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CHANGE IN SOME INDICATORS IN PLANTED SOILS ALONG GANJA-KAZAKH HIGH-WAY

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Abstract. According to the study conducted in planted soil along Ganja- Kazakh highway, it was determined that their physical and chemical indicators are different. Soils are medium, hard clayey, light and medium clayey according to their granulometric composition and they have an alkaline environment. The amount of hummus in soils in studied area is different on genetic layers and it was 3,05-2,70 % on top layers and 0,82-0,45 % in lower layers and these indicators vary respectively between 2,56-0,96 % and 0,46-0,43 % under grain crops in weakly irrigated gray-brown (brown). Changes in other indicators of various prices were determined on genetic layers. According to the results of the studies, a system of ameliorative measures was suggested in order to improve those soils.

Key words: soil, planted soil, genetic horizon, alfalfa, potato, grape.

INTRODUCTION

In recent times, new attitude towards using soils, and sometimes, using them not properly has caused decline in the fertility indicators of soils and eventually, a sharp decrease in plant productivity. Studies show that soil studies were conducted in various directions in Ganja-Kazakh zone and certain conclusion has been made. It was determined that dark gray-brown, gray-brown, gray-brown, light gray-brown and gray-brown grass semi-types are spread according to the mountain brown soil type in that area. In this regard, conducting studies in soils used under different plants along Ganja-Kazakh highway, the study of their modern status and preparation of measures for the improvement of those soils is of practical importance being a relevant issue.

MATERIALS AND METHODS

As a study area, practice areas have been selected in characteristic places where different plants are planted along Ganja-Kazakh highway. Pits put in practice areas have been implemented using visual inspections and existing land map. Chemical analyses of soil samples taken from genetic layers of pits have been conducted with the methods widely used in the republic at present. Generally, geostatic methods should be used.

RESULTS AND DISCUSSION

Ganja-Kazakh zone of Azerbaijan covers Ganja, Shamkir, Tovuz, Aghstafa and Kazakh regions. The distance of the zone from Ganja to Kazakh is approximately 110-120 km. Ganja-Kazakh zone is located between the Greater and Lesser Caucasus Mountains. The width of the zone is 40 km in the west, and 75 km towards the east. Mountain slopes are hard in the west and flat in the east. There are many plains in the territory of zone. As an example for them, Garayazi, Aghyazi, Jeyranchol, Ajinohur etc. can be given. Rocks consist of sediments remaining from Mesozoic and Cretaceous periods of Lower Jurassic period. The sediments of third period can be found in several parts.

The relief of this area is very complex. Relief mainly consists of mountains, plains, valleys, gorges and river cones. Shale or layers of Lower Jurassic period and limestone of lower Cretaceous period spread in the highest parts of mountains. Neozoic sediments, debris and large rocks, small alluvial, alluvial-proluvial and proluvial sediments spread in the low-lying part of the massif. Here, cones also exist as there are many large and small mountain rivers. Climate indicators in Ganja–Kazakh plain differ from one- another. Average annual temperature in the western part of

the zone is 12-13ºC, and it is 13-14ºC in the eastern part of the zone. The amount of rainfall is 350-450 mm in the western part and 300-348 mm in the eastern part [1].

