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Contamination of Shale and Sandy Soils with Industrial Waste

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Abstract: The Mubarak Gas Processing Facilities Plan (MGPP), located in the desert zone of Kashkadarya region, is one of the largest industrial faculties in the country, designed to extract sulfur from hydrocarbons rich, in hydrogen sulfide. As a result of these technological processes, large amounts of H_2S and SO_2compoundsare released into the environment as waste. As a result, under the influence of precipitation, these compounds act as a powder in dry conditions when they fall as acid rain. The effect of plant wastes on soil reclamation, based on the results of agrochemical research, having the amount of mobile nitrogen in irrigated sandy loam soils varied across the layers at the test sites and the effect on some heavy metals in the soil were also studied.

Key words: hydrogen sulfide, hydrocarbon, sulfur, “Acid rain”, mechanism, reclamation, north-east, west, south, agrochemical research, irrigated sandy, shale, mobile nitrogen, microorganisms, potassium, phosphorous, heavy metals, iron, carbonate, cobalt, nicked, cadmium, lead, sandy desert, light gray, bald.

Today, around the world, as a result of the activities of various industrial enterprises, mining, their use in various industries and the influence of the anthropogenic factor, chemical pollution of the soil cover, a change in its properties, as well as a decrease in soil fertility, are observed, as in 116 countries of the world more than 660 oil refineries[1]. Environmental pollution leads to the formation of acid rain, soil degradation, lower quality and quantity of productivity, as well as to the formation of ecosystem-related problems.

Modern environmental problems threaten the sustainable development of human society. A feature of environmental problems lies in the fact that it knows no boundaries, because these problems arise in general, that is, in nature. Today it is clear that the ecological situation, including dramatic changes in soil properties and the deterioration of agricultural land, as well as the role of human activity, among other factors, are important [1,2,3].

In recent years, a decrease in soil fertility due to chemical pollution of soils, i.e. the influx and excess of certain chemicals into the soil and its poisoning. Chemical contamination of the soil cover can potentially be more common than other media, especially gases released into the atmosphere or chemicals from water sources that eventually enter the soil cover. Soil pollution is the addition of physical, chemical and biological substances to the soil. negative changes in ecosystems are caused by a violation of natural and energy metabolism [4,5].

The Republic plays a key role in ensuring regional environmental security, that is, it plays an important role in solving global and regional problems with its natural resources, intellectual and economic potential [6,7]. For example, the

Mubarek gas processing plant (GGES), located in the desert zone of theKashkadarya region, is one of the largest industrial facilities in the country designed to extract sulfur from hydrocarbons rich in hydrogen sulfide. As a result of these processes, a large number of H2S and SO2 compounds are released into the environment as waste.

Scientists have conducted excellent scientific research on the laws of circulation of sulfur and its compounds in the atmosphere, water, soil and plants. On the mechanism of action of "acid rain" on their soil and vegetation Scriabin GK, Ivanov MV, Frenei DR, Savitsky IL, Afendulov KP, Rybalkina AV, Rudnev Effective research by scientists such as V.M., among others.

MGQIZ is one of the largest industrial enterprises in the country, established in 1971. The plant specializes in the extraction of sulfur from natural hydrocarbon gases, as a result of which a large amount of toxic compounds such as hydrogen sulfide (H2S) and sulfur dioxide (SO2) are released into the atmosphere.

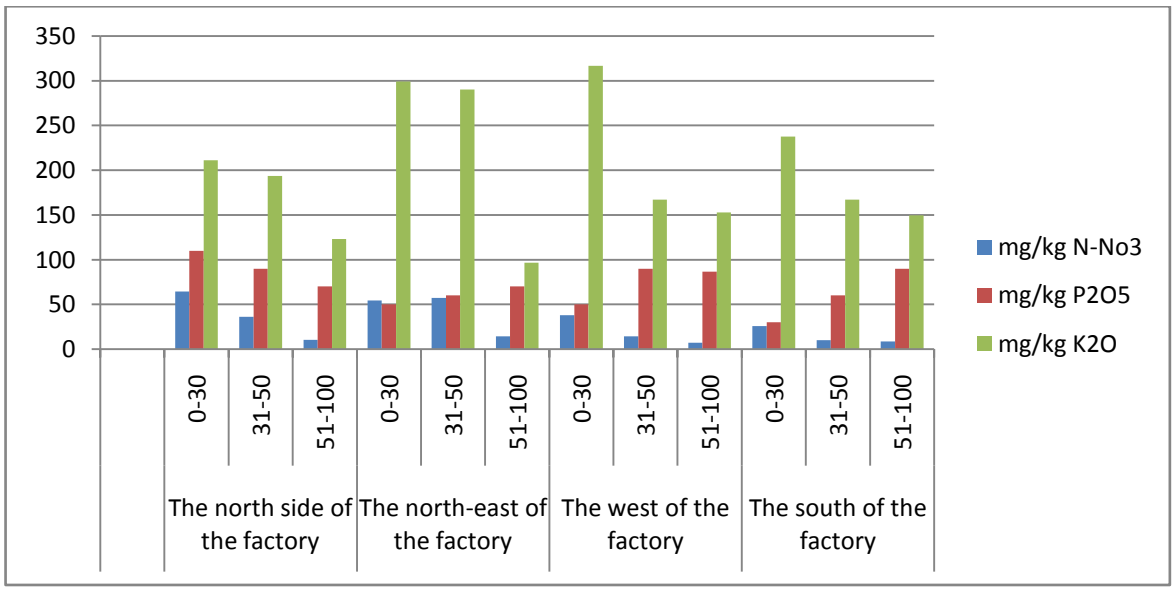
Our studies have shown that under the influence of precipitation, these compounds are exposed in the form of a powder in dry conditions when they precipitate in the form of acid rain. The effect of plant waste on soil remediation is shown in table 1.

