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LOESS LIKE LOAMS AS A SOIL FORMATION FACTOR FOR LIGHT-GRAY FOREST SOILS IN THE CHEBOKSARY REGION OF THE CHUVASH REPUBLIC

Abstract. Covering loess-like loams are widespread in the Chuvash Republic and serve as parent rocks. They are heterogeneous both in the course and in the depth of occurrence. A distinctive feature of loess like loams from other overlying quaternary deposits is a sharp predominance in the granulometric composition of coarse dust fractions ranging in size from 0.05 to 0.01 mm, the content of which is 40% or more. Their granulometric composition varies from light loamy to clayey. Loess like loams, due to the peculiarities of their granulometric composition, have relatively good water permeability and moisture capacity and are superior to original loamy and clay parent rocks of the Permian and Jurassic systems in terms of these parameters. The content of moving forms of phosphorus and potassium (according to Kirsanov) in loess like loams is from 15 to 75 mg/kg, of exchange potassium - from 20 to 105 mg/kg. The soils formed based on them have a well-defined profile, the genetic horizons of which are easily diagnosed in the soil section. Because soils formed on loess like loams have well-developed genetic horizons, clearly manifested features of soil formation peculiar to each soil type, they occupy a central subtype and are diagnosed as typical. However, soils formed on loess-like loams and clays have low erosion resistance and marked as erosion threatening on soil maps.

Key words: granulometric composition, loess like loam, mineralogical composition, profile, chemical composition.

Introduction. Covering loams, including loess like, are widespread in the northern and central parts of Russia, including the Chuvash Republic. They come to the day surface, cover indigenous sedimentary rocks with an almost continuous mantle and serve as parent rocks [1]

Soil-forming rocks, modifying in the process of soil formation and splitting along the soil profile, are its main material (90-98% of the mass) and transfer their granulometric, mineralogical and chemical compositions to it and directly affect fertility [2].

Covering loams belong to cover quaternary sedimentary rocks of problematic origin with an age of fewer than 200,000 years (Middle Pleistocene). The eolian origin hypothesis of the covering loams in recent years has become increasingly preferable. Its essence is that during the melting of glaciers (Central Russian and Valdai Glaciation) fine earth (particles smaller than 1 mm) was blown from their surface by strong winds, which was sorted by wind force, transported and deposited on the surface.

A distinctive feature of loess like loams from other covering quaternary deposits is a sharp predominance of coarse dust fractions of 0.05 to 0.01 mm in the granulometric composition, the content of which is 40% or more, which brings them closer to eolian soil - carbonate coarse-silt rocks of porous composition, common in the southern part of Russia, Ukraine, Kazakhstan, Mongolia, China. Loess like loams have an orange tawny color with various shades of straw or ochraceous. [3].

The mechanical and agrochemical properties of loess like loams change when moving from west to east and from north to south. In the Cheboksary region, they fully cover the indigenous Permian and Jurassic rocks; the thickness of loess like loams on the tops and upper parts of the slopes of the watersheds is mainly from 1.0 to 3 m. In the lower part of the slopes of the watersheds, their thickness increases to 30 m [4,5].

In the southern part of the Cheboksary region, in some places the thickness of loess like loams decreases, and sometimes they disappear, giving away small areas to the eluvium of the upper part of the Tatarian Stage of the Permian system or the Volga stage of the Jurassic system.

The study of soil composition is of considerable importance not only for the development of fodder production but also in various sectors of productive animal breeding [6,7].

Methods of the research. The study region is located on the right bank of the Volga River. Drilling operations were performed by the UGB-50M drilling rig following the document requirements (SP 47.13330.2012, SP 11-105-97, RSN 74-88). The depths of soil horizons were studied in soil sections by studying the morphological features of genetic horizons of the profile. The granulometric composition was studied using the pipette method, the density of composition was studied using the sampler method, the density of the solid phase was determined by the pycnometer method, the plasticity number was defined by the difference in moisture content by weight at the limits of liquidity and rolling-out, and the content of mobile phosphorus and exchange potassium was determined by the Kirsanov method.

