CHANGES IN THE PHYSICAL AND AGROCHEMICAL PROPERTIES OF LIGHT GREY SOILS DISTRIBUTED AROUND THE SHORTNEFT GAS FIELD

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Annotation This article analyzes changes in the physical and agrochemical properties of light gray soils distributed around the Shurtan gas and chemical industry zone. The studies determined soil density, mechanical composition, moisture capacity, pH, humus content, nutrient (N, P, K) concentration, salinity and heavy metal (Pb, Cd, Zn) content in the zones close to and far from the industry. The results show that the natural fertility properties of the soil are changing dramatically as a result of the activities of the Shurtan gas and chemical industry. Especially in areas close to the industry, soil structure deterioration, increased salinity and erosion of the humus layer are manifested as an environmental problem.

Keywords: Saline, light gray soils, physical properties, agrochemical changes, salinization, humus, heavy metals.

Introduction The Shurtan gas and chemical industrial zone is one of the largest industrial complexes in the Kashkadarya region, and the processes of oil and gas extraction, processing and transportation have a negative impact on the soil and the environment. In particular, lands located in ecotone areas, such as light gray soils, are very sensitive to anthropogenic factors. This article scientifically analyzes the changes in physical and agrochemical properties of light gray soils around Shurtan and substantiates their assessment based on modern agrotechnologies.

Materials and methods (Methodology) Research work was carried out in three zones located within 1 km, 3 km and 5 km radii around the Shurtan NGSK. In each

zone, samples were taken from soil layers at depths of 0–30 cm and 30–60 cm. The samples were analyzed according to the following criteria:

• Soil density (g/cm³) - cylinder method;

• Mechanical composition - pipette method;

• Moisture content and hygroscopic moisture – gravimetric method;

• pH (acidity) – potentiometric method;

• Humus content – by Tyurin method;

• Nitrogen (N), phosphorus (P_2O_5), potassium (K_2O) – by photometric and alemetric methods;

• Salinity – by electrical conductivity;

• Heavy metals – determined by atomic absorption spectrometry.

Statistical analyses were performed using MS Excel and STATISTICA programs.

Results

1. Soil density and structural changes:

The density of soils in the 1 km zone is 1.45 g/cm³, which is 10–15% higher than the natural norm. This densification worsens the physical properties of the soil and disrupts the water and air regime.

2. Moisture capacity and moisture retention properties:

In areas close to industry, hygroscopic humidity was 7.8%, while in remote areas it was as high as 9.3%. This indicates that the hydrological balance is being disrupted.

3. pH and salinity:

In areas 1 km away, the soil pH is around 6.3–6.5, indicating a relatively acidic environment. Salinity is 0.45–0.60%, approaching a level harmful to plants.

4. Humus and nutrient depletion:

The humus content in areas close to industry has been found to be between 0.6–0.9%, down from 1.2–1.5% in the natural state. Phosphorus and nitrogen content are also low, requiring agrotechnical soil fertilization.

5. Heavy metals:

Lead (Pb) and zinc (Zn) were found to be 2–3 times higher than the normative values in an area of 1 km. This poses a threat not only to plants, but also to soil microbiota and human health.

Discussion The results of the study show that the light gray soils around Shurtan are being degraded under industrial pressure. There are negative changes in the physical (density, moisture capacity, structure) and chemical (humus, nutrients, pH, salinity, heavy metals) properties of the soil. This not only reduces productivity, but also threatens the stability of ecological systems. Therefore, it is necessary to use bio-organic fertilizers, agro-ameliorative measures, and bioremediation technologies.

Conclusion As a result of anthropogenic loading on light gray soils around the Shurtan industrial zone:

• soil compaction;

• decreased humus content;

• increased salinity;

• increased heavy metal content.

This situation leads to a decrease in soil fertility and disruption of agroecosystems. To restore soil potential, it is necessary to strengthen environmental monitoring, expand agrotechnical measures, and control industrial waste.

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