Ecological condition of soils, problems of pollution and its prevention

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Abstract. In this article, the ecological condition of the soil, its contamination by various factors, and the methods of preparation for land reclamation activities in drought-affected soil areas are studied. Additional remedial measures such as soil contamination, agrotechnical measures, use of oil-degrading bacterial strains, and planting of various plants in renewable options were considered.

1 Introduction

Soil is the most important resource of nature, it is the most porous and fertile part of the earth's crust. It was formed as a result of physical, chemical and biological processes that took place in the lithosphere, hydrosphere, atmosphere and biosphere in connection with each other for a long time.

Interaction of substances between the lithosphere and the atmosphere also takes place through the soil. As a result of the wind, the dust and pollen raised over the soil reach the atmosphere and affect the clarity of the air.

2 Material and methods

In nature, the soil also participates in the exchange of substances (soil-plant-soil), which V.R. Williams called the biological cycle. Thanks to these processes, the fertility of the soil is always maintained. As a result of the growth of agricultural culture, new nutrients are created due to the biological cycle that occurs between the soil and the cultivated plants.

The important importance of soil in human society is that it has the ability to biologically absorb (adsorbent), clean (purifier) and neutralize natural pollutants due to its self-cleaning properties. Soil is also an important medium for mineralizing any remaining organic matter on land [1-3].

The role of soils in nature and in the life of society is incomparable. Soil is a living environment for organisms, a source of nutrients. So, soil refers to the upper, porous layer of the earth's surface, which has the characteristic of uniformity.

Soil is a finite and renewable resource. According to its structure, it is divided into 3 main layers

A- the uppermost humus (humus) layer.

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V-horizon where mineral and organic compounds accumulate.

S- is the mother gender from which the soil is formed.

Each soil horizon consists of a mixture of organic and mineral compounds. Soil is a complex, independent natural body with a historical composition.

It is no exaggeration to say that the problem of studying soil pollution is of great theoretical and practical importance in the field of soil science, both in the past and now. It is especially important to conduct research on this problem in the soils of the arid zone.

I.A. Karimov at the meeting of the Cabinet of Ministers of the Republic of Uzbekistan on the main results of 2011 and priorities for socio-economic development of Uzbekistan in 2012 "2012 will be a year that will take the development of our country to a new level," the report said ‘’ “Currently, we are taking measures in the agricultural sector, first of all, to take measures to increase soil fertility, timely implementation of all agro-technical measures, introduction of modern agro-technologies, further development of selection and seed production, labor organization and incentives. We also need to acknowledge that there are great opportunities that have not yet been explored.”

Sustainable development of agricultural and aquaculture production, optimization of chemical composition of soils, improvement of ecological environment for normal life of all living organisms and prevention of soil pollution for organic cultivation of organic products necessary for humankind. It is necessary to address the issues of proper mineralization and thus increase the amount of organic matter (humus), improve its quality.

Among the chemical contaminants of the soil, contamination with oil and petroleum products is widespread. Because of the widespread use of crude oil in the national economy and today more than 1,000 types of products are produced.

Each oil has its own chemical composition and the nature of the pollution. The oil is found in the range of light gray to dark brown, and sometimes green. Average molecular mass 220-230 g / mol (sometimes 450-470 g / mol), density 0.65-1.05 (usually 0.82-0.95 g / cm3), boiling point 28-1000S in the range (depending on the amount of paraffins), the viscosity is 1.98-265.90 mm2 / s (the viscosity is higher if the heavy fractional content is large).

The composition of carbohydrates also varies, paraffin 30-35%, naphthenic carbohydrates 25-75%, aromatic - in the range of 10-20% N-0.001-1.8, O-0.005-0.35, in addition to about 50 elements.

The presence of heavy metals in oil or petroleum products, such as Ni and Pb, is a toxic hazard to soil cover.

