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CHANGES IN THE MECHANICAL COMPOSITION OF DEFINITE LIGHT-COLORED GRAY SOILS IN LAYERS

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Abstract
The article examines the mechanical composition of light gray soils prevalent in the soil cover of the GTL plant and the Shurtan gas complex in the Guzor massif of the Kashkadarya region. The study of the mechanical composition of Achimov and Achimov soils on the western and southern sides of the GTL plant showed that mainly large dust particles predominate. In particular, it was established that the A-chim horizon contains 36.81%, the Achim sublayer contains 40.37%, and the physical clay content in the Achim horizon is 26.73%, and in the Achim sublayer, which is light sandy, it is 26.12%.
As a result of studying the achime and achime substrate of light gray soils distributed in the eastern and northern poles of the SHGKM, it was established that mainly coarse dust particles predominate. According to it, Achimovo soil is 38.28%, Achimovo soil is 41.39%, and physical clay is 27.03%, Achimovo soil is 28.68%, i.e., it is light sandy.

Keywords: Soil section, mechanical composition, sand, light sand, medium sand, light gray soil, physical sand, Image clay.

Introduction

The natural vegetation cover of pastures, occupying 47% (21.1 million hectares) of the total land area of our republic, is currently under great threat, and their area is rapidly decreasing. According to experts, over the past 25-30 years, 50-70% of the republic's pastures have been degraded, the potential for renewable fodder production of 11 million hectares of pastures has been disrupted, and they have become unsuitable for livestock use. Therefore, in recent years, in our republic, based on local and foreign projects, a deep analysis of soil and climatic conditions has been carried out, and scientific research on the effective use of irrigated lands has been conducted, and certain results have been achieved. The Decree of the President of the Republic of Uzbekistan dated January 30, 2025 No. UP-15 **"On Measures to Introduce Modern Mechanisms for the Protection and Rational Use of Pastures"** defines a number of tasks in order to protect pastures, organize their effective and rational use, bring the development of pasture management to a new level, introduce a compact and effective management system in the industry, and recognize the rights of livestock farms to land plots [1]. Therefore, determining the mechanical properties of soils in order to effectively use the areas where virgin light gray soils are distributed is one of the urgent tasks.

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Objective of the research: to study and scientifically substantiate the mechanical composition of soils by deeply analyzing the soil and climatic conditions of virgin lands.

The object of the study is the GTL plant in the Guzar massif of the Kashkadarya region and the Shurtan gas complex, 38.32.28.758 degrees north latitude, 65.53.46.002 degrees east longitude, the mechanical composition of light gray soils distributed at an altitude of 384.4 meters above sea level.

Results:

It was found that in the mechanical composition of virgin light gray soils of the studied territory, the amount of fine particles is higher than the amount of large particles in the layers where plant residues are widespread.

The mechanical composition of virgin light gray soils of the studied territory was determined by generally accepted methods.

In the A subterranean (5-14 cm) horizons of virgin light gray soils, plant roots are less common than in the upper horizon, and the amount of small particles in the mechanical composition of the soil is greater than the amount of large particles, which is due to the influence of biological and other properties of the decomposition of plant residues. In particular, according to sections 1;2;3 and 4, in the layers Aunder the sod (5-14 cm), coarse sand particles (0.25-0.1 mm) are 9.06-9.42%, medium sand particles (0.1-0.05 mm) are 16.48-16.62%, fine sand particles (0.05-0.01 mm) are 40.25-40.68%, coarse dust particles (0.01-0.005 mm) are 11.07-11.37%, medium dust particles (0.005-0.001 mm) are 10.22-10.76%, and the amount of physical clay is 26.12-26.57%, in the layers with a sparsely distributed root system (15-30 cm), coarse sand particles (0.25-0.1 mm) are 20.37-21.84%, medium sand particles (0.1-0.05 mm) are 6.61-7.54%, fine sand particles (0.05-0.01 mm) are 33.07-34.12%, coarse sand particles (0.01-0.005 mm) are 10.46-10.85%, medium dust particles (0.005-0.001 mm) are 7.35-7.97%, and the amount of physical clay

