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RESEARCH ARTICLE

QUALITATIVE ESTIMATION OF THE GAKH STATE NATURE RESERVE SOILS IN THE REPUBLIC OF AZERBAIJAN

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ABSTRACT

Last times the reserves flora and fauna are investigated systematically, the planned scientific observations and researches are performed on the basis of the certain program and method widely the state and biosphere reserves and Reserves, in the state guarding zones of the different countries. But it is necessary to comment that the researches being performed in these areas aren't much for the present and there is a great need for broadness of such works. From this view point the researches being conducted in a field of estimating the fertility level by a quality the Azerbaijan Republic Gakh State Nature Reserve soils assume a great interest. As a result of the carried out researches "Gakh State Nature Reserve soils map" (with a scale of 1:25000) has been composed. According to the map the following soil types spread in the prohibited zone: mountain-meadow -7017,2 ha; mountain-grey-brown-12823,65 ha; grey-brown-17182,4 ha and grey soils-1483,0 ha. An evaluation of the Gakh State Nature Reserve soils was conducted over 10 soil types and subtypes, because of getting 100 scores the mountain-meadow soils for high upland zone, but mountain grey-brown soils for foothill-plain zone have been received as a standard. According to the bonitet scale the washed mountain-meadow steppe soils possess-92 scores, grey-brown soils-85 scores, the lowest fertile light-grey soils-58 scores.

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INTRODUCTION

The Gakh State Nature Reserve zone having a complex soil-ecological condition was taken as a researches object, the reserve total area is 39504,15 h. The support stations have been chosen over the main soil types and subtypes extended in the prohibited zone corresponding to the aim and duties of the research work and field researches nave been performed. 30 sections were applied in a number 11 (soddy mountain-meadow soils) from the village of Saribash. In 300 m far from Saribash, in Talabashi (mountain-meadow steppe soils), Kishik Armudlu, in one kilometer north-east from Agchay (calcareous mountain forest brown soils), on a slope of the Ulubash mountain (mountain-grey-brown soils), in 750 m north-east from the Chinarly village (grey-brown soils) and other selected support points. The physic-chemical analyses of the taken soil samples have been performed over the following methods; a granulometric composition by a pipette method thanks to N.A.Kachinsky: hygroscopic humidity – by thermal method; whole water weight – by D.I.Ivanov's method; total humus and nitrogen – by I.V.Tyurin's method; total phosphorus and total potassium – by a roentgen spectral method; calcareous – by a calcimetre an environment reaction – has been determined by potentiometer. While conducting an estimation of the Gakh State Nature Reserve soils by a quality the following methods have been used: "Methodical instructions on soils bonitet conduction in Azerbaijan" (Methodical instructions on soils bonitet conduction in Azerbaijan, 1973), "Soils evaluation" (Mammadov and others, 1997), "Contemporary aspects of the soils appraisal and fertility"(Karmanov *et al*., 2002) and others (Ayvazli and Nabiyev, 2007; Gavrilkina, 2006; Kachkov and Yatsukhina, 2002; Kholina, 2010; Loyko, 2000; Orujov, 2008). The soils evaluation is an independent area of the soil science and it is a training which investigates scientific-theoretic bases of the soil evaluation as both natural-historical reality and production means, works principles and methods, investigates large applied problems at a factory (Bulgakov, 2002). A main aim of

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the soils evaluation is to estimate the soils quality in a comparative form or prepare their genetic-industrial classification (Mirkin *et al*., 2002). The soils evaluation is a practical part of the soil science, it forms soil cadaster fundament, very important structural part. The soil structural parts and correlation laws between the soil-plant (correlation law of soil science) being determined by V.V.Dokuchayev form a theoretical base of the soils evaluation (Dobrovolsky and Nikitin, 2000). The scientific-theoretical bases of the comparative evaluation in soils were worked out in V.V.Dokuchayev's work "Russia chernozems" being published in 70-th years of the XIX century (Derdjavin and Frid, 2001).