Each region differs even in terms of the chemical composition of the oil coming out of two oil fields in the same region, and over time the chemical composition of the oil changes. When it enters the soil, the light fractional composition changes due to flight, absorption into the soil layers and natural decomposition by microorganisms, and remains in the soil layers in the form of resin or asphalt.

The morphological characteristics of the grassland-alluvial soil section, which underwent chemical degradation as a result of contamination with oil and petroleum products, are as follows:

The OX-1 section was taken at a distance of 1000 m from the newly irrigated low-cultivated, oil field in Karavulbozor district. Micro relief uneven soils (exploration lands), slope is equal to 20S, vegetation cover is very low, genetic layers are 0-30 cm, gray-black, dense, with a lot of oil residues, weakly moist, heavily sandy, unstructured (mixed with oil and clogged), plant roots are very few, insect nests are almost non-existent, pass to the next layer with color.

30-45 cm. Dark gray, wet, medium sandy, high density, a lot of oil residues, no plant roots and insect nests, during the sampling oil residues are clearly visible in the soil section,

exposed to sunlight The secretion was observed to melt and flow to the lower layers, passing to the next layer with color.

45-60 cm. Gray, oil residues mix with soil layers to form a pale-colored layer, moist, heavy sandy, dense, plant roots are rare, passing to the next layer with color and moisture.

60-95 cm. Light gray, oil residue is less than the upper layer, moist, heavy sandy, dense, rust spots are clearly visible at the bottom of the layer, the transition to the next layer is indistinguishable.

95-155 cm. Light gray, oil residue is rare, relatively high humidity, dense, loose, heavy sand, plant roots and insect nests are absent, moisture and color passes to the next layer.

155-190 cm. Light brown, wet, heavy sand, dense loam, almost no oil residue, bluish rust spots, densely transferred to the next layer.

190-205 cm. Light brown, high humidity, light clay, dense, no oil residues, bluish rust spots, groundwater came out of the 205 cm layer.

From the above morphological description of the soil, we can see that the physical, chemical and biological properties of the soil were severely damaged. Due to the microbiological world present in the soil, the process of self-cleaning takes place, but as this process lasts for many years (20-30 years), it is necessary to rehabilitate degraded soils. At present, there are biological, chemical and physical methods in the development of reclamation technology, and each method has its own characteristics.

Preparation for reclamation activities in oil-contaminated soil areas, taking into account the time, level and aspects of soil contamination, will have a drastic impact on soil remediation. As mentioned above, in the development of reclamation technology, each method has its own characteristics, and in some cases requires the use of a complex method, that is, all methods at once. Our research is based on the biological method, and we have a number of scientific approaches to choosing this method:

First, at the heart of the biological method is the process of bioremediation associated with a living "mechanism."

Second, the physico-mechanical method is observed to disrupt the genetic layer of the soil formed over the years, and the physical properties of the soil deteriorate as a result of the use of a number of devices, techniques and environmental machines.

Third, the use of various chemicals, biologicals, high-molecular-weight preparations, sorbents, and specially formulated substances can cause various chemical reactions in the soil cover and adversely affect soil properties. When carrying out reclamation activities, a plan is formed in advance. At the same time, the process of cleaning the soil is high, secondary harmless, convenient, low time and, most importantly, to achieve a stable, positive and effective result. Additional reclamation measures will be considered, such as soil contamination, agro-technical measures, application of oil-breaking bacterial strains, and planting of various plants in renewable options. Stages of reclamation technology:

The first stage is the preparation and initial processing stage. Taking into account the duration and degree of contamination, the collection of "oil + soil" lumps in the soil layers and the provision of preliminary agro-technical treatment (softening, crushing of lumps, etc.) and an experimental scheme are formed.

The second stage is the testing and selection phase, i.e. conducting experiments on options based on the developed experimental schemes (nutrients, humidity, air regime improvement, etc.), observing, comparing and creating the necessary conditions for the level of purification. Combine 3 oil-breaking bacterial strains to determine the degree of soil contamination and the amount of naturally occurring microorganisms. This stage will last for 6-8 months.