The average temperature in January is rarely below 0ºC (in the mountainous part), and 1,7-3,1ºC in plains. The average temperature is above 20-21ºC in the mountainous part in summer, 30-35ºC in plains and in some days, it reaches 38-40 ºC. The amount of evaporation is two to three times higher than the atmospheric precipitations and is 850-1040 mm. Vegetation zones replace one-another from highest parts of Greater and Lesser Caucasus Mountains towards waterfront of Kura River in the following manner: alpine meadows (2600 m and higher), sub-alpine meadows (up to height from 1800 m to 2600 m), mountain forests (up to height from 1200-800 m to 1800-1200 m), semi-steppe and semi-desert plants comprising the lowest zone of vegetation (<800 m) [2]. Rocks deprived of soil cover in the lowest alpine meadows consist of plant groups developed on large and small rocks that become corroded. Their heights are low and a layer of sod brought by them is thin. As the lower part of alpine meadows is under dense plants, a layer of sod gets thicker. Here, widespread plant species are sandpiper, Astragalus, feather grass and others. Sub-alpine meadows comprise transition towards forest zone. Mountain forests' zone consists of forest massifs. Iberian oak, hornbeam in the lowest strip of the zone, oriental beech (Fagus orientalis) in the middle strip and oak, beech, birch in the highest strip of the zone are widespread. Forests are cut and get thinned in the lowest strip and other types of trees – bushes have replaced them: hawthorn, thorny bushes, buckthorn, juniper etc. Semi-steppe and semi-desert plants spread in the lowest strip of vegetation cover: white grass, feather grass, daises, tulip – lilies, three leaf clover etc.)The topsoil of Ganja-Kazakh massif has been studied by S. A. Zakharov (1926), A. N. Izyumrov (1937), M. E. Salayev (1956-66), S. Q. Hasanov (1961-65) and others [5]. Based on the altitude of the location, the main soil classes are classed as some subclasses. As a result the alpine grasslands of the have been located in high altitude (>2600 m) which is formed of mountain grassland soils and their sub-classes including primary turf-sandy soils, humus-turf soils [3, 4].

Sub-alpine meadows mainly spread in a slightly lower altitude (2600-1800 m) from alpine meadows. Here, sub-types of mountain-meadow soils such as mountain meadow, blackish mountain-meadow and steppe mountain-meadow spread. Sub-types such as mountain-forest meadows spread slightly below the subalpine meadows (1800-1400 m) and Steppe Mountain – meadow spread in great glades. Steppe mountain – meadow sub -type spread in lower heights (1400-1000 m) of mountain – meadow soils. Mountain brown (brown) and mountain black soils are found in steppe areas where bushes and xerophyte forests spread that have approximately the height lower than 1000 m height (1000-600 m). Here, the sub-types of typical washed mountain-forest brown, carbonated mountain-forest brown, brown grass of mountain brown soils and sub –types of usual mountain-black, carbonated mountain-black, tightened mountain-black spread. In the 300-600 m altitude of the massif, the main soil types are dry subtropic steppe and semi-desert soil types are the prevailing soil classes. In this region, the brownish (dark brown) soil of the mountain is classed as the following subclasses: dark grey-brown, normal grey-brown, light grey-brown, grey-brown grasslands [5]. Soil samples were taken from pits put in characteristic places from soils spread along the highway in Shamkir, Tovuz, Kazakh and Aghstafa during the study. Samples were mainly taken from agricultural soils and locating in the distance of 50, 100, 150 meter from the highway. Samples were taken in different depth

taking into consideration the depth and thickness of soil layers after the determination of genetic layers of soils along profile. As well as, soil pits were put in planted soils in Shamkir, Tovuz and Aghstafa regions along Ganja-Kazakh highway during the study (9 pits in each region). Generally, 27 soil pits with the depth 0-150 cm were put in the studied area.

Pit 1. It was put in the area where grain crops had been planted in the territory of Shamkir region of Ganja-Kazakh highway. The type of soil in the area where pit is put is gray-brown and varies as follows on genetic layers:

Ay_a' – 0-20 cm: with dark grey-brown color, containing clods and with broken down structure, with clayey, very soft, containing high amount of plant roots and semi-rotten plant residuals, dry, without clear layers.

Ay_a'' – 25-35 cm: with dark brown color, containing ball form clods, there are plant roots and insect nests.

B: 35-80 cm: With yellowish color, without structure, containing dust and clayey, with hard structure, containing less plant roots and insect nests.