ANALYSIS AND DISCUSSION

The Gakh State Nature Reserve is situated on the Head Caucasus range south slope of the Azerbaijan Republic north-west, the zone borders on Russia Federation from the north, on Samukh region from the west. The Gakh State Reserve zone is situated at an altitude till 140-3480 meters. The lowest zone of Ajinohur side plain which is at an altitude 100-150 meters, the highest zone is Arkhvay top (3480 m) (Aliyev, 1994). As in obvious a height difference forms 3300 meters in the zone, the north and north-east part of the Reserve zone concerns the south slope of the Head Caucasus range, the central part concerns the Ganikh-Haftaran valley, but the south part concerns the Ajinohur front upland. Soil cover of the Great Caucasus south slope was studied by some researchers A classification of the main soil types and subtypes extended in this zone was given by H.A.Aliyev (Aliyev, 1994), B.I.Hasanov, G.A.Salamov and others (Babayev and Hasanov, 2001; Huseynova, 2009; Mustafayeva *et al*., 2007). A soil map on a scale of 1:25000 of the Gakh State Nature Reserve zone was composed on the basis of the mapping materials of the Azerbaijan State Land Surveying Institute and field and laboratory researches. According to the carried out researches the Gakh State Nature Reserve soil cover over the following zones obeying the vertical zonality laws (Gafarbayli, 2010). Alp and sub-alp zone (at an altitude of 1200-2500 m) – characteristic soils: primitive mountain-meadow; soddy mountain-meadow; leached mountain-meadow; Steppe zone (at an altitude from 200-300m to 900-1200 m) – characteristic soils; mountain grey-brown, bright mountain grey-brown, grey-brown, bright grey-brown; Semi-desert zone (till the altitude of 400 m) – characteristic soils, grey-brown, grey and bright grey. The soil – ecological character of the soils extending in the Gakh State Nature Reserve on the basis of the field cameral – laboratory researches, reference and fund material consequences is given below:

a) Alp and sub-alp zone soils

The meadow Landscape of the Nigh mountain spreads in the Gakh State Nature Reserve alp and sub-alp zone and forms different wide height zones depending on the relief. The region relief has complex orogeomorphogical structure, exposed to horizontal and vertical decomposition, valley-ravine net density is 3.5-5 km/km^2, the surface inclination reaches 45-60$^/$ in this zone. The displacements, landslides in connection with gravitation process are found in the zones having high relief inclination, and this causes reduction of the mountain oust meadows area year by year.

Washed primitive mountain meadow soils. The primitive mountain-meadow soils formed in the very complex relief condition, high mountainous zone (above 2500 m) of the north-east in the Gakh State Nature Reserve zone, the different soil forming process and weathering types are even observed in the near distance under the same climate condition. For this purpose a condition doesn't create for formation of all the genetic horizons of the zone soils. The primitive mountain-meadow soils pass into the thin Soddy mountain-meadow soils, these soils usually consist of two layers (Soil Cover and its rational use methods in the Gakh region, 1982). The primitive mountain-meadow soils spread more widely than the North slopes, because the maternal rocks intensive washing doesn't create an opportunity to collect high inclination humidity, weathering products are carried to the low parts of the slopes on the south, therefore there isn't condition for the whole formation of the all genetic horizons. The primitive mountain-meadow soils spread widely in the summer pasture areas of the north-east Gakh State Nature Reserve zone, general area is 4142,5 ha (7,62%) B and C layers aren't observed in these soils (Azerbaijan soils morpho-genetic profile (Sh.G.Hasanov), 2004). The humus quantity forms 3,26-4,24 % under minimum good condition for the plant residues in the thin A layer (8-12 cm). A quantity of common Nitrogen is according to 0,18-0,25%. A quantity of common phosphorus and Potassium is 0,16-,20% and 3,14-4,06% on the upper layer (0-20cm). A quantity of the absorbed bases gathered in clayey schist's of the primitive mountain –meadow soils is 17,25- 23,70 mg.ekv. Ca^{2+} quantity is 8,0-11,5 mg.ekv. Mg^{2+} quantity is 3.0-7.3 mg.ekv in them. The schist's of the Yura period carbonate therefore carbonates aren't observed in these soils. The environment of the soft layer and Litter rocks are neutral reaction and ph parameter becomes 6.5-7.0.