The research results. The granulometric composition of loess like loams in the Cheboksary region varies along with the extension from light loamy to clayey (table 1).

Table 1 – Granulometric composition of the main parent rocks of the Cheboksary region (fraction content, %)

Loessoid heavy loam (Studgorodok UNPK)						
1.0-0.25 mm	0.25-0.05 mm	0.05-0.01 mm	0.01-0.005 mm	0.005-0.001 mm	less than 0.001 mm	less than 0.01 mm
0.1	10.5	45.6	9.6	5.9	28.4	43.9
Permian calcareous clay (Lapsarsky IAPC)						
8.8	13.8	26.2	11.5	17.2	19.6	51.2
Jurassic calcareous clay (Kuibyshev IAPC)						
0.7	3.7	21.6	4.5	5.5	64.0	74.0

In their granulometric composition, the content of the coarse and medium sand fractions of 1-0.5 mm and 0.5-0.25 mm in size, respectively, is very small - often less than 0.1%; fine sand fractions from 0.25 to 0.05 mm in size content from 7 to 29%; fractions of coarse dust (0.05-0.01 mm) - from 40 to 57%, medium dust (0.01-0.005 mm) - from 2 to 10%, fine dust (0.005-0.001 mm) - from 4 to 12 %, sludge (size less than 0.001 mm) - from 10 to 35%.

Often loess like loams at a depth of 1.8 - 2.0 m or deeper boil from the addition of 10% hydrochloric acid, i.e. they contain carbonates.

Eluvium of parent rocks of the Jurassic and Cretaceous systems, according to external features (color, density, calcareousness), is sometimes similar to loess like loams and clays; however, they easily differ in particle size distribution, namely, in the content of the coarse dust fraction of 0.05-0.01 mm in size. Loess like loams are also heterogeneous in depth, however, they are all united by a high content of coarse dust (table 2).

It was noted that a powerful layer of Quaternary rocks, reaching 19.5 m or more, does not represent a single homogeneous mass - it is heterogeneous and includes 8 horizons, different in properties, in which color, the content of physical clay, structure, inclusions change. As a result, on the peaks and slopes of the watersheds, various Quaternary rocks can act as soil-forming rocks: loess like loams and ancient alluvial sandy clays and sands. This also explains the slightly different physical properties, mineralogical and chemical compositions of loess like loams in the Cheboksary region, which serve as parent rocks (table 3).

Table 2 – Description of the geological section in the northern part of the Cheboksary region

No	Index	Morphological features of sedimentary rocks	Depth of occurrence, m
1	B (Qh)	The illuvial horizon B is from dark brown with a brownish tint to brown, humid. Loams are dark brown, brown, fissured,	0.5-1.7
2	C (dQ_h)	Parent rock. Loess like loam is medium in granulometric composition, brown and light brown in color, fresh, fissured, with a touch of light dust separately and cracked, dense, dusty, with individual spots of humus. It does not boil.	1.7-2.0
3	D (prQ_p)	The underlying parent rock. Loess like loam is heavy loamy, brown and orange tawny, fresh, hard, silty, with glandular spots. It boils.	2.0-3.8
4	prQ_p	Loess like loam is heavy loamy, humid, light brown or brown, dense, soft-plastic, silty, with individual weak spots of humus. It boils.	3.8-7.1
5	aQ_p	Loess like loam is dark brown, humid, heavy loamy, with gray spots, silty, plastic, with frequent layers of sand and sandy loam. It boils.	7.1-12.6
6	aQ_p	The sandy loam is brown, humid, plastic, silty, with layers of sand and inclusions of calciferous cartilage (granitic subsoil). It boils.	12.6-14.2
7	pdQ_p	The loam is brownish-brown, humid, dense, silty, plastic, with interlayers of sand and clay.	17.4-19.5
8	pdQ_p	Loam is brown, silty, soft plastic, with layers of sand.	19.5-22
9	J_3	Heavy loams and clays are gray, humid, with ferruginized spots, with frequent layers of yellow fine and silty sand	22-23.5
10	(P_3s+v)	Heavy loams and clays are reddish-brown, brown, hard and semi-solid, fissured, with layers of gray and brownish-gray siltstone, brown sand with a thickness of up to 0.2 m, with nests and punctures of white and light gray marl.	23.5 and deeper
Note: * C (dQ_h) – integumentary upper quaternary Holocene deluvial loams; D (prQ_P) – Pleistocene loess deposits of problematic genesis; aQ_P - Pleistocene alluvial deposits; pdQ_p - mid-quaternary proluvial-deluvial deposits; J_3 – heavy loams and clays of the Upper Jurassic system; P_3s+v – Upper Permian clay of the Severodvinsk and Vyatkian stages.			

