

CONDITIONS OF SOIL CONTAMINATION WITH OIL AND OIL PRODUCTS

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Abstract. In the following article the conditions of soil contamination with oil and oil products are considered based on the chemical substantiation. The chemical contaminants are analyzed based on the morphological characteristics of the grassland-alluvial soil section, which underwent chemical degradation as a result of contamination with oil and petroleum products.

Keywords. Soil, contaminants, mineralization, composition, soil clearance, enzymes, selection.

Introduction. 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.

Methods. 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.

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.

Discussion. 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.

Conclusion. 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. 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.

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