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**MORPHO-GENETIC CHARACTERISTICS, COMPOSITION
AND PROPERTIES OF SOILS OF THE WILD FRUIT FORESTS
OF ZHETYSU ALATAU**

Abstract. The article deals with morpho-genetic features, physico-chemical properties, granulometric composition of dark-gray forests soil formed under apple trees of wild fruit forests of Zhetysu Alatau.

Keywords: soil, humus, granulometric composition, profile.

Introduction. The Zhetysu Alatau is also a mountainous area, which extends to 400 km from the south-west to the north-east, reaches 5066 m in the upper reaches of the Cox River, forming a mountain junction. In the northeast of this mountain junction, the Zhetysu Alatau is stretched as a single mountain range. In its northern part at a sea-level altitude of 1500-2000 m, in the mountain-forest zone with a moderately warm climate and a relatively high amount of precipitation (about 1000 mm), the largest amount of which falls in the warm season, the Zhetysu Alatau forms a discontinuous belt of the deciduous forests of aspen, poplar, birch, ash, wild apple trees – sweet cherry, barberry et al., under which dark grey soils are formed on clay loam [1]. Flora of Zhetysu Alatau is represented by 2168 species of plants, of which 76 endemic species are found only in this area. There are 21 rare species in the flora of Dzungarian Alatau [2]. Of course, there are also known Sivers apple trees.

In the article, the wild apple tree was attacked by a butterfly attack and killed by the *Bacillus thuringiensis* entomopathogenic bacteria living on the dark grey soils of the underlying forest, analyzed in this soil for the purpose of producing a highly effective biological product and assessing the survival of *Bacillus thuringiensis* bacteria.

Dark gray soils of the forest are referred to the middle belt of Zhetysu Alatau mountain-forest-steppe zone. The absolute curvature is about 2000-2500m. They do not normally form a massive band, but are located in the form of separate valleys among the other soils of the steppe zone.

Their prevalence is observed only in Konstantinovka, Topolevka and Lepsi villages. Among the forests are a leafy forest (appel and populous etc).

The relief is represented by the average vertical sections (15-20°) on slopes in different directions. The most important is in the northern and north-western expositions. The tops of some of the hills are plateau-like, for example, Cayman, Belteren, Cold Zhailau, Shubaragash, Kotyrkyn and others. as shown in the form.

Soil-forming rocks are lava-like sediments. Originality is a prolific-de-democracy. The granulometric composition of sandy loam and loam. On the described soils the vegetation dominates: woody forests, poplars, birches, algae, wild apple, chickpea, honeysuckle, barberry and others.

The morphological features of the dark grey soils similar to some types of black soils, as well as to its podzolization and alkaline to alkaline species. Their humus layers have a dark gray and gray tone. In most cases, the soil surface is covered with wood paneling. The ash layer is absent, but the silicon seabed is always observed in the second humus layer (A₂B) [3].

Methods of research. Soil profiles were studied by making cuts in a typical section, characterizing the distribution area of dark grey soils in the Zhetysu Alatau. the composition of the ions of the water extract of Arinushkin was determined [4, 5]. In the description of cuts profiles, we used a traditional comparative morphological and genetic analysis with the allocation of genetic horizons. In the selected soil samples, we determined:

- Humus by Tyurin I.V., GOST 26312-91 (The State Standard);
- Total nitrogen by Kjeldahl I.G., GOST 26107-84;
- Total phosphorus and potassium according to GOST 26264-84;
- Readily hydrolyzable nitrogen by Tyurin – Kononova;
- Labile phosphorus by Machingin;
- Exchange potassium – on a flame photometer according to GOST 26205-84,85;
- Composition of the aqueous extract according to GOST 2643-85, 26428-85, 26425-85, 26426-85, 26424-85, 25428;
- pH according to GOST 26425-85;
- Cation exchange capacity by Bobkov – Askinazi – Aleshin, GOST 17.4.4.01.

Results and discussion. To describe the dark grey soils of the forest, we show the morpho-genetic signs of the soil profile.