Table 3 – Physical and chemical properties of sedimentary rocks of the section in the northern part of the Cheboksary region

No	Index	Humidity, %	Density, g/cm^3	Solid phase density, г/см^3	Total porosity, %	Plasticity number, %	Mobile phosphorus and potassium according to Kirsanov	
							P_2O_5, mg/kg	K_2O, mg/kg
1	B (Qh)	18	1.61	2.68	39.93	9	125	145
2	C (dQ_h)	23	1.61	2.71	40.59	12	98	105
3	D (prQ_p)	19	1.62	2.71	40.22	9	54	85
4	prQ_p	25	1.68	2.71	38.01	8	47	50
5	aQ_p	33	1.75	2.71	35.42	9	32	45
6	aQ_p	14	1.62	2.64	38.64	6	17	20
7	pdQ_p	18	1.74	2.73	36.26	12	26	55
8	pdQ_p	25	1.50	2.71	44.65	13	15	40
9	J_3	27	1.53	2.71	43.5	11	11	55
10	P_3s+v	29	1.52	2.71	43.91	14	68	75

From the results of the analyzes in Table 3, it turns out that the density of the solid phase – the value determined mainly by the mineralogical composition – practically does not change along the profile of geological outcrops. However, relatively high values of the density of the solid phase concerning the most common minerals (quartz, feldspars) indicate a significant presence of heavy fraction minerals (anorthite, muscovite, biotite, hornblende, etc.), which indirectly affects the chemical composition of the rock and its wealth with mobile forms of plant nutrients.

The content of mobile phosphorus and potassium (according to Kirsanov) in loess like loams is from 15 to 75 mg/kg, of exchange potassium from 20 to 105 mg/kg.

Loess like loams and clays generally have a similar mineralogical composition, in which quartz prevails sharply. Its content in loess like loams is more than 80%; feldspars (orthoclase, microcline, albite, plagioclase) - from 9 to 10%; heavy minerals (ilmenite, magnetite, hematite, garnet, zircon, rutile, biotite, etc.) - from 0.70 to 0.9%.

In such a way, among the primary minerals of the loess like loams, as in loesses, light fraction minerals predominate - more than 99%.

The composition and content in the average loess like loam of primary minerals of the light fraction (with a total content in the rock) of 99.23% are as follows: quartz - 81.9%, feldspars - 9.1%, weathered minerals - 9.0% [4].

The composition of the primary minerals of the heavy fraction is quite diverse, but the total content in the rock is small - 0.77%. Almost half of the heavy minerals are the epidote-zoisite group. Higher contents of ilmenite and magnetite, leukoxen and garnet are noted.

The composition and content of the primary minerals of the heavy fraction in the loess like loam is as follows: ilmenite - 14.6%, magnetite - 1.1%, hematite - 3.2%, leukoxen - 5.0%, hornblende - 13.6%, epidote - zoisite group - 46.7%, zircon - 3.75%, garnet - 5.6%, distene + staurolite - 0.6%, rutile + titanite - 2.2%, tourmaline - 0.3%, muscovite - 0.3%, biotite - 0.3%, picotite - 0.4%, rare - 0.8%, weathered -1.6%.

The total content of the heavy fraction of minerals in the rock is 0.77%. The composition of the coarse and medium sand fraction (1-0.25 mm) in loess like loam is very small, and it almost entirely consists of quartz and feldspars. Secondary minerals - clays - are represented in loess like loams by widespread minerals: hydromica, montmorillonite groups and, less commonly, kaolinite mixed with disordered mixed-layer hydromica-montmorillonite formations, which mainly together with amorphous substances are part of fine dust and silt.