Pit 4: This pit was drilled in a potato farm in Shamkir district near the highway. The land is relief slope farmland. The soil type is grey-brown (dark). The description of genetic layers is given below.

Description of Pit

AU_a' – 0-25 cm: Darkish brown, dusty -with clods with broken down structure, with clayey-clay, with high content of plant roots and residuals, with some sand particles, very soft, relatively humid.

AU_a'' – 25-47 cm: Darkish brown color, will ball form clod, compacted, with clayey and clay, containing plant roots and insect roots, high content of stone and gravel, without any clear layers.

B – 47 – 78 cm: With dark brown color, with clay and clayey, compacted, without clear structure, containing some plant roots, the insect nests are considered, the soil of the pit is in grey-brown color.

Description of Pit:

AU_a' – 0-25 cm: Dark grey-brown, with clayey-clay, dusty with small particles of clode, with high content of plant roots and semi-rotten plant particles, with optimal biological content, very soft, with gradual transition, dry.

AU_a'' – 25-50 cm: with grey-brown color, the granolometric composition is slightly heavier, containing clods with weak aggregate, compacted, containing small prosity and insect nest, with clear transition.

B – 50 – 90 cm: with yellowish color, containing clayey and clay and broken down structure, with small amount of plant root, relatively hard and dry, with gradual transition.

Soil Pit 14:

This pit was drilled in Tovuz district along the highway in a land under grape cultivation. The description of genetic layers is given below.

Description of Pit:

AU_a' – 0-25 cm: Dark grey-brown, well aggregated, with grain and clod structure, with high content of plant roots and semi-rotten plant particles, with optimal biological content, relatively porous, soft, humid, with clear transition

AU_a'' – 25-50 cm: with very dark brown color, with high clay content, containing small clods, structured and relatively porous

B_{Ca} – 50 – 110 cm: with Brown color, with large clod and balled structure, relatively dry, with clay and clayey, with little humus, with little grape and plant root content, without clear transition.

Soil Pit 19:

This pit was drilled in Aghstafa district along the highway in a land under alfalafa cultivation. The color of the pit is grey-brown.

Description of Pit:

AU_a' – 0-20 cm: with Dark brown color, with clod and balled structure, with heavy clayey, porous, with relatively suita-

ble aggregates, well woven with alfalfa roots, containing semi-rotten plant residual

AU_a'' – 25-35 cm: with dark grey-brown color, with balled – clod structure, containing clayey, containing large gravels and sand, relatively compacted, with high content of plant root, with clear transition

B – 35 – 85 cm: with straw yellow color, compacted, containing bally structure, relatively hard, dry, with gradual transition, it appears as stony soil

Soil Pit 22:

This pit was drilled in Aghstafa district along the highway in a land under grape cultivation. The land is relief sloppy land. The soil color is grey-brown.

Description of Pit:

AU_a' – 0-25 cm: with very dark brown color, containing clay and heavy clayey, well aggregated, containing high content of grape and plant roots, porous, with semi-rotten plant particles, with clear transition

AU_a'' – 25-45 cm: with very dark brown color, balled and grainy structure, relatively compacted, containing high amount of plant roots and semi-rotten plant residuals, with clay, with clear transition

B_{Ca} – 50 – 110 cm: with Brown color, with broken down clod structure, containing small amount of plant root, not porous, with gradual transition

Chemical analyses of soil samples taken for the determination of changes in soils of Ganja – Kazakh zone are appointed on the basis of existing methods, comparative analysis of results are conducted and change in some indicators of soils specific for the zone is given below (table 1).