The profile is located 5 kilometers to the south-east of Konstantinovka village. At exactly the same distance from the image, the north-west coast of the Krasnaia River is connected to the Tentek River. The Arctic surface is vertical (20-25⁰). The northern slopes are strongly embedded in the valley of the Red River. Absolute height 2000m.

The depth of the profile is 150 cm. It does not boil from the surface to the deep layer. The silicon segments from the 15cm to 90cm of the image are determined.

A₀ 0-5 cm Forest lumber, consisting of leaves of trees and semi-decomposed small branches;

A₁ 5-15cm Black, sandy loam, moist, empty, large grain, clear transition by colour;

A₂B 15-40 cm Grassy gray, sandy loam, large cereals, moist, loose, leaching, with 30 cm from the surface of the soils there is a small amount of silicon, with a gradual transition to the next layer;

B₁ 40-70cm Dark-gray, sandy, nuts, wet, compacted, with rainfall, with a large amount of silicon on the sides of the aggregates;

B₂ 70-90cm There is a small amount of silicon splinters on the sides of dark stains, gray-wet, wet, sandy, walnut-cut, pressed, agglomerates;

BC 90-150cm Gray, loam, wet, compressed.

From the morphological nature of the soil profile, it consists of six clearly visible genetic layers (A₀, A₁, A₂B, B₁, B₂ and BC), that the soil surface is covered with a thick (5 cm) wooden substrate, with a thin (10 cm) well-developed humus-accumulative layer, and in the subsequent A₂B and B₁ layers, it is observed that silicon segments occur on the surface of the soil aggregates as a result of the leaching process. These layers have been well processed by upholstery up to 70cm. The latter is a sign of the high level of soil fertility. Now let's look at the soil patterns from these layers of soil (table 1).

It is clear from the table that the surface of the dark-gray forest soil is humus (8,30-15,5%) at a very high level, its size decreases gradually down to the surface at a depth of 40-70 cm at 2.2%. Accordingly, soil is generally enriched with nitrogen in phosphorus (0.52 and 0.25%, respectively). The water filter

Table 1 – Physical and chemical properties and chemical composition of the gray forest soils in the Zhetysu Alatau

Depth of sampling, cm	Humus, %	Total nitrogen, %	Total phosphorus, %	Water pH	The absorption capacity mgEq per 100 g	Absorbed bases mgEq per 100 g				Labile forms mg/100 g		
						Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Hydrolysable nitrogen	P ₂ O ₅	K ₂ O
0-5	15,5	0,800	0,28	6,8	30,2	29,4/80	7,35/12,2	0,65/2,8	0,08/0,18	10,25	5,12	82,20
5-15	8,30	0,518	0,24	6,4	21,65	18,45/80	5,25/12,8	0,48/2,4	0,01/0,04	8,60	4,06	79,20
15-40	3,88	0,185	0,20	6,4	18,72	15,60/81	3,82/12,2	0,42/2,1	0,05/0,29	2,70	1,50	21,01
40-70	2,22	0,152	0,15	6,4	15,2		3,42/12,2				1,42	17,20

data show that the soil formation process is a bit acidic. Low concentration of sodium (2.5%) absorbed in the absorption capacity (20-30 mg/liter 100g soil). This indicates that the soil does not have a mark of dryness. Soil is enriched with plants for effective nutrients with nitrogen, phosphorus and potassium.

The granulometric composition of the soil indicates that the sedimentary rocks at the boundary between the same average and heavier sandstones are formed along its entire surface (table 2). Given that Lest's roots are ideal for all animals living in the soil, we see that the soil in our soils is formed in one of the most favorable sedimentary rocks.