The weathered minerals consist mainly of grains of acidic and basic plagioclases, orthoclase and microcline. They are highly corroded and difficult to detect under a microscope.

The mineralogical composition of loess like loam is reflected in its chemical composition, in which silica predominates. The cation exchange capacity is 21 - 39.5 mg-eq/100g. The amount of exchangeable bases is mostly represented by calcium.

Carbonates in loess like loams are leached to one or another depth (1.2 - 2.5 m).

The acidity of the loess like loams depends on the degree of leaching of carbonates and varies from medium acid to neutral.

It was established that loess like loams are non-saline; the amount of toxic salts is very low. The content of gross forms of heavy metals and microelements in loess like loams ranges from: boron - 40-50 mg/kg, copper - 23-25, zinc - 30-49, molybdenum - 3.0-3.20, cobalt - 7-12, manganese - 550-800 mg/kg (table 4).

Table 4 – The results of the water extraction of loess like loams, Cheboksary (2017-2019)

No	Sampling point	Sampling depth, cm	water extract pH	Conductometer reading, mSm/m	Dry residue, %	The number of toxic salts, %
1	New town	120-145	7.98	0.69	0.274	0.0011
2	Berendeevsky forest	120-160	7.95	0.68	0.268	0.0010
3	Lakreevsky forest	118-150	7.92	0.65	0.258	0.0009
4	Red hill	94-105	7.29	0.49	0.105	0.0003
5	Water canal	150-400	7.80	0.69	0.246	0.0010

The heavier the granulometric composition of the parent rock, the smaller the pore size and lower the filtration coefficient. When soil solutions are infiltrated, high molecular weight humic acids are retained in thin pores, which creates conditions for their precipitation in the form of lime humates and concentration in the upper part of the soil profile.

Therefore, soils formed under the same conditions, but with loess like loams of different granulometric composition, will have different humus contents. The higher the content of physical clay in the soil, the higher the humus content. The maximum amount of humus is found in soils formed based on loess like heavy loams and clays (dark gray forest and chernozemic), and the minimum - in soils on light and medium loess like loams (light gray and typically gray forest).

The calcareousness of the parent rock enhances the process of soil humification.

Light-gray forest soils are formed under conditions of a periodic leaching regime under a mixed forest with herbaceous vegetation, based on leached sedimentary rocks, which are represented in the Cheboksary region by loess like loams, ancient alluvial deposits, eluvium and deluvium of Permian and Jurassic rocks.

The thickness of light-gray forest soil (up to the lower boundary of horizon B1), formed on heavy loess like loam, is on average 14-15 cm higher than that of soils formed based on parent rocks of Permian and Jurassic systems with similar granulometric composition. This difference is even stronger when comparing the thickness of soil profiles on loess like light clays and light clays of parent rocks (table 5).

Table 5 – Average depths of soil horizons of light-gray forest soil on watersheds in the Cheboksary region (1993-2019)

No	Parent rock, number of soil sections	Depth of genetic soil horizons, cm			
		A_1	A_1A_2	A_2B	B_1
1	Loess like heavy loam, 12	0-18	18-33	33-46	46-57
2	Permian deluvial heavy loam, 6	0-16	16-22	22-34	34-43
3	Jurassic deluvial heavy loam, 4	0-14	14-20	20-35	35-44
4	Ancient alluvial sandy loam, 9	0-11	11-36	36-55	55-69

Loess like loams have almost no effect on the color of the soil humus horizon. Therefore, in the soils formed on them, the genetic horizons have saturated colors that reflect soil-forming processes, and are easily diagnosed in the soil section.

However, soils developed upon the loess like loams and clays that transfer their granulometric composition to the soil with a predominance of coarse dust, weakly binding to aggregates, have low erosion resistance and easily eroded on the slopes of the watersheds, forming mainly weakly and moderately eroded varieties.

Permian eluvial and deluvial clays are often reddish-brown, and Jurassic clays are greenish-light brown or dark gray. This affects the color of the soil humus horizon giving it brownish or dark gray shades.

