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Potential of Vetiver (*Vetiveria zizanioides*) for the Use in Phytoremediation of Petroleum Hydrocarbon-Contaminated Soils in Venezuela

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Abstract

Venezuela is one of the largest oil-producers in the world. For the rehabilitation of oil-contaminated sites, engineering techniques are conventionally used but the interest in biological-based methods is growing. Phytoremediation represents a promising alternative technology. It is based on the use of plants and their associated microorganisms to remove or contain organic or inorganic contaminants present in soil and water.

Within the research on phytoremediation in Intevep (Research and Technological Support Centre of the Venezuelan oil company PDVSA) a greenhouse experiment was conducted. Vetiver grass (*Vetiveria zizanioides* (L.) NASH) was chosen as the experimental plant. The 6-month study aimed to determine the tolerance of vetiver to a heavy crude oil (Boscán) in soil. Additionally, the potential for stimulating biodegradation of petroleum hydrocarbons was tested. Plant growth and soil parameters between different treatments. Vetiver transplants suffered under the influence of crude oil. However, most of them demonstrated the ability of asexual reproduction. After 6 months, the tiller production rate was higher in contaminated than in uncontaminated soil. Despite significantly reduced biomass and heights, the tillers did not exhibit signs of toxicity on their shoots in the presence of contaminants but their root surface areas were reduced. First, growth was higher in the medium (220 N/kg, 110 mg P/kg, 110 mg K/kg) than in the high fertilizer treatment (300 mg N/kg, 150 mg P/kg, 150 mg K/kg) of contaminated soil but in the course of the experiment, plant growth achieved a similar development level. Vetiver was found to be tolerant concerning the toxic effects of crude oil in soil. As to the degradation of total oil and grease in soil, no significant increase in biodegradation in the presence of vetiver was detected. Thus, the species was deemed to be unsuitable for facilitating biodegradation of crude oil in soil. However, vetiver is a beneficial plant in soil and water conservation practice. Promising uses of the species on petroleum-contaminated sites in Venezuela are for amelioration of soils, as “organic pumps” and for erosion control.

Keywords: Biodegradation, crude oil, petroleum hydrocarbons, phytoremediation, Venezuela, vetiver