Table 1 – Change in some indicators in soils of Ganja – Kazakh zone

Place where pits are put	Genetic layers and depth (cm)		Humus %	N %	$CaCO_3$	water-solution pH	Main amount of Ud.	Soil Ud content	Granolometric Composition 100%	
									<0,001	<0,01
High mineralized, irrigated lands with grey-(dark) brown color Under horticulture crops	AU,a'z	0-27	3,05	0,23	7	8,0	35	0,10	25	52
	AU"a,z	27-52	2,70	0,20	9	8,2	28	0,12	28	60
	AB	52-70	1,54	0,13	11	8,5	26	0,15	23	57
	B	70-92	0,82	0,09	12	8,5	22	0,20	20	53
	C	92-120	0,56	0,07	10	8,2	20	0,22	21	50
Mineralized, irrigated with grey-(dark) brown color Under grape cultivation	AU,a'z	0-30	2.79	0,23	2,76	7,9	31,93	0,10	30,52	61,60
	AU'a",z	30-50	2,79	0,23	2,95	7,9	32,44	0,09	33,60	65,68
	AU'a"',m	50-72	1,90	0,15	5,25	8,0	30,51	0,09	37,28	69,23
	AB	72-88	1,55	0,13	8,38	8,1	27,42	0,09	29,76	52,56
	B	88-110	0,63	0,07	8,98	8,2	29,38	0,06	29,00	53,00
	C	110-140	0,45	0,06	8,22	8,3	27,54	0,06	33,12	65,20
Mild mineralized, irrigated, with grey (dark) brown under grain culture	AU,a'z	0-10	2,56	0,17	15,41	8,5	14,6	0,06	6,88	49,92
	AU	10-29	0,96	0,08	18,59	8,5	15,84	0,06	9,52	47,20
	B_{Ca}	29-53	0,76	0,06	18,09	8,6	15,00	0,06	8,24	45,68
	C_{Ca}	53-94	0,46	0,06	17,71	8,5	15,56	0,06	7,80	43,76
	C_q	94-155	0,43	0,06	15,89	8,4	14,56	0,07	1,76	38,04

As it can be seen from table, the amount of hummus in top layers (0,52 cm) of highly mineralized and irrigated gray-brown soils under cultural plants is 3,05-2,70 %, nitrogen 0,23-0,20 %, $CaCO_3$ 7-9 %, pH 8,0-8,2, sum of absorbed bases is 35-28 mg. equiv. its amount is 0,10-0,12 % and the amount of

physical clay is 52-60 %. These indicators are different in lower layers (52-120 cm) and vary as follows: 1,54-0,56 %, 0,13-0,07, 10-12, 8,5-8,2, 26-20mg.equiv., 0,15-0,22 %, 23-21 % and 57-50 %. Generally, these soils are heavy clayey, light and medium clay according to their granulometric composition and have an alkaline environment. The above mentioned indicators have been appointed in soils used under grape in mineralized and irrigation gray – brown soils and it is determined that they vary as follows on genetic layers: 2,79-1,90 %, 0,23-0,15 %, 2,76-5,25 %, 7,9-8,0, 31,93-32,44 mg. equiv., 0,10-0,09 %, 30,52-37,28 % and ,55-0,45 %, 0,13-0,06 %, 8,38-8,98 %, 8,10-8,3, 27,42-29,38 mg.ekv., 0,09-0,06 %, 52,56-65,20 % in lower layers.

These indicators are different in soils of weakly mineralized and irrigated gray-brown used under grains and vary as follows. The amount of hummus in upper layers is 2,56-0,96 % and in lower layers, it varies between 0,76-0,43 %. The amount of nitrogen and carbonates vary between 0,17-0,08 %, 15,41-18,59 % and 0,06 %, 18,09-15,89 %. pH amount in soils varies 8,6-8,4 and it is determined that they have an alkaline environment. The sum of absorbed bases are 14,60-15,84 mg equic., and it varies between 15,00-14,56 mg equiv. These differences are observed in the change in granulometric composition. So, if its amount in upper layer of soil is 49,92-45,68 %, then this indicator was 43,76-38,04 % in lower layers. As it is seen, these soils are hard clayey in upper layers and medium clayey in lower layers according to their granulometric composition.