Conclusion. Loess like loams due to the peculiarities of their particle size distribution and composition have relatively good water permeability and water capacity and surpass the rest of the loamy and clay parent rocks in these parameters. The distribution of chemicals along the soil profile is natural for each type of soil formation, but the degree of manifestation of the morphological features of the genetic horizons depends on the properties of the parent rocks - color, density, porosity, etc. However, soils formed based on loess like loams and clays have low erosion resistance and marked as erosion threatening on soil maps. Since soils developed on loess like loams have well-diagnosed genetic horizons, clearly manifested features of soil formation distinctive of each soil type, they occupy a central subtype and marked as typical.

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ЧУБАШ РЕСПУБЛИКАСЫ ЧЕБОКСАРЫ АУДАНЫНДАҒЫ АҚШЫЛ-СҰР ОРМАН ТОПЫРАҒЫНЫҢ ТОПЫРАҚ ТҮЗУШІ ҚИЫРШЫҚТЫ-ШАЙЫНДЫ ЖАБЫНЫ

Аннотация. Чуваш Республикасында қиыршықты-шайынды жабын топырақ кең тараған және топырақ түзуші түр болып саналады. Ол жайылу жағынан да, тереңдігі жағынан да әртекті болып келеді.

Қиыршықты-шайынды топырақтың айырмашылығы – гранулометриялық құрамында 0,05-0,01 мм аралығында 40% мөлшерінде ірі шаңның кездесуі Ресейдің оңтүстік бөлігін, Украина, Қазақстан, Моңғолия, Қытайдағы қиыршықты-карбонатты топыраққа ұқсас болып келуі. Қиыршықты топырақтың түсі сарғыш-қоңыр түсті болады.

Топырақ горизонтының тереңдігі топырақ қабатындағы генетикалық профиль көкжиегінің морфологиялық ерекшеліктерін қарастыру негізінде зерттелді.

Пипетка тәсілімен гранулометриялық құрамын зерттеу, қабаттардың тығыздығы «бурика» әдісімен, қатты фаза тығыздығы пикнометриялық тәсілмен, Кирсан тәсілімен жылжымалы фосфор және алмасушы калийдің мөлшері анықталды.

Чебоксары ауданындағы қиыршықты-шайынды жабынның гранулометриялық құрамы жеңіл ұнтақтан лайға дейін қамтиды. Олардың гранулометриялық құрамында мөлшері 1-0,5 және 0,5-0,25 мм ірі және орташа құм мөлшері сәйкесінше өте аз, көбінесе 0,1%-дан аз; мөлшері 0,25-0,05 мм ұсақ құм мөлшері 7-29%; ірі шаң мөлшері (0,05-0,01 мм) – 40-57%, орташа шаң (0,01-0,005 мм) – 2-10%, ұсақ шаң (0,005-0,001 мм) – 4-12%, тұнба (мөлшері 0,001 мм-ден аз) – 10-35%.

Аталған топырақ түрі 1,8-2,0 мм тереңдікте және одан әрі тереңдікте 10% тұз қышқылын тамызғанда қайнайды, құрамында карбонаттар бар. Юр және Бор жүйесіндегі жыныспен (түсі, тығыздығы, карбонаттылығы) кейде қиыршықты және лайлы топыраққа ұқсас болады, алайда гранулометриялық құрамы бойынша оңай ажыратылады, атап айтқанда, ірі шаң 0,05-0,01 мм кездеседі. Қиыршықты-шайынды жабын біртекті емес, бірақ бұны құрамындағы ірі шаң біріктіреді.

Жылжымалы калий және фосфор формалары топырақта 15-75 мг/кг, алмасушы калий – 20-105 мг/кг. Топырақ профильді, топырақ қиындысында генетикалық горизонттар оңай анықталады. Сондықтан оның жетілген генетикалық горизонты бар, топырақ түзілудің белгілері айқын көрініс береді. Бірақ қиыршықты-шайынды топырақтың эрозияға төзімділігі төмен және картада эрозияға қауіпті топыраққа жатады.

