Journal of Chemical Health Risks 2(3): 17-20, 2012
ISSN:2251-6719

The Effect of Oil Pollution on *LathyrusSativus* and *Lens Culinaris* with Potential of Phytoremediation

R .Noori, B. Lorestani, N. Yousefi, N.Kolahchi,
.
Department of Environment, Hamedan Branch, Islamic Azad University, Hamedan, Iran

Abstract: Oil pollution is a worldwide threat to the environment. The remediation of oil contaminated soils, sediments and water is a major challenge for environment. Phytoremediation is an emerging green technology that uses plants to remediate soil, sediment, surface water, and groundwater in environment which contaminated with toxic metal, organics, and radionuclide. In this study, some species of Fabaceae family were chosen and planted in different concentrations of oil pollution in soil, to identify the tolerant species. It was done in period of 40 days in Completely Randomized Design (CRD). The results showed the highest level of light crude contamination, which the plant is able to grow,is 8% with 3.3 cm for lathyrussativus species and 6% with 7cm for Lens culinaris. So among the studied species Lathyrussativus and Lens culinaris were tolerant species that could grow in high concentrations of oil pollution. These species can be suggested to phytoremediation of oil-polluted soils.

Key words: Contaminated soil, Oil effect, Phytoremediation, Tolerant

INTRODUCTION

Among the broad range of organic pollutants contaminating soil-water environment, polycyclic aromatic hydrocarbons and pesticides are of great environmental concerns [4]. PAHs are hydrophobic organic contaminants and persist in the environment because of their recalcitrance to degradation and widespread occurrence in contaminated industrial wastelands. Thereby these compounds pose a health risk due to their toxic, mutagenic and carcinogenic properties [5]. Crude oil in soil makes the soil condition unsatisfactory for plant growth due to the reduction in the level of available plant nutrient or a rise in toxic levels of certain elements such as iron and zinc. Plants are highly susceptible to oil exposure and this may kill them within a few weeks to several months. There are several vegetal species that are capable of growing soils polluted with hydrocarbons and they participate in their degradation. These plants are good candidate to phytoremediation [8].

To reduce human health risks for these compounds some innovative bioremediation techniques have been developed using phytoremediation [9].

Phytoremediation is a broad term that has been used since 1991 to describe the use of plants to reduce the volume, mobility, or toxicity of contaminants in soil, groundwater, or other contaminated media [6]. Phytoremediation is an emerging green technology that can be a promising solution to remediate hydrocarbon-polluted soils, not only in developed countries but also in developing countries like Iran [1]. In this study growth ability of five species of Fabaceae family were investigated.

Finally two species that acceptable growth in soil contaminated have been introduced.

MATERIAL AND METODS

Table 1.Physical and Chemical characteristic

Parameters	Amount	Method
sand	35	Hydrometer
silt	19	Hydrometer
clay	43	Hydrometer
soil texture	clay loam	Hydrometer
PH	7	PH meter
EC	2.93(DS)	EC device
Organic carbon	0.86(%)	Oxidation
Nitrogen	0.05(%)	kjeldahl
Phosphorus	12(mg/kg)	Olsen
Organic matter	6.21(%)	Walky& Black

The soil used in study was obtained from the top of soil (0-20 cm) collected of agriculture farm.

Then physical and chemical characteristic were determined because the success phytoremediation independent to physical and chemical characteristics of soil. Light crude oil from Serkan refinery was prepared. Soil contaminated with different concentrations of light crude oil. Five plant species including Lathyrussativus, Trigonellafoenum, Glycyrrhizaglabra, Lenusculinarys and Phaseolus vulgaris were bought from local market.

Corresponding Authors:*R .Noori, Department of Environment, Hamedan Branch, Islamic Azad University, Hamedan, Iran , Email: Rash.in.2060@gmail.com*

Then six plant species planted in pots of uncontaminated and contaminated (2, 4, 6, 8 and 10 percent light crude oil) soil and kept to be grown for 2 months.

Then two species that had acceptable growth rate compared to the control sample selected. So persistence species introduced [7].