Table 1 Mechanical composition of soils distributed on the western side of the GTL plant in the Guzar massif

Intercept, No	Layer, cm	Size of fractions, mm								Mechanical composition
		>0.25	0.25-0.1	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	Physical clay	
1.	0-3	5.56	8.63	22.27	36.81	12.15	9.35	5.23	26.73	Light loam
	4-13	7.65	9.24	16.62	40.37	11.37	10.22	4.53	26.12	Light loam
	14-28.	15.87	20.56	7.42	34.12	10.47	7.35	4.21	22.03	Light loam
	29-87.	22.38	30.82	10.24	18.07	9.35	5.69	3.45.	18.49	Sandy
	88-142	23.03	32.41	10.47	18.63	7.53	4.37.	3.56	15.46	Sandy
	143-210.	23.57	32.53	10.03	19.15	6.86	4.45.	3.41	14.72	Sandy
2.	0-3	5.51	8.59	22.23	36.92	12.23	9.31	5.21	26.75	Light loam
	4-13	7.43	9.42	16.58	40.25	11.14	10.76	4.42	26.32	Light loam
	14-27.	16.09	21.84	6.61	33.07	10.46	7.83	4.1	22.39	Light loam
	28-79.	21.74	32.91	8.94	17.76	8.53	5.64	4.48	18.65	Sandy
	80-136	23.39	32.73	10.53	17.32	8.02	4.32	3.69	16.03	Sandy
	137-198.	23.54	32.28	10.77	19.21	6.49	3.89	3.82	14.20	Sandy
3.	0-3	5.48	8.55	22.20	37.02	12.29	9.27	5.19	26.75	Light loam
	4-14	7.28	9.15	16.59	40.62	11.24	10.74	4.38	26.36	Light loam
	15-26.	15.82	20.37	7.54	33.61	10.85	7.54	4.27	22.66	Light loam
	27-84.	22.37	32.58	8.73	17.44	9.39	5.26	4.23	18.88	Sandy
	85-132	24.02	33.23	8.85	17.78	8.37	4.32	3.43	16.12	Sandy
	133-218	23.64	33.71	9.43	17.52	7.69	4.19	3.82	15.70	Sandy
4.	0-3	5.42	8.57	22.16	37.11	12.35	9.23	5.16	26.74	Light loam
	4-13	7.21	9.06	16.48	40.68	11.07	10.76	4.74	26.57	Light loam
	14-30	15.66	21.55	6.83	33.18	10.49	7.97	4.32	22.78	Light loam
	31-85.	22.37	32.11	8.98	17.76	9.27	5.17	4.34	18.78	Sandy
	86-151.	23.53	32.92	9.16	18.21	8.10	4.60	3.50	16.19	Sandy
	152-196	23.61	33.12	9.73	18.34	7.28	4.32	3.62	15.21	Sandy

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1, obtained from virgin light gray soils; 2; It was established that the mechanical composition of the soil up to the lower layers of sections 3 and 4 is loamy. In particular, the content of coarse sand particles (0.25-0.1 mm) is 30.82-33.71%, medium sand particles (0.1-0.05 mm) is 8.73-10.77%, fine sand particles (0.05-0.01 mm) are 17.32-19.21%, coarse dust particles (0.01-0.005 mm) are 6.49-9.39%, medium dust (0.005-0.001 mm) is 3.89-5.69%, and the amount of physical clay is 14.20-18.88%.

