environmental-defensive, social-economical, ecological and strategic significance at the present stage.

The research was conducted by using field experimental and laboratory research methods. Field research has been conducted in brown forest soil conditions. All soil samples were taken by means of sampling device Burkle Soil Sampling Kit. For determination of sampling the agrochemical indicators was performed according to genetic horizons: 0-16, 16-38, 38-70, 70-109 cm-from four depths.

After transfer to the laboratory, the stones and plant residues were removed from the samples, then dried at room temperature /20-22 °C / and crushed for further studies. Humus in soil samples was determined according to I.V. Tyurin's, available nitrogen-I.V. Tyurin-M. Kononova's, available phosphorus (P_2O_5)-B.P. Machigin /carbonate soils/, available potassium (K_2O)-A.L. Maslova's methods, total nitrogen by Y.G. Keldal's, phosphorus and potassium by H.A. Lorentz's methods, the mechanical composition was determined according to N.A. Kachinsky's, the reaction of the soil solution was electro-potential-metric, the content of carbonates ($CaCO_3$) was determined by Kudrin's methods [11,12,13]. Agrochemical/physicochemical property analyzes were performed in three samples.

Research Results

The data in the table show that the humus content in the nearby soils of Drmbon Enrichment Plant is quite high in the upper soil (A) genetic horizons and fluctuates in the

range of 7.9-8.2%, which decreases in depth, and in the C horizons, reaches 0.02-0.14%. The reaction of the soil solution, depending on the genetic horizons, ranges from a weak acid to a basic/alkaline reaction (pH 6.14-8.4). The carbonate content in the upper soil layers (A) is absent/missing, and the quantity increases with depth.

Table

Agrochemical characteristics of areas close to mines (Drmbon, Kashen, Artsakh Republic)

Land plot number, land type/lookand place	Horizon power, cm	Humus, %	pH	$CaCO_3$,by CO_2	<0,01 mm, %	Total nutrients,%			Available nutrients, mg/in 100 g soil		
						N	P_2O_5	K_2O	N	P_2O_5	K_2O
1	2	3	4	5	6	7	8	9	10	11	12
1.Forest brown typical, Drmbon, 3 km /inspection /	A 0-16	8,2	6,59	-	44,04	0,24	0,23	1,90	3,6	5,6	48,2
	B 16-38	6,5	7,5	4,6	59,60	0,23	0,21	1,76	3,0	4,7	36,0
	BC 38-70	3,8	8,4	10,8	36,60	0,12	0,18	1,64	1,40	2,0	39,6
	C 70-109	0,02	8,4	7,9	23,54	0,09	0,14	1,52	0,28	0,69	21,0
2. Forest brown typical, Drmbon, 600 m	A 0-12	7,6	6,14	-	39,0	0,23	0,22	1,98	4,2	5,3	49,6
	B 12-35	4,3	6,9	6,2	42,6	0,21	0,22	1,80	3,9	4,0	46,5
	BC 35-62	3,7	7,8	7,0	40,5	0,19	0,17	1,63	2,4	1,8	29,0
	C 62-104	0,14	7,6	6,1	30,0	0,06	0,09	1,38	0,20	0,07	20,3
3.Forest brown typical, Drmbon, 200 m	A 0-13	8,0	7,0	-	46,2	0,24	0,23	2,1	3,9	5,1	51,0
	B 13-30	5,1	7,6	3,65	52,0	0,21	0,21	2,0	4,1	4,7	36,1
	BC 30-85	3,7	7,8	7,04	30,5	0,16	0,12	1,7	2,4	1,6	30,0
	C 85-117	0,025	8,1	8,1	31,9	0,04	0,07	1,3	0,02	0,03	23,1
4.Forest brown typical, Kashen, 5-6 km /inspection /	A 0-16	7,9	7,2	-	46,0	0,23	0,22	2,0	4,4	4,6	46,2
	B 16-38	4,2	6,7	2,6	58,5	0,20	0,20	1,71	3,9	4,0	39,4
	BC 38-70	2,0	7,3	8,0	57,4	0,17	0,16	1,60	2,0	1,2	48,3
	C 70-98	0,4	7,6	8,2	30,0	0,08	0,09	1,40	0,05	0,43	24,0
5. Forest brown typical, Kashen, 2 km	A 0-18	7,4	6,9	-	49,8	0,24	0,23	1,90	3,9	5,0	49,8
	B 18-42	4,0	7,2	2,2	56,5	0,21	0,19	1,90	3,0	4,1	42,0
	BC 42-80	1,8	7,8	4,2	60,0	0,13	0,19	1,70	2,1	2,8	30,0
	C 80-117	0,8	9,5	8,6	26,5	0,06	0,07	1,15	0,05	0,90	16,6
6.Forest brown typical, Kashen, 800 m	A 0-14	9,1	6,6	-	42,0	0,24	0,24	2,0	4,1	5,1	54,0
	B 14-35	5,6	6,8	3,6	54,3	0,20	0,21	1,8	3,0	5,0	50,0
	BC 35-90	1,9	7,6	6,9	53,1	0,20	0,20	1,8	1,9	3,1	42,6
	C 90-112	0,9	8,0	6,9	28,6	0,03	0,09	1,2	0,06	0,78	29,0
7. Forest brown typical, Kashen, 200 m	A 0-12	8,3	6,8	-	45,0	0,24	0,23	1,97	3,9	4,4	52,2
	B 12-38	4,3	7,4	1,2	59,4	0,22	0,20	1,70	3,0	5,0	38,7
	BC 38-96	2,6	8,2	3,9	35,0	0,16	0,18	1,45	2,0	3,0	40,0
	C 96-118	0,14	8,6	6,7	31,0	0,07	0,02	0,16	0,07	0,40	21,0

The studied soils are characterized by clay-sand heavy mechanical composition. Accumulation of physical clay is recorded mainly in horizon B, which is 3.60-15.56% more than in horizon A, and, compared to horizons BC and C 0.21-22.0 and 12.6-26.06%,

respectively. The content of total nitrogen in the upper layers of the 1st, 2nd, 3rd sections (A, 0-12, 0-16 cm) varies from 0.23-0.24%, phosphorus-0.22-0.23, potassium-1.98-1.90%, which is- 8.4-3.2, 2.44-1.64, 1.25-1.46 times higher than the C horizon, respectively.