Washed soddy mountain-meadow soils. The mountain-meadow soils types speeded widely in the Alp and sub alp zone are soddy mountain-meadow soils, these soils spread on the high mountainous parts mainly on North exposition slopes and their common area is 1230,41 ha (2.27%). Soddy mountain-meadow soils are distinguished by having upper dense Soddy layer provided its firmness against erosion in comparison with the other soils. The mountain meadow soils of the Great Caucasus south-east slopes have been studied by Aliyev (1994). The soddy mountain-meadow soils spread on the height of 2000-2200 from sea Level in the Ilisu State Reserve zone, here both the sun energy and the rainfall qualitative are more (one and a half) than north slopes. According to these parameters the soddy mountain-meadow soils of the Ilisu Reserve zone are usually thin and humus quantity on upper layer is high -5,44-7,29%, strong reduction towards. Low layers is observed: humus quantity is 7,29%, in 2-14 cm of layer according to 7-2 numbered parameters, but this parameter reduces till 1,14% in 45-70 cm of layer. Reducing of quantity of the humus substances in under soddy layer is explained by more rainfalls and litter rocks without carbonate on the south slopes than on the north ones. The total Nitrogen quantity shows weak gradual splintering and mineralization of the organic matter in the mountainous zone:

0,20-0,45%.The consequences of the physic-chemical analyses of the cuts taken from mountain-meadow soils of the research object, and the result of the other soil research materials over the same zone are gathered are reflected on by finding a mathematic middle. A mechanical composition of the washed soddy mountain-meadow soils is light: a quantity of the clayey particals is (<0.01mm) 27,16-33,78 % and strong reduction is observed towards low layers, it is connected with the soddy layer on the upper part and formation of the low layers from soft schist's. A quantity of the silt particals (< 0,001mm) forms 6,42-13,4% along profile. As we noted that carbonates aren't observed in these soils in connection with maternal rock structure. A reaction of the soil environment is neutral: pH-6,5-7,1 (Table 1). The washed soddy mountain-meadow soils of the research zone don't have higher absorbing capacity-18,80-28,40 mg.ekv. It is considered one of the distinguishing characters of the south slope soils from north slope soils in the Great Caucasus (Ismayilov, 2004). The researches show that the litter rocks structure and fertility influence on saturation degree of the soddy mountain-meadow soils with the bases.

Washed mountain-meadow steppe soils. The washed mountain –meadow steppe soils of the Gakh State Nature Reserve passed into mountain-meadow-forest soils depending on the microclimate condition and the place relief. The meadow steppe soils are formed in the drier part of the sub-alp one and they are situated in the transitional zone from the Soddy mountain-meadow soils to mountain-forest soils. The washed mountain-meadow steppe soils of Gakh State Natural Reserve spread in the Central North Part, around Saribash and form 3,03% of the area (1644,30 ha). Characteristics plant cover is Festuca and Stipa. The steppe soils are distinguished from the other mountain- meadow soils by thin soil layer, little humid substance weak development of plant cover (Aliyev, 1994). The humus quantity in these soils according to physic-chemical parameters of the 8-1, 8-2 and 8-3 numbered soil cuts taken from mountain- meadow steppe soils in the Gakh State Nature Reserve is 4,56-5,16% on upper layer, but it is 2,05-2,33% reducing enoughly towards low layers. A quantity of the total Nitrogen and phosphorus is accordingly 0,20-0,31% and 0,19-0,25% on upper layer, a quantity of the total potassium is 3,88-4,36%. Differing from the meadow steppe soils of the north-east slope of the Great Caucasus the south slope soils, reserve zone soils are washed out from carbonates. Washing out of these soils from carbonates can be explained by micro relief and being the same zone under forest in the past. The soil solution reaction is neutral characteristic: pH-6,8-7,2 (Gafarbayli, 2010). The mechanical structure of the steppe mountain-meadow soils possesses mean loamy character, the sittyparticals quantity is 28,48-40,36%. An increase of the clayization process from north-west towards south-east is observed along the zone. It is obvious that steppiration process goes along the profile when we notice the consequences of the mechanical structure definition: here dominant fractions are silt and weak dust fractions. Humidity in these soils aren't higher: 3,9-5,02% . The contemporary morphogenetic and bioecological characters have been investigated on the basis of the collected references and fund material, and private field-soil and laboratorial researches consequences and it was determined that these soils possess high fertility and expose to erosion to different degree.

b)Steppe zone soils

The mountain grey-brown, bright mountain grey-brown, grey-brown and bright grey-brown soils spread in the Gakh State Nature Reserve steppe zone.