The results of analysis show that soils which are studied have been weakly provided for the food sources, they varied from medium clayey to medium clay according to their granulometric composition and they have an alkaline environment. Providing mineral and organic fertilizers in that area relevant to the demands of plants to be cultivated and using the methods of deep plowing, softening and advanced irrigation are suggested for the improvement of these soils.

CONCLUSION

It was determined as a result of the study that the amount of hummus was 3,05 -0,43 %, nitrogen was 23-0,06 %, $CaCo_3$ was 7-18,59 %, pH was 7,9-8,6, and the amount of salts was 0,09-0,22 %, value of physical clay varied between 38,04-69,23 % in the irrigated mountain brown soils used under different plants in Ganja-Kazakh area. Taking into consideration the obtained results, providing organic and mineral fertilizers under plowing in accordance with the accepted standards and using the methods of deep plowing, softening and advanced irrigation (drops, rain etc.) should be ensured for the improvement of water-physical characteristics of soils and increasing high productivity in those areas. If these measures are taken, the ameliorative condition of soils will gradually improve and 20-25 % increase in productivity will be achieved.

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ТҮЙІН

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ГАНЖА-ҚАЗАҚ ТАС ЖОЛЫ БОЙЫНДАҒЫ АҒАШТАР ЕГІЛГЕН ТОПЫРАҚТАРДЫҢ КЕЙБІР КӨРСЕТКІШТЕРІНІҢ ӨЗГЕРУІ

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Ганжа-Қазақ тас жолы бойындағы ағаштар егілген топырақтарында жүргізілген зерттеулердің нәтижелеріне сәйкес олардың физикалық және химиялық қасиеттерінің әр түрлі екендігі анықталды. Топырақтың гранулометриялық құрамы орташа, ауыр балшықты, жеңіл және орташа балшықты және олардың ортасы сілтілі. Зерттелген аумақтың топырақтарындағы гумустың мөлшері генетикалық қабаттардан өзгешеленеді, жоғарғы қабаттарда 3,05-2,70 % және төменгі қабаттарда 0,82-0,45 %-ды құрайды және бұл көрсеткіштер аз суарылатын сұр-қоңыр топырақтардағы астық дақылдары егілген жерлерде өзара өзгешеленеді, яғни әр қабатқа сәйкесінше 2,56-0,96 % және 0,46-0,43 %. Басқа көрсеткіштердің өзгеруі генетикалық қабаттарда әр түрлі дәрежеде анықталды. Жүргізілген зерттеулердің нәтижелері бойынша осы топырақтарды жақсарту мақсатында мелиоративтік іс шаралар жүйесі ұсынылды.

Түйінді сөздер: топырақ, мәдени топырақ, генетикалық қабат, жоңышқа, картоп, жүзім.

РЕЗЮМЕ

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ИЗМЕНЕНИЕ НЕКОТОРЫХ ПОКАЗАТЕЛЕЙ В ПОЧВАХ ЛЕСОПОСАДОК ВДОЛЬ ШОССЕ ГАНЖА-КАЗАХ

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Согласно результатам проведенного исследования в почвах лесополос вдоль шоссе Ганжа-Казах установлено, что их физические и химические показатели различны. Гранулометрический состав почвы средний, тяжело глинистый, легко- и средне-глинистые и они имеют щелочную среду. Содержание гумуса в почвах исследуемой территории отличается от генетических слоев, что составило 3,05-2,70 % в верхних слоях и 0,82-0,45% в нижних слоях, и эти показатели соответственно различаются между 2,56-0,96% и 0,46-0,43% под зерновыми культурами в слабо орошаемых серо-коричневых почвах. Изменения других показателей различной степени были определены в генетических слоях. По результатам проведенных исследований предложена система мелиоративных мероприятий в целях улучшения этих почв.

Ключевые слова: почва, саженные почвы, генетический горизонт, люцерна, картофель, виноград.