Considering that the bulk of the waste falls on irrigated barren sandy soils, we divided the plant area into 4 research and experimental sites relative to the direction of the wind. The first test site is located on the north side of the station, the second test site is located in the northeast, the waste from the plant is unlikely to fall, and the third and fourth test sites are on the west and south sides of the plant.

The results of agrochemical studies showed that the amount of mobile nitrogen in the irrigated sandy loam soils varied by layers in the experimental test sites. Relatively clean northern and northeastern experimental plots were 64.3-54.4 mg/kg in a soil layer of 0-30 cm and 36.0-57.1 mg/kg in a layer of 31-50 cm. In soils of the third and fourth experimental sites, these values were 38.5-25.8 mg/kg in a layer of 0-30 cm and 10.0-14.3 mg/kg in a layer of 31-50 cm.

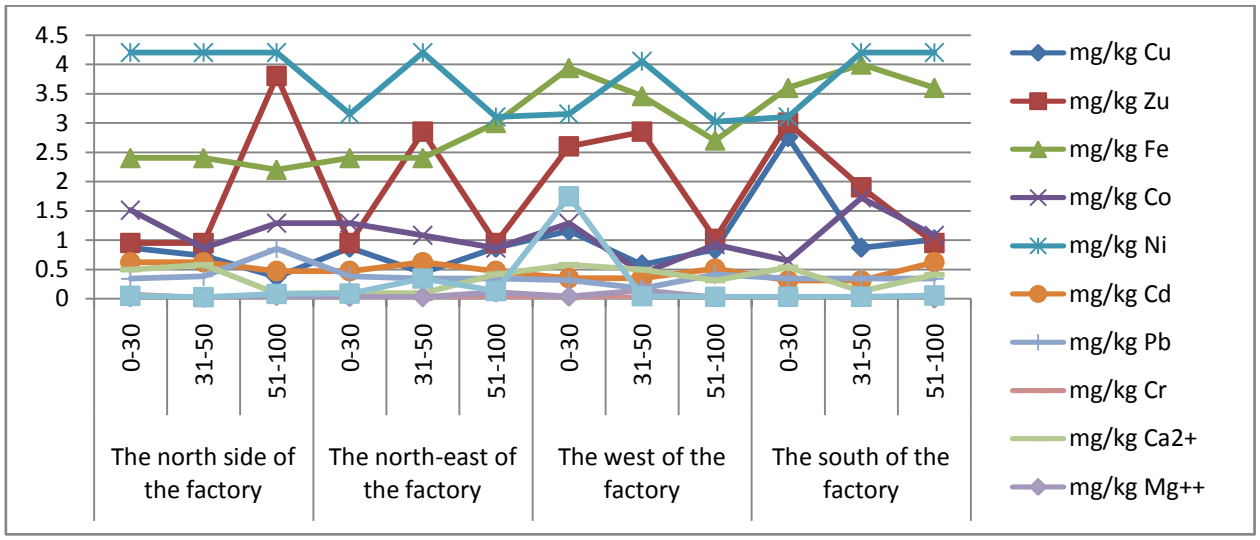
However, in relatively deep soil layers 51-70 cm thick, there was no significant difference between these indicators (Table-1).

Thus, plant waste has a certain negative effect on the activity of microorganisms that control nitrogen metabolism of the soil. The differences between the quantitative indicators of phosphorus and potassium in different experimental zones are directly related to the period of development of the site and the level of culture. The study also examined the effect of plant waste on some metals and heavy metals in the soil. The amount of copper (Su) detected during the study was 0.87 mg/kg in a layer of 0-30 cm of soil from the northern experimental plots (relatively clean) of the plant, while in the same layer of western and southern soils it was 1.16-2.76 mg/kg noted.