According to the results of the third and second stages, the option with the highest level of purification will be continued. This phase is carried out for at least 24 months with the planting of alfalfa and sesame crops, which have a positive effect on the level of soil

purification and have phytomeliorative properties. Reclamation activities are carried out in this way, the minimum time for biological methods is 2 years, and between 5-7 years the level of soil clearance reaches 97%. After 3.5 years of our reclamation activities, the soil clearance rate was 89.4%. During the study, the following indicators were developed in the scoring system to express the degree of soil clearance after reclamation:

1 point - the degree of soil clearance - 0-20%;
2 points - the degree of soil clearance - 20-40%;
3 points - the degree of soil clearance - 40-60%;
4 points - the degree of soil clearance - 60-80%;
5 points - the degree of purification of the soil - 80-100%;

As noted above, soil contamination is more common than petroleum products (incomplete combustion of gasoline, fuel oil, motor oil, and other fuels by air pollutes the air) and takes many years to clean up and restore fertile soils.

Oil pollution of the soil cover varies depending on various factors and is divided into the following levels depending on the amount of oil in the soil:

When oil or petroleum products fall into the soil, a radial chemical membrane is formed in the genetic layer, which reduces the passage of water or air, and most soil microorganisms are killed. As a result, it is difficult for plants to feed. Eventually, the biological world will change. In addition, biochemical and biological processes involving microorganisms damaged and killed by toxic chemicals are disrupted, and a number of soil properties deteriorate.

Natural and anthropogenic factors constantly affect the soil, which in turn changes the properties of the soil. In particular, petroleum hydrocarbons are among the main pollutants of the natural environment and soil cover. Its chemical effects change the morphological, physical, physicochemical, agrochemical, microbiological, biochemical and biological properties of the soil. As a result, a decrease in soil fertility is observed. In addition, it affects the process of mineralization of organic matter in the soil, the diversity of general and group microorganisms, their reduction, the activity of enzymes (catalase, polyphenol oxidase, oxidase, protease, phosphatase, dehydrogenase), changes in soil respiration and morphological characteristics [4-9].

Occurrence of carbohydrates in 5g / 100g of soil leads to several slowdowns of the nitrification process and a sharp decrease in microorganisms.

The amount of humus in the soil increases or decreases depending on the amount of oil. The amount of humus increases as the oil becomes an organic substance as the chemical effects of the oil decrease due to damage to the biological world and deterioration of the soil properties, and over time the soil properties gradually improve. It is known that the process of humus formation slows down when oil or petroleum products fall into the upper layer of the soil (0-30 cm), and with the emergence of favorable conditions, this process begins and the amount of humus increases.

Oil and petroleum products also have a significant impact on the physical properties of the soil. Firstly, the water absorption and retention properties of the soil deteriorate, secondly, the structure is lost due to the mixing of oil with the soil, and thirdly, over time, the soil becomes eroded and difficult to handle with agricultural implements. The mechanical composition of the soil also changes.

As the mechanical composition of the soil changes, so does the degree of contamination, and the lighter the mechanical composition of the soil, the faster the oil or product will be absorbed. The process of cleaning such soils is more convenient and easier. In heavy mechanical soils, on the other hand, heavy mechanical soils absorb large amounts of oil slowly and in large quantities, making cleaning and rehabilitating such soils more difficult.

Performance Indicators:

- Unpolluted soils 1.0 g / kg
- Weakly contaminated soils 1.0-5.0 g / kg
- Moderately contaminated soils 5-12 g / kg
- Strongly contaminated soils 12-25 g / kg
- Very heavily contaminated soils more than 25 g / kg.