According to the mechanical composition of virgin light gray soils, distributed on the southern side of the studied territory (GTL plant), the indicators are as follows: 5; 6; According to sections 7 and 8, in layers A_{dust} (0-4 cm), coarse sand particles (0.25-0.1 mm) predominate in the range of 8.39-8.51%, medium sand particles (0.1-0.05 mm) - 21.91-22.11%, fine sand particles (0.05-0.01 mm) - 37.26-37.59%, among dust particles, coarse dust particles (0.01-0.005 mm) - 12.43-12.71%, medium dust particles (0.005-0.001 mm) - 9.11-9.18%, the amount of physical clay varies within 26.73-26.90%, and the mechanical composition is characterized by light loamy. And in the layers $A_{subterranean}$ (5-14 cm) along the sections, coarse sand (0.25-0.1 mm) particles 9.27-9.85%, medium sand (0.1-0.05 mm) particles 16.21-16.82%, fine sand (0.05-0.01 mm) particles 40.25-40.74%, coarse dust (0.01-0.005 mm) particles 11.53-11.97%, medium dust (0.005-0.001 mm) 10.26-11.02%, and the amount of physical clay was in the range of 26.60-27.63%, and by mechanical composition, it was found to be light loam.

In layers with a sparsely distributed root system (15-30 cm), the content of coarse sand particles (0.25-0.1 mm) in the sections is 20.46-21.56%, medium sand particles (0.1-0.05 mm) - 6.97-7.56%, fine sand particles (0.05-0.01 mm) - 33.31-34.03%, coarse dust particles (0.01-0.005 mm) - 10.38-10.59%, medium dust particles (0.005-0.001 mm) - 7.14-7.27%, and the amount of physical clay - 22.79-23.42%.

taken from virgin light gray soils distributed on the southern side of the GTL plant; 6; Up to the lower layers of sections 7 and 8, the mechanical composition of the soil was determined to be loamy.

Table 2 Mechanical composition of soils distributed on the southern side of the GTL plant in the Guzar massif

Intercept, No	Layer, cm	Size of fractions, mm								Mechanical composition
		>0.25	0.25-0.1	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	Physical clay	
5.	0-3	5.39	8.51	22.11	37.26	12.43	9.18	5.12	26.73	Light loam
	4-14	7.04	9.11	16.51	40.74	11.53	10.36	4.71	26.60	Light loam
	15-28.	15.22	21.56	7.05	33.38	10.52	8.14	4.13	22.79	Light loam
	29-92.	22.45	32.91	8.48	17.63	9.26	5.07	4.2	18.53	Sandy
	93-146	24.17	33.23	8.75	17.84	8.32	4.22	3.47	16.01	Sandy
	147-203.	23.93	33.86	9.21	17.46	7.57	4.19	3.78	15.54	Sandy
6.	0-3	5.35	8.47	22.06	37.38	12.52	9.14	5.08	26.74	Light loam
	4-13	6.84	9.27	16.82	40.25	11.95	10.24	4.63	26.82	Light loam
	14-28.	15.19	21.14	7.56	33.31	10.38	8.21	4.25	22.84	Light loam
	29-85.	22.37	32.17	8.86	17.61	9.38	5.32	4.29.	18.99	Sandy
	86-132	23.77	33.08	9.01	17.99	8.24	4.46	3.46	16.16	Sandy
	133-219	23.62	33.42	9.58	17.93	7.48	4.26	3.72	15.46	Sandy
7.	0-4	5.24	8.46	21.97	37.46	12.63	9.13	5.11	26.87	Light loam
	5-15	6.78	8.85	16.21	40.53	11.97	11.02	4.64	27.63	Light loam
	16-30	15.08	20.46	7.21	34.03	10.59	8.27	4.42	23.28	Light loam
	31-93.	22.47	31.64	9.02	17.37	9.67	5.58	4.25	19.50	Sandy
	94-138	23.52	33.22	9.63	17.46	8.42	4.26	3.49.	16.17	Sandy
	139-227	23.65	33.54	10.04	17.72	7.29	4.05	3.71	15.05	Sandy
8.	0-3	5.21	8.39	21.91	37.59	12.71	9.11	5.08	26.90	Light loam
	4-14	6.65	8.92	16.53	40.39	11.84	10.81	4.86	27.51	Light loam
	15-28.	15.14	20.64	6.97	33.83	10.51	8.24	4.67	23.42	Light loam
	29-87.	21.86	33.03	8.98	17.62	8.55	5.61	4.36	18.52	Sandy
	88-142	23.46	32.98	10.08	17.39	8.22	4.29.	3.59	16.10	Sandy
	143-214	23.60	32.91	10.41	18.47	6.89	3.97	3.77	14.63	Sandy