Mountain grey-brown soils. The steppe zone soils develop under xerophyl, forest-shrubbery, shrubbery-grainy-divers grassy plant cover on the south slope of the Great Caucasus. The soil forming rocks of the mountain-grey-brown soils are considered the fourth period diverse original residues. The alluvial-prolluvial residues being represented by river gravel exceeds. The genetic layers are obviously seen in the morphological profile of these soils. The profile consist of humic accumulative "A" layer, illuvial-calcareous "B" layer and calcareous loamy "C" mother layer. Being chestnut colour the surface layers are mean loamy till 60 cm, but have heavy loamy mechanical structure towards bottom (Aliyev, 1994). The humus quantity on "A" layer of the mountain grey-brown soils is 2,10-4,04% but it sharply reduces towards bottom: 1,19-1,82% changing the total nitrogen according to humus its number vibrates by 0,18-0,28% on the same layers. On these soils surface layer (0-20 cm) the total phosphorus number is 0,17-0,25%; potassium quantity is 2,52-3,40% (Table 2). The whole profile of the mountain-grey-brown soils is calcareous, the carbonate is in a minimum quantity on surface, they collected in a maximum quantity on the illuvial layer: 7,02-15,43%. These soils surface is rich in absorbed bases: 21,27-41,10 mg-ekv., the absorbing capacity reduction is obviously observed towards low layers: 21,23-32,77 mg-ekv. Saturation with carbonates and the profile high clayness was a reason for being rich of complex in Ca^{2+} cation (12,7-22,7 mg-ekv). Well draining of the zone and seasonal moistening of the soils don't allow to be collected easily solved salts in these soils. The mechanical analysis results indicate an absence of density and cloddish structure forms in these soils profile. The mountain grey-brown soils are mean and heavy loamy: 30,44-50,48% a quantity of the silt particles is 11,35-15,77%. The soil environment reaction is weak alkaline and alkaline.

Grey-brown soils. The grey-brown soils spread at an altitude of 200-600 m in the low zone of the Great Caucasus foothill plains. These soils are the main zonal soil types in the Azerbaijan arid steppe regions. The grey-brown soils in the investigative zone extend in the Ganikh-Ayrichay valley and Sarija plain, they occupy 1148,01 h (15,68%) of the zone and being represented by two subtypes; ordinary and bright grey-brown soils. The grey-brown soils possess the following morphological characters; densed illuvial layer nearness the surface gypsic layers availability (50-70 cm) in a profile, exposing of soil to the soil biological woring on the second layer (in 15-30 cm), being of salinization sulphatic typical and so on. After "B" layer on a profile density is high, especially denseness is observed on the illuvial layer (Gafarbayli, 2010). An insufficiency of the humus quantity makes the profile colour pale: humus on a surface layer is 2,76-3,24%, gradually reduces towards low layers: at 0-100 cm it is 0,85-1,39 %. The nitrogen quantity isn't rather more corresponding to humus: 0,16-0,21%, a quantity of total phosphorus and potassium is also little (Table 3). A profile of the grey-brown soils is wholly calcareous, carbonates mostly collect on the surface and illuvial layer.

Table 1. Fertility characteristics of mountain-meadow soils

Soil characteristics	Washed primitive mountain-meadow soils		Washed soddy mountain-meadow soils		Washed mountain-meadow steppe soils	
	İnterval	M	İnterval	M	İnterval	M
Particle size data (%)						
0–100 cm						
<0.01 mm	25,92-30,64	29,36	27,16-33,78	31,57	28,48-40,36	35,61
<0.001 mm	5,08-10,12	7,24	6,42-13,04	9,31	12,0-21,24	17,92
Humus, %, 0-20 cm	3,26-4,24	3,73	4,17-7,66	5,80	4,01-5,16	4,41
0- 50 cm	2,43-3,55	2,77	2,89-5,51	4,01	2,45-3,85	3,27
0- 100 cm	-	-	-	-	-	-
Nitrogen,%,0- 20 cm	0,18-0,25	0,21	0,20-0,45	0,32	0,20-0,31	0,25
0- 50 cm	0,14-0,20	0,16	0,17-0,31	0,24	0,17-0,26	0,20
Phosphorus,, %,						
0- 20 cm	0,16-0,20	0,18	0,18-0,23	0,21	0,19-0,25	0,22
0-50 cm	0,14-0,18	0,16	0,16-0,21	0,18	0,17-0,21	0,19
Potassium, %						
0-20 cm	3,14-4,06	3,72	4,18-4,57	4,31	3,88-4,36	4,15
0-50 cm	3,28-3,71	3,51	4,02-4,46	4,24	3,62-4,25	4,0
Adsorbed bases, mg.ekv/ 100g						
0-20cm	17,25-23,70	21,74	18,80-28,40	22,72	21,80-25,55	23,11
0- 50cm	15,83-19,49	17,41	17,40-25,10	19,05	18,50-23,01	20,70
pH, 0-100 cm	6,5-7,0	6,7	6,5-7,1	6,7	6,8-7,2	6,9
$CaCO_3$, %	-	-	-	-	-	-

