



“Gheorghe Asachi” Technical University of Iasi, Romania



RISK ASSESSMENT OF SOME HEAVY METALS CAUSED BY DRILL CUTTINGS)□ CASE STUDY: MANSOURI OIL FIELD AHVAZ-IRAN)

Peyman Khalili¹, Mehran Hoodaji^{2*}, Mozhgan Ahmadi Nadoushan³, Atfeh Chamani³

¹*Department of environmental sciences, Isfahan (khorasgan) Branch, Islamic Azad University, Isfahan, Iran*

²*Department of Soil Science, Isfahan (khorasgan) Branch, Islamic Azad University, Isfahan, Iran*

³*Department of environmental sciences, Waste and Wastewater Research Center, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran*

Abstract

One of the most important wastes generated from oil and gas exploration is drill cuttings. Contamination of heavy metals in these wastes affects the environment. The purpose of the current study was to identify the hazards and health risks of three heavy metals (Cd, Pb, Zn,) caused by drill cuttings on the employees and residents of the study area and their reduction using phytoremediation. Due to the high concentration of heavy metals, petroleum hydrocarbons, and salinity in the soil, and the lack of seed germination, contaminated drill cuttings were mixed with non-contaminated soil in proportions of 5%, 10%, and 15%. After laboratory analysis, they were utilized to cultivate barley, wheat, oats, and quinoa. After 70 days, plants were harvested and Rhizosphere soil samples were analyzed. The results show that the highest value of the indices (Pollution load index (PLI), geo-accumulation index (I-GEO) and contamination (CF)) was in the pre-sowing soil samples and in the mixing percentages of 50% and 100% of contaminated soil, which were in a critical state. The geo-accumulation index of these metals followed the guidelines of the American Environmental Protection Agency in the polluted and severely polluted range. The high rate of dermal absorption and the risk index through inhalation indicate an increased possibility of non-cancerous risk for the drilling workers and adverse health effects for the residents of the area. The probability of carcinogenicity of the two metals lead and cadmium, for adults was much higher than the standard level. Therefore, in oil regions, plant remediation technology can reduce the risks of the presence of heavy metals caused by the drilling mud and cuttings in agricultural lands to an acceptable level for human health.

Key words: carcinogenic and non-carcinogenic risks, drilling mud, heavy metals, risk assessment

Received: January, 2023; *Revised final:* April, 2024; *Accepted:* April, 2024

* Author to whom all correspondence should be addressed: e-mail: mehran.hoodaji1@gmail.com; Phone: +9835002246