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Accordingly, the content of coarse sand particles (0.25-0.1 mm) was 31.64-33.86%, medium sand particles (0.1-0.05 mm) - 8.48-10.41%, fine sand particles (0.05-0.01 mm) - 17.37-18.47%, coarse dust particles (0.01-0.005 mm) - 6.89-9.67%, medium dust particles (0.005-0.001 mm) - 3.97-5.61%, and the amount of physical clay was 14.63-19.50%.

According to the mechanical composition of the soil in 8 sections taken from virgin light gray soils distributed in the western and southern territories of the GTL plant, where the research was conducted, the layers A_{turf} and $A_{subturf}$ are light loamy and the layers below it also differ. From the analysis results, it should be noted that no significant differences were found between the indicators of the sections. However, differences were found across layers.

Residual lands in the eastern and northeastern territories of the surveyed SHGKM were taken; According to sections 10 and 11, in layers A_{chim} (0-4 cm), coarse sand particles (0.25-0.1 mm) are 8.30-8.35%, medium sand particles (0.1-0.05 mm) are 21.84-21.89%, fine sand particles (0.05-0.01 mm) are 37.75-37.82%, coarse dust particles (0.01-0.005 mm) are 12.83-12.91%, medium dust particles (0.005-0.001 mm) are 9.06-9.11%, the amount of physical clay is 26.86-26.96%; In the A_{basin} (5-18 cm) layers, along the sections, the content of coarse sand (0.25-0.1 mm) particles is 8.48-8.67%, medium sand (0.1-0.05 mm) particles are 16.42-16.72%, fine sand (0.05-0.01 mm) particles are 40.68-41.11%, coarse dust (0.01-0.005 mm) particles are 11.67-11.86%, medium dust (0.005-0.001 mm) particles are 10.45-10.98%, and the amount of physical clay is 27.64-27.87%, and the mechanical composition is light loamy (Table 3).

In the layers with a sparsely distributed root system (19-31 cm), the content of coarse sand particles (0.25-0.1 mm) is 20.75-20.83%, medium sand particles (0.1-0.05 mm) is 6.45-6.62%, fine sand particles (0.05-0.01 mm) are 33.60-33.79%, coarse dust particles (0.01-0.005 mm) are 10.14-10.85%, medium dust particles (0.005-0.001 mm) are 8.37-8.91%, and the amount of physical clay is 23.49-23.68%, and the mechanical composition is light loamy (Table 3).

Obtained from virgin light gray soils of the eastern-northern territories of the SHGKM 9; It was established that the soil up to the lower layers of sections 10 and 11 is loamy in terms of mechanical composition. The content of coarse sand particles (0.25-0.1 mm) in the soil is 31.91-33.46%, medium sand particles (0.1-0.05 mm) 8.51-10.62%, fine sand particles (0.05-0.01 mm) 17.54-18.75%, coarse dust particles (0.01-0.005 mm) 6.58-8.86%, medium dust (0.005-0.001 mm) 3.23-5.26%, and the amount of physical clay is 13.11-18.61% (Table 3).

Table 3 Mechanical composition of soils distributed on the eastern side of the SHGKM in the Guzar massif.