Table 2. Fertility characteristics of mountain grey-brown soils

Soil characteristics	Mountain grey-brown		Light mountain grey-brown	
	İnterval	M	İnterval	M
Particle size data (%)				
0–100 cm				
<0.01 mm	30,44-50,48	41,83	33,36-54,38	45,48
<0.001 mm	11,35-15,77	13,09	13,44-18,48	15,45
Humus, %, 0-20 cm	2,10-4,04	3,08	2,40-3,14	2,83
0- 50 cm	2,08-2,87	2,35	1,27-2,05	1,59
0- 100 cm	1,19-1,82	1,46	0,91-1,21	1,12
Nitrogen,%,0- 20 cm	0,18-0,28	0,23	0,18-0,25	0,21
0- 50 cm	0,15-0,21	0,18	0,15-0,20	0,17
Phosphorus, %,				
0- 20 cm	0,17-0,25	0,21	0,15-0,23	0,20
0-50 cm	0,14-0,21	0,17	0,13-0,19	0,16
Potassium, %				
0-20 cm	2,52-3,40	2,95	2,25-2,90	2,52
0-50 cm	2,19-2,51	2,34	2,00-2,28	2,17
Adsorbed bases, mg.ekv/ 100 g				
0-20cm				
0- 50cm	21,27-41,10	32,45	26,40-38,97	31,05
pH, 0-100 cm	21,23-32,77	28,25	22,11-30,20	25,86
$CaCO_3$, %	7,1-8,6	8,0	7,6-8,8	8,2
	7,02-15,43	12,41	8,13-18,64	13,92

Table 3. Fertility characteristics of grey-brown soils

Soil characteristics	grey-brown soils		light grey-brown soils	
	İnterval	M	İnterval	M
Particle size data (%)				
0–100 cm				
<0.01 mm	35,52-61,36	53,20	36,96-67,21	55,48
<0.001 mm	15,24-24,36	19,34	18,52-29,60	22,05
Humus, %, 0-20 cm	2,76-3,24	2,96	1,31-2,29	1,91
0- 50 cm	1,71-2,27	2,0	1,23-1,88	1,54
0- 100 cm	0,85-1,39	1,09	0,75-1,15	0,96
Nitrogen,%,0- 20 cm	0,16-0,21	0,19	0,15-0,18	0,17
0- 50 cm	0,15-0,18	0,16	0,12-0,17	0,14
Phosphorus,, %,				
0- 20 cm	0,15-0,23	0,18	0,13-0,18	0,15
0-50 cm	0,14-0,19	0,16	0,11-0,16	0,13
Potassium, %				
0-20 cm	1,98-2,35	2,17	1,50-2,03	1,81
0-50 cm	1,83-2,15	2,0	1,57-1,80	1,68
Adsorbed bases, mg.ekv/ 100 g				
0-20cm				
0- 50cm	21,10-35,98	30,11	24,0-28,55	25,95
pH, 0-100 cm	20,18-32,02	26,58	20,83-27,17	23,44
$CaCO_3$, %	7,6-8,2	7,9	7,5-8,5	8,0
Dry residue, %	10,55-21,62	16,47	10,36-23,80	17,15
	0,08-0,20	0,15	0,1-0,23	0,17

