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CONCENTRATIONS OF PETROLEUM HYDROCARBONS AT DIFFERENT DEPTHS OF SOIL FOLLOWING PHYTOREMEDIATION

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Abstract

Petroleum hydrocarbons not only are toxic to humans and other living organisms, but will also pollute groundwater. It is thus critical to decrease the concentration of these pollutants in soil. Phytoremediation is an effective way to remove toxic compounds from soil. The current study used sorghum (Sorghum bicolor (L.) Moench) and barley (Hordeum vulgare) to reduce petroleum hydrocarbon content of contaminated soil around Isfahan Oil Refinery (Isfahan, Iran) and assessed the concentrations of petroleum hydrocarbons and oil-degrading bacteria at different depths of soil following phytoremediation. We prepared one-meter soil columns from the control and contaminated soil and sowed sorghum and barley seeds in triplicate. There were also unplanted treatments to eliminate the effects of environmental factors on the reduction of oil-based contaminants. Thirteen weeks after sowing of the plants, soil columns were sampled at 25, 50, 75, and 100 cm depths and concentration of petroleum hydrocarbons and number of oil-degrading bacteria were determined. Moreover, the roots and shoots of the plants were separated, dried in an oven at 80°C for 48 hours, and finally weighed. Statistical analyses indicated the two plants to reduce the concentration of petroleum hydrocarbons to a significantly higher extent (23%-35%) than the control treatment. Increasing depth was associated with increased petroleum hydrocarbons concentration and decreased number of oil-degrading bacteria, i.e. the method was only effective in depths where plant roots penetrated. Accordingly, in order to remove deep soil contamination, phytoremediation needs to be accompanied by land farming and stimulation and injection of oil-degrading microorganisms.

Key words: depth, oil-degrading bacteria, petroleum hydrocarbons, phytoremediation, soil

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