Table 2 – Granulometric composition of gray-soils of wild-fruit t forest belt of Zhetysu Alatau

Depth of sampling, Cm	Amount of fractions in absolute dry soils%						Diameter <0.01 mm set of fractions
	Sand, mm		Dust, mm			Pollen, mm	
	1-0,25	0,25-0,05	0,05-0,01	0,01-0,005	0,005-0,001	<0,001	
0-5	No	12,6	43,21	10,05	12,03	8,2	30,15
5-15		10,03	38,70	14,20	15,05	12,08	45,60
15-40		9,50	42,85	10,08	11,28	15,36	45,71
40-70		7,37	41,63	12,4	15,09	15,30	45,80
70-90		9,31	41,50	11,42	14,25	15,30	45,82
90-150		9,20	45,90	11,65	14,72	15,20	49,50

The dark gray soils of the investigated forest show that the amount of water-insoluble salts is insignificant (Table 3). It ranged from 0.05% to 0.098% of salts. This is a very low indicator that soil salinization does not allow the salinization of the soil as it is always washed off.

Table 3 – Composition of the aqueous extract of dark grey soils of wild fruit forests in the Zhetysu Alatau, mgEq /%

Depth of sampling, Cm	Alkalinity		Cl ⁻	SO ₄ ²⁻	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Amount of salts, %	Solids, %
	On the whole HCO ₃ ⁻	CO ₃ ²⁻								
0-5	0,60	–	0,12	–	0,40	0,17	0,12	0,18	0,098	0,080
	0,072		0,004		0,006	0,004	0,004	0,008		
5-15	0,52		0,10		0,30	0,15	0,07	0,12	0,050	0,074
	0,032		0,004		0,006	0,002	0,001	0,005		
15-40	0,28		0,10		0,22	0,14	0,04	0,05	0,025	0,047
	0,014		0,004		0,004	0,001	0,001	0,001		
40-70	0,26		0,09		0,12	0,12	0,07	0,04	0,027	0,033
	0,015		0,004		0,003	0,002	0,002	0,001		

Conclusions. The dark grey soils of wild fruit forests in the Zhetysu Alatau, consist of five genetic layers (A0, A1, A2B, B1, B2 and BC) clearly differentiated under low viscosity conditions with low viscosity (up to 150cm) without carbonate, its surface A1, A2B layers are very high humus (15.5 and 8.30%, respectively). Enriched with nutrients; granulometric composition - relieved heavy sandstones, the image is free of water-soluble salts. This situation is favorable for the survival of *Bacillus thuringiensis* entomopathogenic bacteria.

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**ЖЕТИСУ АЛАТАУЫНЫҢ ЖАБАЙЫ ЖЕМІС ОРМАННЫҢ КҮНГІРТ-СҰР ТОПЫРАҒЫНЫҢ
МОРФО-ГЕНЕТИКАЛЫҚ СИПАТЫ, ҚҰРАМЫМЕН ҚАСИЕТТЕРІ**

Аннотация. Мақалада Жетісу Алатауының жабайы жемісті орман белдеуіндегі алма ағаштары астында қалыптасқан орманның күнгірт-сұр топырақтарының морфо-генетикалық белгілері, физико-химиялық қасиеттері, грануламетриялық құрамы, су сүзіндісінің құрамы қарастырылған.

Түйін сөздер: топырақ, гумус, гранулометриялық құрам, кескін.

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**МОРФО-ГЕНЕТИЧЕСКИЕ ХАРАКТЕРИСТИКИ, СОСТАВ И СВОЙСТВА
ТЕМНО-СЕРЫХ ПОЧВ ДИКОПЛОДОВЫХ ЛЕСОВ ЖЕТЫСУСКОГО АЛАТАУ**

Аннотация. В статье рассматриваются особенности морфо-генетических признаков, химического и гранулометрического составов серых лесных почв под дикими яблоневыми деревьями лесного пояса Жетысуского Алатау. Результатами исследований установлено, что изучаемая почва обогащена питательными элементами, имеет облегченный гранулометрический состав и профиль ее промывает от воднорастворимых солей. Такие условия благоприятны для жизнедеятельности энтомопатогенных бактерий *Bacillus thuringiensis*.

Ключевые слова: почва, перегной, гранулометрическая композиция, профиль.

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