Table 4. The bonitet scale of the soils in Gakh State Nature Reserve

Torpaqlarin adi	Humus, t/ha mark			Nitrogen, t/ha mark		Phosphorus, t/ha mark		Potassium, t/ha mark		Sum of the absorbed bases, mg-ekv.		Bonitet mark
	0-20	0-50	0-100	0-20	0-50	0-20	0-50	0-20	0-50	0-20	0-50	
Mountain-meadow soils of the high upland												
Washed primitive mountain-meadow soils	64,90 59	144,04 89	-	3,65 66	8,32 67	3,13 86	8,32 89	64,72 86	182,52 83	21,74 96	17,41 91	79
Washed soddy mountain-meadow	110,92 100	208,52 100	-	5,57 100	12,48 100	3,65 100	9,36 100	74,99 100	220,48 100	22,72 100	19,05 100	100
Washed mountain-meadow steppe soils	76,73 69	170,04 81	-	4,35 78	10,04 83	3,83 105	9,88 105	72,21 96	208,0 94	23,11 102	20,70 109	92
Steppe and semi-desert soils of the foothill and plain zone												
Mountain grey-brown	72,07 100	143,35 100	191,26 100	5,38 100	10,98 100	4,91 100	10,37 100	69,03 100	142,74 100	32,45 100	28,25 100	100
Light mountain grey-brown	54,99 76	96,99 68	146,72 77	4,91 l91	10,37 94	4,68 95	9,74 94	58,97 85	132,37 93	29,05 89	25,86 91	84
Grey-brown	71,04 99	126,0 88	141,7 74	4,56 85	10,08 92	4,32 88	10,08 97	52,08 75	126,0 88	30,11 93	26,58 94	85
Light grey-brown	45,84 64	97,02 68	124,8 65	4,08 76	8,82 80	3,6 73	8,19 79	43,44 69	105,84 74	25,95 80	23,44 83	71
Grey	56,75 79	91,65 64	135,34 71	4,25 79	8,45 77	3,75 76	7,8 75	49,00 71	104,65 73	23,37 72	19,21 68	72
Light grey	33,75 47	69,55 49	95,14 50	3,75 70	7,15 65	3,25 66	6,5 63	40,50 59	94,25 66	21,09 65	18,74 66	58

The absorbed bases quantity in these soils is enough high, it is 21,20-35,98 mg-ekv at 0-20 cm, 20,18-32,02 mg-ekv at 0-50 cm (Table 3). The profile high clayness is a reason for enriching of the adsorbing complex with Ca^{2+} cation: 13,5-20,2 mg-ekv. The soil environment reaction is weak alkaline and alkaline: pH – 7,6-8,6.The grey-brown soils mechanical structure is heavy loamy and gleyey. The physical clay quantity rises towards bottom along the profile, then it reduces, the clay particles number is 35,52-61,36%, the silt particles number is 15,24-24,36% at 0-100 cm of a layer. These soils aren't mainly salinized from surface, the salt quantity increases towards depth. The sulphatic, sulphatic-chloridic type of salinization is met in the diversities of the grey-brown soils.

3.Semi-desert zone soils

The semi-desert zone soils extend in the Ajinohur plain central and south parts of the Gakh State Nature Reserve. These zone soils are mainly found at the foothills, intermountain plains and low foothills, at a height from 100-200 m to 300-400 m. The Ajinohur plain surface is covered with the sandy loams and slightly possesses inclination, (1^{o}). The soils are strongly salinized on the hollow parts. A valley splintering density is 5-6 km/ km^{2} in Alazan and Alijanchayarasy zone. On such vertical slopes the plant and soil cover develop weakly. Wormwood, gengyz, saltwort, efemers exceed in vegetation of stony-gravel, weak-weathered, delluvial-prolluvial debris, develop on salty and gleyey rocks of the deep layers. The semi-desert zone soils extended in the Gakh State Nature Reserve zone are grey soils (http://www.eco.gov.az/b-qoruqlar.php).

