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Abstract. The soils of the city of Uralsk are currently experiencing a strong urban impact due to anthropogenic inputs of materials and atmospheric fallout. In this work, urban soils were studied selected in the zone of influence of gas stations, highways, as well as in public gardens and park named after Kirov. The soils of the urban environment are characterized by a special urban-anthropogenic layer, the presence of building and household inclusions and close proximity to communications, therefore, sampling was carried out in a layer of 0-20 cm. The determination of pollutants, heavy metals and oil products was carried out along with the study of biological activity and pH. The biological parameters of urban soils were determined by the rate of decomposition of linen tissue - cellulolytic activity. Measurements for heavy metals, pH and petroleum products were carried out by atomic absorption, fluorimetric and potentiometric methods. The analysis of the territories most susceptible to anthropogenic influences showed the least results in terms of changes in the weight of cellulosic materials, as well as the greatest excess of the maximum permissible concentrations for lead, zinc and cobalt and oil products. The clearly expressed excess testifies to a strong anthropogenic impact and deterioration of the soil condition, despite the occupation of green spaces in the squares named after Zh. Moldagulov, Isatay and Makhambet. At the same time, the soils of the Kirov Park, which are located far from potential sources of pollution and the absence of pollutants, have shown their recreational value in terms of improving the environment. Biological diagnostics of soils based on cellulolytic activity is a quite suitable and reliable indicator in the study of urban soils in the city of Uralsk.

1. Introduction

The intensive growth of anthropogenic load, expressed in the construction of the city, the annexation of new micro districts, and an increase in the share of vehicles, has a negative effect on the state of the natural environment. Cities are human-dominated ecosystems. People living in cities depend on sustainable management of urban ecosystems and in this regard, such factors as increased consumption of resources and maintenance of ecosystem services are the main current social problems [1-2]. The reasons why cities are the driving force behind the creation of environmental problems is the predominant growth of the world population and intense anthropogenic activity. The urbanization rate has now reached 50%. The United Nations predicts a 60% increase in urbanization over the next 30 years [3]. The risk of harm to the environment is associated with the scale of excitem services and, accordingly, with the amount of pollutants falling out of the urban environment [4-7]. The impacts of urbanization are profound and range from local to global. Currently, cities account for about 60% of

water use in dwellings, 75% of energy consumption, 80% of wood consumed for industrial purposes and 80% of greenhouse gas emissions [8-9].

One of the impacts of urbanization are pollutants such as heavy metals. Road networks and industrial plants are the two main sources of heavy metal emissions in cities [10-12]. Heavy metals, entering the soil in the form of various chemical compounds, can accumulate in it to high levels, which pose a significant threat to the normal functioning of the soil biota. Emissions of heavy metals can enter the soils of suburban and rural areas with atmospheric precipitation [13]. The frequency of heavy metal pollution from both natural and anthropogenic sources raises concerns about potential health effects. Natural and anthropogenic sources of soil pollution are widespread and diverse [14]. In high concentrations, heavy metals can have toxic effects on plants and human health [15-18].

A large amount of data has been accumulated in the literature indicating the negative impact of soil pollution with HMs on soil biota. When the chemical balance in the soil is disturbed, a stressful situation arises. Urbanization processes strongly affect the ecology [19-20].

The aim of this work is to study the anthropogenically altered soils of the urban environment, which are under constant anthropogenic impact.

The objects of research were soils and soil-like formations located within the city, in various functional zones: recreational, gas station and highways.

2. Materials and methods

The selection of urbanized soil samples was carried out in different parts of the city: zones of influence of road transport and gas stations, recreational zones. Urbanized soils are in the zone of influence of the communication infrastructure, therefore, the experiment was laid by the method of digging to a depth of 0-20 cm. Each sample was averaged by combining five single samples taken within 100 m^2 from the sampling site.

Five districts of the city of Uralsk were selected for the study: the embankment of the Ural River (Stella), the Zh.Moldagulov square, a gas station (along Zhangir Khan street), Isatay and Makhambet square, Kirov park (control).

As a control for comparison, the soils of the park zone were studied the least exposed to anthropogenic impact. To determine the biological activity, we used a linen cloth attached to a glass plate using the “cottonstripassay” application method. The cellulosic materials embedded in the soil were kept in it for 30 days. When assessing the cellulolytic activity of the soil, the following scale in percent proposed by DG Zvyagintsev was used: very weak < 10%, weak - 10-30%, medium - 30-50%, strong - 50-80%, very strong > 80%.

Heavy metals, actual acidity, oil products, and biological activity of soils were determined in soil samples. The actual acidity was measured potentiometrically in a suspension supernatant prepared at a soil: water ratio of 1: 2.5. Measurements of the mass fraction of oil products in soil samples were carried out on a fluid analyzer "Fluorat-02-2M". The fluorometric method for measuring the mass fraction of oil products in the soil is based on their extraction from the sample with hexane and measuring the intensity of the fluorescence of the purified extract. Heavy metals were determined using an atomic absorption spectrometer (model AA140). Before performing measurements on the spectrometer, sample preparation is carried out by chemical decomposition of the soil.