Intercept, No	Layer, cm	Size of fractions, mm								Mechanical composition
		>0.25	0.25-0.1	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	Physical clay	
9.	0-4	5.16	8.35	21.88	37.75	12.83	9.06	4.97	26.86	Light loam
	5-18	6.41	8.48	16.56	40.91	11.86	10.55	5.23	27.64	Light loam
	19-21.	15.34	20.75	6.62	33.79	10.14	8.48	4.88	23.50	Light loam
	32-88.	22.28	31.91	9.77	18.67	7.45	5.47	4.45.	17.37	Loamy
	89-123	23.65	32.99	9.99	17.54	8.35	4.05	3.45.	15.85	Loamy
	124-182.	23.99	33.37	10.33	18.24	6.94	3.64	3.51	14.08	Loamy
10.	0-4	5.12	8.32	21.89	37.76	12.85	9.08	4.98	26.91	Light loam
	5-18	6.34	8.53	16.72	40.68	11.67	10.98	5.08	27.73	Light loam
	19-30	15.28	20.83	6.59	33.62	10.74	8.91	4.03	23.68	Light loam
	31-82.	22.08	33.20	8.51	17.67	8.33	5.56	4.65	18.54	Loamy
	83-140	23.78	32.75	10.34	17.61	8.27	3.84	3.41	15.52	Loamy
	141-196.	24.32	33.20	10.62	18.75	6.58	3.23	3.30	13.11	Loamy
11.	0-5	5.08	8.30	21.84	37.82	12.91	9.11	4.94	26.96	Light loam
	6-18	5.93	8.67	16.42	41.11	11.74	10.45	5.68	27.87	Light loam
	19-28.	15.67	20.79	6.45	33.60	10.85	8.37	4.27	23.49	Light loam
	29-91	22.23	32.39	9.22	17.56	8.86	5.41	4.34	18.61	Loamy
	92-126	23.90	32.99	9.60	17.70	8.32	4.08	3.42.	15.82	Loamy
	127-193.	23.98	33.46	10.03	18.14	7.14	3.71	3.56	14.41	Loamy

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Virgin lands were taken in the northern territories of the surveyed SHGKM; 13; According to sections 14 and 15, in the layers of Asod (0-5 cm) coarse sand (0.25-0.1 mm) particles are 8.13-8.26%, medium sand (0.1-0.05 mm) particles are 21.61-21.77%, fine sand (0.05-0.01 mm) particles are 37.98-38.42%, coarse dust (0.01-0.005 mm) particles are 13.04-13-34%, medium dust (0.005-0.001 mm) particles are 8.88-9.09%, the amount of physical clay is 27.03-27.05%, and in the layers of Apodsod (6-19 cm) coarse sand (0.25-0.1 mm) particles are 7.82-8.77%, medium sand (0.1-0.05 mm) particles are 16.45-16.87%, fine sand (0.05-0.01 mm) particles are 41.26-41.39%, coarse dust (0.01-0.005 mm) particles are 11.27-12.45%, medium dust (0.005-0.001 mm) particles are 10.48-11.53%, the amount of physical clay is

In layers with a sparsely distributed root system (20-33 cm), coarse sand (0.25-0.1 mm) 20.38-20.74%, medium sand (0.1-0.05 mm) 6.47-6.72%, fine sand (0.05-0.01 mm) particles 33.47-33.87%, coarse dust (0.01-0.005 mm) particles 10.32-10.67%, medium dust (0.005-0.001 mm) particles 8.26-8.68%, physical clay content 23.66-23.75%; in the lower (34-87 cm) layers, coarse sand (0.25-0.1 mm) particles 31.57-32.34%, medium sand (0.1-0.05 mm) particles 8.31-8.96%, fine sand (0.05-0.01 mm) particles 16.43-17.12%, coarse dust (0.01-0.005 mm) particles. 8.83-9.74%, medium dust particles (0.005-0.001 mm) - 5.94-7.76%, the amount of physical clay - 20.17-20.87%, the mechanical composition is light loam.