It is known that there is a constant exchange of air between the soil and atmospheric air, because the process of soil respiration during various processes (biochemical, humus formation, etc.) that take place in the soil microorganisms, plant roots and soil occurs. Soil respiration is a variable process that changes over time and under different factors. Changes in temperature, pressure, diffusion of gases and changes in the biological world play an important role. This process is not the same in different soil types and soil climatic conditions, and soil microorganisms are drastically reduced due to oil contamination.

A number of the above soil properties analysis results show that almost all properties of soil samples close to the oil field are severely damaged and the respiration process also varies with the amount of oil concentration in the soil according to the differences in the above options. At the same time, in soils heavily contaminated with oil, the concentration of oil is very high, a sharp decrease in the existing microflora, the violation of the aeration process also affected the respiration of the soil. After recultivation, there is an increase in respiration. Especially in cleared soils, this process has increased sharply, as reclamation measures have reduced the concentration of oil, creating favorable conditions for its microbiological world and the growth of agricultural products, and growing plants such as alfalfa, sesame. In the variants, the biological world of the soil is relatively restored, and along with the improvement of a number of processes taking place in it, respiratory activity also increased.

During the study of soils of Karovul market district, samples were taken from the soils of several farms in the district. The purpose of choosing this area is that the soil of these areas is mainly contaminated with heavy metals. The samples were taken mainly from the lands near highways, and the ecological condition of the soils was checked. They were analyzed in the laboratory and the state of their soil was studied. A scientific requirement was developed based on the results of the analysis.

3 Results

The environment of the soil is one of the important indicators, and this indicator is taken into account when planting crops and placing crops according to the condition of the fields. Therefore, the environment of the obtained soil samples was studied in the section of the contours (Table 1).

Table 1. The pH environment determined as a result of the analysis of the soils of the Korovulbazar district.

Incision	Layer, cm	Contour №	The amount of pH	Environment
1	0-27	187	9.05	Alkaline
	27-59		9.06	Alkaline
2	0-30	189	8.65	Alkaline
	30-60		8.81	Alkaline
3	0-34	186	8.71	Alkaline
	34-63		8.95	Alkaline
4	0-35	176	8.62	Alkaline

	35-70		9.1	Alkaline
6	0-27	169	8.34	Alkaline
	27-65		8.27	Alkaline
7	0-32	169	8.39	Alkaline
	32-59		8.35	Alkaline
8	0-28	169	8.36	Alkaline
	28-63		8.35	Alkaline
9	0-28	239	8.83	Alkaline
	28-56		8.85	Alkaline
10	0-31	239	8.86	Alkaline
	31-63		8.75	Alkaline

The results of the analysis show that the soils distributed in the Qarovulbazar district are in a weak alkaline environment and the indicator is in the range of 8-9.5. As it can be seen from the analysis, one of the main reasons for the weak alkaline environment found in the soil of Qarovulbazar is the effect of gases emitted from machines, various toxic gases released from factories, which destroy the ecological environment in the area.

During the analysis, the mechanical composition of soils was also studied (Table 2). Samples were taken from the soil of Qarovulbazar district and analyzed. It can be seen that according to the mechanical composition of soils, there are light loam, medium loam, heavy loam and loam soil types. Table 2 provides information on fractions of soil particles.

Table 2. The condition of the soils of the Korovulbazar district according to their mechanical composition.