The studied soil samples of the 1st, 2nd and 3rd sections are poorly supplied with nitrogen and phosphorus and with potassium–average and good.

The analysis of agrochemical indicators of the lands/soils adjacent to Kashen mine shows that the emissions caused by the activity of the man-made/techno genic source also did not have a significant impact on the physicochemical indicators of the lands/soils of the adjacent areas (sect. 4,5,6,7): Thus, in the 4th incision (control 5-6km) in horizon A (0-16cm) and in the 6th incision in the area adjacent to the plant (200m), (0-17cm) humus difference was 0.4%. Changes in other agrochemical parameters (pH, carbonates, total and movable/mobile nutritional substances) were not recorded in the same genetic horizons (Table).

The activities of the mines did not have a negative impact on the physicochemical (agrochemical) parameters/indicators of the main component of the environment-the soil.

Conclusions

The soils of the areas close to Drmbon and Kashen mines have unfavorable conditions from an agronomic point of view for ensuring a high yield of crops and one of the primary factors of regulation is the use of organic and mineral fertilizers.

The degree of insecurity of mobile nutrients is caused by the lack of annual fertilizing in the soil (non-use of mineral fertilizers for many years, non-implementation of other agro technical measures).

The direct and indirect effects of the mines on the physicochemical indicators of the soils of the surrounding areas do not pose a threat. Safe agricultural products can be obtained from the soils of the studied region.

Taking into account the agrochemical indicators of the researched soils/mobile nutrient supply level, soil mechanical composition, potential composition of cultivated plants and planned harvest quantity, multi-year results of field fertilization experiments/ the following doses of fertilization of the researched land areas are recommended:

- Semi-decomposed manure 20-30t/ha or compost 30-40t/ha,
- Semi-decomposed manure 20-25t/ha+$N_{120}P_{180}K_{90}$ kg/ha (per active substances or compost 15-20t/ha + $N_{120}P_{180}K_{90}$ kg/ha /per active substances).

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ԱՐՑԱԽԻ ՄԱՐՏԱԿԵՐՏԻ ՇՐՋԱՆԻ ՀԱՆՔԱՎԱՅՐԵՐԻ ՀԱՐԱԿԻՑ ՏԱՐԱԾՔՆԵՐԻ ԱԳՐՈՔԻՄԻԱԿԱՆ ՑՈՒՑԱՆԻՇՆԵՐԸ

Ջհանգիրյան Տ.Ա., Հունանյան Ս.Ա., Բարսեղյան Մ.Հ., Էլոյան Ա.Շ.
Հայաստանի ազգային ագրարային համալսարան

Ուսումնասիրվել է Արցախի մետաղահանքերի հարակից տարածքների հողերի ագրոքիմիական, ֆիզիկաքիմիական հատկությունները: Չնայած այն հանգամանքին, որ հանքավայրերի գործունեությունը բացասական ազդեցություն չի ունեցել հարակից տարածքների հողերի ագրոքիմիական ցուցանիշների վրա, իսկ նկատվող ոչ էական տարբերությունները, ստուգիչ և հանքերին հարակից տարածքներում, պայմանավորված

է տարածքի ռելիեֆով, դիրքադրությամբ և այլ էկոլոգիական գործոններով, հետազոտության արդյունքներից պարզ է դարձել, որ հողերը ունեն պակաս նպաստավոր ագրոքիմիական և ֆիզիկաքիմիական հատկություններ բույսերի աճի, զարգացման համար, իսկ բարձր և էկոլոգիապես անվտանգ բերքի ստացման համար անհրաժեշտ է հանքային և օրգանական պարարտանյութերի համատեղ օգտագործում:

Բանալի բառեր. հող, ագրոքիմիական ցուցանիշներ, բերրիություն, հանքավայր,ազդեցություն:

АГРОХИМИЧЕСКИЕ ПОКАЗАТЕЛИ ТЕРРИТОРИЙ, ПРИЛЕГАЮЩИХ К РУДНИКАМ МАРТАКЕРТСКОГО РАЙОНА АРЦАХА

Джангирян Т.А., Унанян С.А., Барсегян М.А., Элоян А.Ш.
Национальный аграрный университет Армении

Изучены агрохимические, физико-химические свойства почв территорий, прилегающих к рудным месторождениям Арцаха.

И несмотря на то, что эксплуатация месторождений не оказала негативного влияния на агрохимические показатели почв прилегающих территорий, а наблюдаемые несущественные различия на контрольных и прилегающих к рудникам территориях обусловлены рельефом, расположением и другими экологическими факторами, результаты исследований показали, что почвы обладают менее благоприятными агрохимическими и физико-химическими свойствами для роста и развития растений, а для получения высокого и экологически чистого урожая необходимо совместное применение минеральных и органических удобрений.

Ключевые слова: почва, агрохимические показатели, урожайность, рудник, воздействие.

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