Батпақ пен қиыршықты-шайынды топырақтың минералды құрамы ұқсас, кварц басым болады. Қиыршықты топырақта оның мөлшері 80 %; дала шпаты (ортоклаз, микроклин, альбит, плагиоклаздар) – 9-10%; ауыр минералдар (ильменит, магнетит, гематит, гранат, циркон, рутил, биотит және т.б.) – 0,70-0,9%. Осылайша қиыршықты- шайындыда және орманда жеңіл фракция минералдары басым 99%.

Ауыр фракцияда біріншілік минерал құрамы алуан түрлі, алайда жыныста жалпы мөлшері көп емес (0,77%). Ауыр минералдардың жартысын эпидот-цоизит тобы құрайды. Салыстырмалы түрде алғанда ильменит және магнетит, лейкоксен және гранат мөлшері басым. Қиыршықты-шайынды топырақта ауыр фракциялы біріншілік минерал құрамы мен мөлшері: ильменит – 14,6%, магнетит – 1,1%, гематит – 3,2%, лейкоксен – 5,0%, мырышты қоспа – 13,6%, эпидот-цоизит тобы – 46,7%, циркон – 3,75%, гранат – 5,6%, дистен + ставролит-0,6%, рутил + титанит – 2,2%, турмалин – 0,3%, мусковит – 0,3%, биотит – 0,3%, пикотит – 0,4%, 0,8% – сирек кездесетіндері, үрінді – 1,6%.

Ауыр фракциялы минералдың жыныстағы жалпы мөлшері – 0,77% . Ірі және орташа құмды фракция мөлшері (1-0,25 мм), ол көбінде кварцтан және дала шпатынан тұрады. Қиыршықты топырақта екіншілік минералдар – батпақ алуан түрлі: гидрослюд, монтмориллонит топтары және сирек реттелмеген гидрослютті-монтмориллонитті түзіліс қоспалы каолинит, негізінен аморфинді заттармен бірге шаң және ил құрамына кіреді.

Қиыршықты-шайынды жамылғыларды сортаң баспаған; улы тұз мөлшері өте аз. Ауыр металл және микроэлементтер қиыршықты-шайындыда шектелді: бор – 40-50 мг/кг, мыс – 23-25, мырыш – 30-49, молибден – 3,0-3,20, кобальт – 7-12, марганец – 550-800 мг/кг.

Түйін сөздер: гранулометриялық құрам, минерологиялық құрам, профиль, химиялық құрам.

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ЛЕССОВИДНЫЕ СУГЛИНКИ КАК ФАКТОР ПОЧВООБРАЗОВАНИЯ СВЕТЛО-СЕРЫХ ЛЕСНЫХ ПОЧВ В ЧЕБОКСАРСКОМ РАЙОНЕ ЧУВАШСКОЙ РЕСПУБЛИКИ

Аннотация. Покровные лессовидные суглинки широко распространены в Чувашской Республике и служат почвообразующими породами. Они неоднородны как по простиранию, так и по глубине залегания. Характерным признаком лессовидных суглинков от других покровных четвертичных отложений является резкое преобладание в гранулометрическом составе фракции крупной пыли размером от 0,05 до 0,01 мм, содержание которой составляет 40% и более, что сближает их с лессами – карбонатными крупнопылеватыми породами пористого сложения, распространенных в южной части России, Украины, Казахстана, Монголии, Китая. Лессовидные покровные суглинки имеют желтовато-коричневый цвет с различными оттенками палевых или буровато-желтых тонов

Глубины залегания почвенных горизонтов изучались в почвенных разрезах методом изучения морфологических признаков генетических горизонтов профиля. Гранулометрический состав исследовался методом пипетки, плотность сложения – методом «бурика», плотность твердой фазы – пикнометрическим методом, число пластичности - по разности весовых влажностей на границе текучести и раскатывания, содержание подвижного фосфора и обменного калия – методом Кирсанова.