Grey soils. The grey soils extend in the Ajinohur plain central and south parts. The two subtypes of the grey soils extend in the investigative zone – grey soils occupying 401,0 h of zone and bright-grey soils occupying 744,0 h of zone. These soils develop under wormword – ephemer and wormwoody-fragile saltwort plant formations. These soils are characterized by a humus satisfactory number and observation of the high calcareous from surface. These soils are distinguished by "B" layer densing and alkaline reaction of soil solution, indicating solonetzification signs (Ilisu State Reserve, 2005-2007). The humus quantity in the grey soils is 1,47-3,0 % on the upper layer (0-20 cm), 1,08-1,64% on half-meter layer, 0,8-1,26% on one-meter stratum (Table 4). The total nitrogen quantity gradually reduces towards depth: 0,14-0,22% on 0-20 cm of layer, 0,12-0,15% on 0-50 cm of layer. Provision of these soils with total phosphorus and potassium is to a weak degree. These soils are saturated to average degree according to the degree of provision with the absorbed bases. The absorbed Ca^{2+} quantity reduces while increasing the depth and it's 12,5-21,0 mg-ekv, but Mg^{2+} number rises: 4,5-9,0 mg-ekv. This is considered a characteristic state for the grey soils spreading in this zone. In some places Na^{+} quantity highness indicates extending of the solonetzification sorts in the grey soils. A profile of the grey soils is wholly calcareous: 10,25-28,37%. Mostly illuvial – calcareous layer is found at 35-45 cm of depth. The grey soils mechanical structure is mean loamy on the slopes, heavy loamy and gleyey in the foothill plains: <0,01 mm of the particles number is 39,60-68,64%, in its content a silt fraction number is high: 0,001 mm – 15,92-31,44%. The hygroscopic humidity of the grey soils isn't high and forms 3,7-4,0%, pH value is 8,0-8,7 and it indicates that these soils are alkaline and strong alkaline reaction. According to the water weight analysis results the salinized diversity also extend besides the unsalinized versions of the grey soils in the zone: 0,17-0,47%. After the zone soils fertility parameters are collected, the work over the soils qualitatively evaluating (evaluation) is began to be performed. During the bonitet cost works the soil features and structures which can liaise a

constant correlative relation with the plant productivity as a main leading diagnostic parameter are taken. According to the mathematic-statistical analysis consequences these parameters are a sum of humus, nitrogen, phosphorus, potassium supply and absorbed bases. Due to the methodology the soil parameters being taken as a value criterion over the depths which in the plant roots will spread: 0-20cm, 0-50cm, 0-100 cm of depth is calculated, at this moment evaluating chance of the soil different layers separately is obtained (Yusifova, 2007). The soil subtype having the highest parameters is selected as a standard for the inner diagnostic characters in this zone soils and a fertility level of other soils is determined according to the methodology. During an estimation scale composition the bonitet scores were calculated over formula:

$$B = \frac{K_f}{K_e} \cdot 100$$

Here, B-soil bonitet score;

K_f-factual size of any character and signs of soil.
K_e-a size of the standart soil corresponding parameters:

As a result of the carried out calculation works a main bonitet scale of the Gakh State Nature Reserve was composed (Table 4). The Gakh State Nature Reserve soils evaluation was performed over 10 soil types and subtypes, 3 (three) from them are sub-alp zone mountain-meadow soils; 7 of them are steppe and semi desert soils. The primitive mountain –meadow soils possess less fertility (79 scores) than the leached soddy and steppe subtypes of the mountain-meadow soils (bonitet score 100 and 92). The steppe and semi-desert soils have less fertility level than the high upland zone soils. According to the value scale it is determined that mountain bright grey-brown and grey-brown soils are high fertile (84-85 scores), light grey-brown and grey soils are average fertile (71-72 scores), grey-brown and light-grey soils are low fertile (58-64 scores).

Conclusions

1. The contemporary morphogenetic and soil ecological characters of Gakh State Nature Reserve were determined, the soil maps on a scale of 1:25000 in the prohibited zone were composed on the basis of the reference and fund materials, field-laboratorial and cameral researches.
2. The mountain bright grey-brown soils developed at foothill arid steppe zone over the Gakh State Nature Reserve zone gain the first place for spreading of soils-7938,8 h (20,1%). After them comes the primitive mountain-meadow soils which in the summer pastures spread widely-4142,5h (10,49 %). 1094,9 hectares (277%) fall. The other unfit soils are 3110,0 hectares (7,87%).
3. Performing the Gakh State Nature Reserve evaluate a main bonitet scale has been constructed, at this time mountain-meadow soils have been selected as a standard for the high upland zone, but mountain-grey-brown soils for the foothill-plain zone (100 scores) the other soils bonitet scores have been determined in comparison with them. At this time it was defined that the washed mountain-meadow steppe (92 scores) soils possess a high fertility, the light grey soils (58 scores) have the less fertility.

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