

UDC: 628.5:614.7

ENVIRONMENTAL FRIENDLY SOLUTIONS FOR THE REMEDIATION OF POPs CONTAMINATED SITES

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The soil contamination by toxic organic substances (POPs, PAHs, BTEX, petroleum hydrocarbons, pesticides etc.) is very important problem worldwide and for Republic of Moldova. The management of contaminated sites includes different remediation approaches. The aim of this work is to test a bioremediation technology for the decontamination of POPs contaminated soil for the analysis of their implementation for the management purposes. The review of existing bioremediation technologies showed their importance for the sustainable management of POPs contaminated sites. One case study of high POPs contaminated site was realized for the risk assessment procedure and the evaluation of the bioremediation technology. The site was studied in detail which included sampling, laboratory analysis, determination of hotspots and contamination area, evaluation of the contaminated soils volume, the conceptual model elaboration for the risk assessment, and recommendation for the selection of the appropriate remediation technology. for the soil and geological condition. POPs concentration and spectrum were analysed using GC/MS method. The bioremediation experiment in the laboratory condition was realised for the demonstration of the capacity of this method.

The fertilizer supplement was prepared from the local materials for the acceleration of the bioremediation process as follows: 40 % of iron powder (0.3 – 0.50 mm); 50 % of small wood shavings; 10 % of composted chicken manure. This fertilizer was used as an additive to the soil in the amount of 5 and 10% of the soil mass. The soil treatment after the fertilizer addition included cycles of anaerobic and aerobic conditions. The anaerobic condition phase included the soil hydration up to 70% of the maximum molecular moisture capacity, heating to 30⁰ C and isolation from the air. This phase lasted for 14 days. The aerobic condition phase included the open-air condition for the temperature 20 – 25⁰ C, soil loosening and drying up to 20% of the humidity. This phase lasted for 7 days. The remediation had 8 cycles.

The obtained results showed that the initial POPs concentration from 500 – 650 mg/kg decreased to up 100 – 120 mg/kg (70 – 85 % of the initial concentrations). The blank experiment showed a reduction up to 60 %. The increase in the total number of microorganisms participating in the bioremediation process in all experimental schemes from 40 to 120 % compared to the blank was indicated. The principal conclusion is that the bioremediation technologies are perspective, cost-effective and simple approach among all methods for the remediation of contaminated soils in the comparison with existing remediation approaches (https://frtr.gov/matrix2/section3/table3_2.pdf). The in-situ soil treatment is a better approach because leaves the soil structure intact, reduces the potential migration of contaminants through soil and water systems.

Acknowledgements. This work is a part of the Moldovan State Program (2020-2023) “Study and management of pollution sources to develop recommendations for implementing measures to mitigate the negative impact on environment and human health”, Project number: 20.80009.7007.20.