Гранулометрический состав лессовидных суглинков в Чебоксарском районе варьируется по простиранию от легкосуглинистого до глинистого. В их гранулометрическом составе содержание фракции крупного и среднего песка размером 1-0,5 и 0,5-0,25 мм соответственно очень небольшое – часто менее 0,1%; фракции мелкого песка размером от 0,25 до 0,05мм содержится от 7 до 29%; фракции крупной пыли (0,05-0,01 мм) – от 40 до 57%, средней пыли (0,01-0,005 мм) - от 2 до 10%, мелкой пыли (0,005-0,001 мм) – от 4 до 12%, ила (размером менее 0,001 мм) – от 10 до 35%.

Часто лессовидные суглинки на глубинах 1,8 – 2,0 м и более вскипают от добавления 10% соляной кислоты, т.е. они содержат карбонаты. Элювий коренных пород юрской и меловой систем по внешним признакам (цвет, плотность, карбонатность) иногда бывает похожим на лессовидные суглинки и глины; однако они легко различаются по гранулометрическому составу, а именно по содержанию фракции крупной пыли размером 0,05-0,01 мм. Лессовидные суглинки неоднородны и по глубине залегания, однако их всех объединяет высокое содержание крупной пыли.

Содержание подвижных форм фосфора и калия (по Кирсанову) в лессовидных суглинках составляет от 15 до 75 мг/кг, обменного калия – от 20 до 105 мг/кг. Почвы, формирующиеся на них, обладают хорошо выраженным профилем, генетические горизонты которого легко диагностируются в почвенном разрезе. В связи с тем, что почвы, сформированные на лессовидных суглинках, имеют хорошо развитые генетические горизонты, четко проявляющиеся черты почвообразования, характерных для каждого почвенного типа, они занимают центральный подтип и диагностируются как типичные. Однако почвы, сформированные на лессовидных суглинках и глинах имеют малую противоэрозионную устойчивость и выделяются на почвенных картах как эрозионноопасные.

Лессовидные суглинки и глины в целом имеют схожий минералогический состав, в котором резко преобладает кварц. Содержание его в лессовидных суглинках составляет более 80%; полевых шпатов (ортоклаз, микроклин, альбит, плагиоклазы) – от 9 до 10%; тяжелых минералов (ильменит, магнетит, гематит, гранат, циркон, рутил, биотит и др.) – от 0,70 до 0,9%. Таким образом, среди первичных минералов лессовидных суглинков, как и в лессах, резко преобладают минералы легкой фракции – более 99%.

Состав первичных минералов тяжелой фракции достаточно разнообразен, но общее содержание в породе небольшое – 0,77%. Почти половину тяжелых минералов составляет группа эпидот-цоизита. Отмечается сравнительно высокое содержание ильменита и магнетита, лейкоксена и граната. Состав и содержание первичных минералов тяжелой фракции в лессовидном суглинке следующее: ильменит - 14,6%, магнетит - 1,1%, гематит - 3,2%, лейкоксен - 5,0%, роговая обманка - 13,6%, группа эпидот-цоизита - 46,7%, циркон - 3,75%, гранат - 5,6%, дистен + ставролит - 0,6%, рутил + титанит - 2,2%, турмалин - 0,3%, мусковит - 0,3%, биотит - 0,3%, пикотит - 0,4%, редко встречающиеся - 0,8%, выветрелые -1,6%,.

Общее содержание тяжелой фракции минералов в породе составляет 0,77% . Содержание крупно- и среднепесчаной фракции (1-0,25 мм) в лессовидном суглинке очень небольшое, и она почти целиком состоит из кварца и полевых шпатов. Вторичные минералы - глины - представлены в лессовидных суглинках широко распространенными минералами: гидрослюдами, группами монтмориллонита и реже каолинита с примесью неупорядоченных смешаннослойных гидрослюдо-монтмориллонитовых образований, которые, в основном, вместе с аморфными веществами входят в состав тонкой пыли и ила.

Установлено, что лессовидные суглинки незасоленные; сумма токсичных солей очень низкая. Содержание валовых форм тяжелых металлов и микроэлементов в лессовидных суглинках колеблется в пределах: бор – 40-50мг/кг, медь – 23-25, цинк – 30-49, молибден – 3,0-3,20, кобальт – 7-12, марганец – 550-800мг/кг.

Ключевые слова: гранулометрический состав, лессовидный суглинок, минералогический состав, профиль, химический состав.

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