The mechanical composition of the lower layers (85-237 cm) of 4 sections taken from virgin light gray soils of the northern territories of the SHGKM was determined to be loamy. According to the analysis results, the content of coarse sand particles (0.25-0.1 mm) in the soil is 32.70-33.46%, medium sand particles (0.1-0.05 mm) 9.03-10.51%, fine sand particles (0.05-0.01 mm) 16.90-18.64%, coarse dust particles (0.01 0.005 mm) 6.74-8.38%, medium dust (0.005-0.001 mm) 3.60-6.23%, and the amount of physical clay is 13.87-17.64% (Table 4).

Table 4 Mechanical composition of soils of the eastern part of the SHGKM in the Guzar massif

Intercept, No	Layer, cm	Size of fractions, mm								Mechanical composition
		>0.25	0.25-0.1	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	Physical clay	
12.	0-4	4.95	8.26	21.77	37.98	13.04	9.09	4.91	27.04	Light loam
	5-18	5.37	8.77	16.51	41.26	12.36	10.48	5.25	28.09	Light loam
	19-21.	15.69	20.56	6.62	33.47	10.67	8.42	4.57	23.66	Light loam
	32-84.	22.37	31.78	8.89	16.67	9.51	6.43	4.35.	20.29	Light loam
	85-138	23.59	33.10	9.81	17.50	8.38	4.16	3.47	16.01	Sandy
	139-215	23.82	33.46	10.19	17.98	7.11	3.85	3.61	14.57	Sandy
13.	0-4	4.91	8.23	21.72	38.09	13.12	9.05	4.88	27.05	Light loam
	5-18	5.44	8.38	16.45	41.26	12.12	10.81	5.54	28.47	Light loam
	20-30	15.43	20.74	6.47	33.82	10.67	8.26	4.61	23.54	Light loam
	30-78.	22.17	31.57	8.96	16.43	8.83	7.76	4.28	20.87	Light loam
	79-135	23.47	32.70	9.03	17.16	7.93	6.23	3.49.	17.64	Sandy
	136-208.	23.78	32.99	10.03	18.64	7.00	4.08	3.49.	14.56	Sandy
14.	0-5	4.86	8.19	21.64	38.28	13.2	8.98	4.85	27.03	Light loam
	6-19.	5.30	8.21	16.47	41.39	11.27	11.53	5.83	28.63	Light loam
	20-33	15.33	20.38	6.72	33.87	10.54	8.68	4.48	23.70	Light loam
	34-82.	22.06	32.34	8.31	17.12	9.62	6.16	4.39	20.17	Light loam
	83-127	23.49	32.92	9.66	17.41	8.20	4.24	4.08	16.52	Sandy
	128-213.	23.68	32.87	10.48	18.59	6.80	3.87	3.71	14.38	Sandy
15.	0-5	4.81	8.13	21.61	38.42	13.34	8.88	4.81	27.03	Light loam
	6-19.	5.14	7.82	16.87	41.36	12.45	11.14	5.22	28.81	Light loam
	20-32.	15.20	20.65	6.57	33.83	10.32	8.57	4.86	23.75	Light loam
	33-87.	21.97	32.28	8.75	16.71	9.74	5.94	4.61	20.29	Light loam
	88-142	23.62	32.86	10.21	16.90	8.25	4.07	4.10	16.41	Sandy
	143-237	23.96	33.06	10.51	18.61	6.74	3.60	3.53	13.87	Sandy

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Conclusion

Due to the lack of irrigation, fertilization, and soil cultivation measures in virgin soils during the years of research, the mechanical composition of these soils changed very little compared to irrigated soils.

Also, it can be determined that the mechanical composition of the studied soils, compared to the western and southern parts, in the upper A_{turf} and $A_{subturf}$ layers of the eastern and northern parts, the predominance of dust particles is associated with the development of the root system.

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