Soil control based on the measurement of maximum permissible concentrations was carried out by comparing it with biological activity, since integral measurements are more informative diagnostic criteria.

3. Results

Urbanized soils have an "urbic" horizon characterized by an organic-mineral layer representing a mixture of urban-anthropogenic inclusions: construction and domestic waste, industrial waste.

In order to study the state of urbanized soils, such indicators as lead, zinc, cobalt and manganese (accumulated in the soil due to the movement of vehicles), oil products, pH of the water extract, as well as an integral indicator of soil quality - cellulosolytic activity were selected.

In the study of the actual acidity, an increase in pH towards neutral and weakly alkaline was found in areas less exposed to anthropogenic influence.

Attention is drawn to the factor of increasing pH towards increasing alkalinity in areas exposed to road traffic pollution. In addition to transport, soil pH is influenced by drainage waters containing calcium and sodium salts (table 1).

Table 1. Actual acidity of soils.

Sampling points	pH without vegetation	pH under vegetation
Ural river embankment	8.2	7.2
Square named after Zh.Moldagulov	8.4	7.6
Gas station (along Zhangir Khan street)	8.2	7.8
Isatay and Makhambet square	8.6	8.4
Kirov park	7.5	7.3

Indicators of biological activity of soils are highly informative in assessing the ecological state of soils. Indicators of biological activity are presented in table 2.

Table 2. Cellulolytic activity (change in the weight of cellulosic materials), % in the soil layer 0-20 cm.

Sampling points	pH without vegetation	pH under vegetation
Ural river embankment	22	27
Square named after Zh.Moldagulov	18	24
Gas station (along Zhangir Khan street)	16	19
Isatay and Makhambet square	11	17
Kirov park	18	28

The data obtained show a regular increase in cellulolytic activity under the vegetation cover.

The nature of the distribution of heavy metals in the soils of the urbanized areas of the city showed an excess of the MPC for such indicators as lead, manganese and cobalt (table 3).

Table 3. The content of heavy metals in the soil.

Sampling points	Pb (MPC=46.8)	Zn (MPC=71.9)	Co (MPC=16.7)	Mn (MPC=1147)
Ural river embankment	28.6	32.6	6.5	301.5
Square named after Zh.Moldagulov	52.1	30.9	19.6	653
Gas station (along Zhangir Khan street)	68.2	91.2	20.9	742
Isatay and Makhambet square	64.5	73.3	18.6	816
Kirov park	5.7	24.2	2.8	167

There are no clearly defined maximum permissible concentrations for oil products in Kazakhstan. When describing the degree of pollution of the studied areas, we were guided by approximate indicators of the concentration of oil products (table 4).

4. Discussion

The results of monitoring of urbanized soils showed their significant transformation in relation to both heavy metals and their biological activity. Particularly critical conditions were observed in soils

located in areas of high heavy traffic and city-wide roads. Determination of the actual acidity, depending on the state of the soil, showed an increase in the pH value of the aqueous extract in the regions most susceptible to technogenic pressure. The data obtained as a result of the study of the cellulolytic activity of soils showed a high percentage of decomposition in the Kirov park, probably due to the favorable conditions for the supply of nutrients. The correlation coefficient r = - 0.78 shows the relationship between the studied values: cellulolytic activity and pH. Sites located near highways and potential pollution sources showed excess for lead, zinc and cobalt (of the total number of samples, the excess was 32%, 14% and 12%, respectively). The results of the survey of the studied areas for the content of petroleum products showed their excess in the area of the gas station and the squares of Isatay and Makhambet. There is a risk of further concentration of heavy metals and oil products at the investigated objects.

Table 4. The content of oil products in the soil, mg / kg (APC = 300 mg / kg).

Sampling points	The content of oil products in the soil, mg / kg (APC = 300 mg / kg)
Ural river embankment	56
Square named after Zh.Moldagulov	68
Gas station (along Zhangir Khan street)	110
Isatay and Makhambet square	650
Kirov park	11

5. Conclusion

Thus, according to the results of the study, the following conclusions can be drawn:

- Studies carried out in various parts of the city and experiencing a long urban pressure showed approximately the same indicators of pollution;
- The state of soils for heavy metals shows an increase in their maximum permissible concentrations within the "urbic" layer;
- Integral indicators of biological activity of soils are really highly informative and may well be used in the diagnosis of urbanized soils;
- Zones characterized by a smaller area in contrast to parks, namely, recreation parks, turned out to be more sensitive to pollution and anthropogenic pressure.

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