Picture-1Mobile nutrients, mg/kg

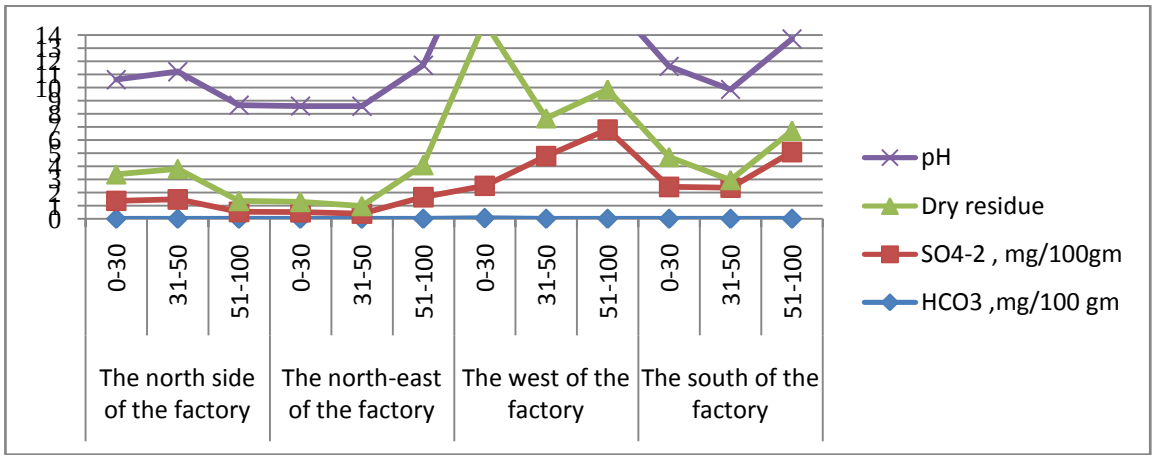
However, in relatively deep soil layers, such large differences are not noticeable. It is felt that sulfur and iron bacteria have a long-term effect on the total amount of iron (Fe) in the soil (table 1). In the 0-100 cm layer of soils of the northern and eastern experimental sites, the average iron content was 2.2-2.4 mg/kg, while in soils subject to a long sulfur content, it was found to be about 3.46- 4.0 mg/kg.



Picture-2Metals and heavy metals,mg/kg

This means that iron compounds with carbonates are more stable. The content of heavy metals of cobalt (So), nickel (Ni), cadmium (Cd) and lead (Pb) in irrigated sandy desert soils of the plant territory was determined as follows: Cobalt metal in all soils of all experimental areas with a large difference in layers of 0.43 mg/kg from 1.72 mg/kg, nickel from 3.02 mg/kg to 4.20 mg/kg with a slight difference, the cadmium content from 0.31 mg/kg to 0.62 with practically no large differences in soil layers mg/kg , it was found that this pattern also applies to lead in soil. The results of laboratory analysis showed that the ability of all experimental soils in irrigated sandy desert soils to store heavy metals is explained by their mineralogical composition, as well as the fact that sandy desert soils are a product of aeolian deposits. The total amount of heavy metals in the spent sands of the plant was not directly affected by their distribution in the strata.

As a result of our research, it was found that the amount of sulfur in the form of SO4 varies in different soil layers. In other words, 1.342 mg/kg in the 0-30 cm layer, 1.474 mg/kg in the 31-50 cm layer, 0.525 mg/kg in the 51-100 cm layer on the north side of the plant and 0.502, 0.385 in the eastern part of the plant. 1.644 mg/kg. However, on the western side of the plant, where sulfur compounds fall in the direction of the wind, the amount of sulfate (SO4) is 2.479 mg / kg in a 0-30 cm layer, 4.776 mg/kg in a 31-50 cm layer and 6.794 mg/kg in a 51- layer 100 cm. The amount of sulfate ions in soils on the southern side of the plant was also high, that is 2425, 2364, 5078 mg/kg. Accordingly, some changes were observed in the reaction of the soil solution, and the alkalinity index decreased from 7.6-7.8 to 6.9-7.2. This is because sulfur compounds that enter the soil react with alkalis in the soil as sulfuric acid, causing a shift in alkalinity to the neutral side.



Picture-3Results of watery suction, %

Three experimental sites were selected to study the effect of sulfur compounds on soil and fruit trees when they were removed from the Mubarek gas processing plant: the villages of Karlik and Maimanak and Karshi. The light gray soil of the village of Maimanak is an automorphic soil of the foothills of Maimanak, and the barren soil of the village of Karlik is a unique hydromorphic soil. Due to the fact that these lands, located 10, 15 and 70 km from the plant, have long been under the influence of intensive agriculture due to the cultivation of cereals, vegetables and cotton, in gardens, the fertility level of these soils is qualitatively different from irrigated sandy loam. Light gray soils of the city of Karshi, located 70 km from the plant, are also automorphic soils and were chosen as the object of study on the shores of Kashkadarya. Although the irrigated badlands of the village of Karlik and the irrigated light gray soils of the village of Maymanak are located 10-15 km from the plant in the direction of the wind, according to the leading specialists of the plant's ecology department, these soils account for 15-30% of sulfur emissions.

Based on the results of the above scientific studies, it can be concluded that plant waste can have a direct effect on soil and plants, mainly inside the plant and in the vicinity of 10-15 km, in the villages of Karlik and Maimanak. As you move away from the plant, the harmful effects of the waste are not noticeable. Harmful substances entering the soil cannot resist the buffering properties of the soil; they form water-soluble salts.

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