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Ecological Remediation of Heavy Metals in Crude Oil Polluted Waters Using Duckweed

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Abstract

Heavy metals are present in crude oil produced worldwide in varying concentration as impurities. Such metals are also exposed to the environment when oil spill occur. In this study, we applied the duckweed, *Lemna paucicostata* as an ecological based treatment method for the phytoremediation of heavy metals present in crude oil polluted waters. Duckweed was applied in an artificial constructed wetland mesocosm contaminated with crude oil to simulate a spill site. Heavy metals were analyzed following established guidelines using AAS for a 60-day period. The results showed that heavy metals reported in this study were above permissible limit. Initial cadmium, chromium, lead and vanadium decreased by 4.36, 7.06, 17.95 and 2.47% after 15 days respectively and then decreased further by 11.21, 19.94 and 32.4% for Cd; 13.15, 16.9 and 13.76% for Cr; 20.51, 30.77 and 41.03% for Pb; and 4.12, 15.66 and 26.37% for V after 30, 45 and 60 days respectively. There was no significant difference between the mean values of the metals across the duration. The result of this study showed that duckweed moderately removed heavy metals from crude oil polluted waters. Extending the duration of the study could increase the potentials of the plant to remove a higher amount of metals from the contaminated media. This result could be translated to real life application as an ecological base tool for the sustainable remediation of metals in crude oil polluted environment.

Keywords: phytoremediation, constructed wetlands, duckweed, petroleum hydrocarbons, floating macrophytes

INTRODUCTION

Nigeria is the leading oil-producing nation in Africa and one of the top oil producing nations in the world. Over the years, the oil sector has grown to become the mainstay of the Nigerian economy displacing agriculture with the oil and gas sector responsible for about 80% of the federal government revenue and about 90% of export earnings (Enegide and Chukwuma 2018). Crude oil is a complex chemical mixture composed primarily of saturated and polyaromatic hydrocarbons, with some level of emulsified