Mechanical composition of soils											
			Fractions, %								
Incision	**Layer, cm**	**Outline №**	**>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 blur, %**	**TIPI**
1	0-27	187	1.0	1.5	64.1	11.9				21.5	light
	27-59		1.0	1.0	67.8	6.4				23.9	light
2	0-30	189	0.8	5.5	26.1	31.8				35.8	mediu m
	30-60		0.9	5.0	60.8	4.0				29.4	light
3	0-34	186	1.5	2.0	61.5	12.7				22.3	light
	34-63		1.3	1.5	66.2	7.2				23.9	light
4	0-35	176	5.0	3.5	60.5	9.5				21.5	light
	35-70		2.0	2.0	66.6	6.4				23.1	light
6	0-27	169	4.0	5.2	11.3	19.9				59.6	heavy
	27-65		3.5	3.0	17.2	19.1				57.2	heavy
7	0-32	169	0.5	2.5	20.7	16.7				59.6	heavy
	32-59		5.0	4.5	7.0	28.6				54.9	heavy
8	0-28	169	14.5	2.0	1.6	28.6				53.3	heavy
	28-63		4.0	3.5	12.2	34.2				46.1	heavy
9	0-28	239	10.1	4.0	54.9	19.1				11.9	sandy
	28-56		6.3	2.0	57.6	20.7				13.5	sandy
10	0-31	239	24.5	3.5	41.0	19.1				11.9	sandy
	31-63		18.5	3.0	46.7	19.9				11.9	sandy

We all know that there is salinity in the soils scattered in the Bukhara oasis. Therefore, it is advisable to plant salinity-resistant crops in such saline soils. Also, preparing the land before planting crops is an important factor. Later, it requires practical knowledge and skills

for farmers, peasants and landowners in planting crops and carrying out agrotechnical activities. Currently, there are various methodological instructions for mastering such practical skills. Implementation of recommendations based on scientific studies in soils with salinity will be beneficial to the land user and the intended harvest will be obtained. Accordingly, it is advisable to take measures against salinity in cultivated land.

The type, condition and levels of salinity of the soils of Qarovulbazar district were studied during the analysis. It was found that the amount of carbonates in the soil (HCO_3^-) is 0.022-0.028%, chloride salts (Cl^-) are 0.007-0.056%, sulfate salts (SO_4^{2-}) are 0.043-0.486%. Based on the above, the type and level of soil salinity was determined. According to this, it was found that the soils of the contours 176, 186, 187, 189 of the district are of chloride-sulfate salinity type, while the soils of sections taken from contours 169 and 239 are of sulfate type in some areas, and chloride-sulfate salinity type in some areas. We can see that the salinity levels of contours 176, 187, 186, 239 are low, and contours 189 and 169 have medium and low salinity. It can be said that the condition of the soil in the district is much better than other districts of the region. But even if the salinity is small, it is recommended to wash with salt. It is beneficial for both the soil and the plant. It is desirable to know the amount and rate of salt washing. Based on the results of the analysis, it is recommended to wash 1 time with 1500-1700 m3 of water per hectare in low salinity soils. In moderately saline soils, depending on the type of salinity, 2 times washing with 2500-5000 m3 of water per hectare gives an effective result.

Today, the problem of environmental pollution with heavy metals is becoming urgent in the world. Therefore, today in science there are many physical and physico-chemical research methods that allow to determine the ultra-micro amount of heavy metals, but these methods cannot determine the exact amount of heavy metals. The purpose of the study is to monitor heavy metals, which are considered to be the main pollutants of the environment on a global scale. Special attention is being paid to issues such as the creation of new ion-selective electrodes made of local raw materials, which can replace the expensive, toxic mercury electrode, and the detection of carcinogenic and toxic metals.

In the scientific works devoted to the problems of environmental pollution and environmental monitoring, it was mentioned that a number of metals are harmful to nature and humans. Therefore, it is important to study and check detailed information about the hazard class of metals. According to the mentioned results, many heavy metals enter the human body directly and have a negative effect on its normal functioning. Also, the increase in the amount of heavy metals in the water in fresh water basins also causes the pollution of drinking water. The biggest environmental threat is the problem of environmental pollution with heavy metals. Therefore, this research aimed at determining the amount of heavy metals is important both for chemistry and for human and environmental protection.

4 Summary

In short, soil respiration activity determines the extent to which biochemical and biological processes take place in the soil, which in turn are key indicators of soil fertility. From the learned experiments, we can see that as a result of the sudden change in the current ecological situation, the soils.

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