The design of the experiment was a randomized complete block design (RCBD) with 3 replications. One-way analysis of variance (ANOVA) and LSD test. A probability of 0.05 was considered as significant.

RESULT AND DISCUSSION

Result of analysis variance showed that significant differences ($p \leq 0.05$) existed in the effect of oil pollution levels and growth rate. So LSD test showed that significant differences ($p \leq 0.05$) between level of oil pollution

.

Table 2.Analysis of variance growth parameter Lathyrussativus and Lenusculinarys

Species	Concentration parametr	Control sample	2%	4%	6%	8%	10%
Lathyrussativus	Mean Standard Deviation	27.8± 3.9	25.7± 3.6	14.4 ± 2.5	7.2± 1.9	3.3± 0.9	-
Lens culinaris	Mean Standard Deviation	25.2 ± 2.8	22.1 ±2.2	13.8± 1.5	7±1.1	-	-

In this study Lathyrussativus species and Lenusculinarys species growth were investigated. Control plants grew better than plants grown in soils treated with crude oil. Control plant had high growth and highest concentration had low growth. The highest level of pollution light crude oil soil resulted in no growth. Statistically there was a significant difference between growth in the control and those of treated soils at 5% probability level. Application of light crude oil up to 8% pollution levels soil pollution level significantly reduced growth at the 5% probability level. Udo and Fayemi also found that the performance of maize plants was seriously affected by oil pollution. Growth was generally poor in the polluted soil as level of pollution increased. Retardation of growth at high levels of oil treatment were also observed by Toogood and Rowell and Odu and Fayemi. The reduction in growth may be due to a hindrance of transpiration and photosynthesis [10, 11]. The observed reduction in growth rate of species subjected to higher doses of the light crude oil confirmed growth retardation is possible with oil pollution of soil due to insufficient aeration caused by displacement of air from pore spaces. The evidence of growth retardation as a result of increased for oxygen demand by light crude oil decomposing organisms [3]. Agbogidi and Eshegbeyi also found that aeration of the soil, reduction in nutrient mobilization cause of dejection and retardation of growth [2].

CONCLUSION

Organic compound is important pollutant in soil. Phytoremediation of organic compound is still a developing technology. This technology can provide a low-cost men's of controlling widespread environmental oil contamination identification and used of tolerant species that could grow in high concentration of oil pollution this species are important factor in phytoremediation success.

In this study although showed that significant difference $p<0.05$ exist the effect of oil pollution level and growth but Lathyrussativus species and Lenusculinarys species showed high resistance to toxicity of organic compound to other species. These species are probably well potential to oil polluted soil.

REFRENCES

1. Anderson, T.A.; Guthrie, E.A.; Walton, B.T (1993) Bioremediation. Environ. Sci Technol. 27: 2630-2636.
2. Agbogidi, O. M. and Eshegbeyi, O. F (2006) Performance of Dacryodesedulis (Don. G. Lam H. J.) Seeds and seedlings in a crude oil contaminated, soil. Journal of Sustainable. 22:1-13.
3. Agbogidi, O. M.; Eruotor, P. G. and Akparobi, S. O (2007) Effects of crude oil levels on the growth of maize (Zea mays L.). Journal of Food Technology. 2(6):529-535.
4. Corgie SC.; Beguiristain T Leyval C. (2004) Spatial Distribution of Bacterial Communities and Phenanthrene Degradation in the Rhizosphere of Loliumperenne L. Applied and Environmental Microbiology. 70(6):3552-3557

5. Maila, M. P. and Cloete, T. E (2002) Germination of Lepidiumsativum as a method to evaluate polycyclic aromatic hydrocarbons removals from contaminated soil. International Biodeterioration and Biodegradation. 50:107-113.
6. Mccutcheon, S.C. and Schnoor, J.L. (Eds) (2003) Phytoremediation: Transformation and Control of Contaminants. John Wiley & Sons, New Jersey. USA. 2: 91-110
7. Nasir, H.; Iqbal, Z.; Hiradate, S. and Fujii, Y (2005) Allelopathic potential of Robinia pseudo-acacia L. Journal of Chemical Ecology. 31: 2179-2192.
8. Omosun, G, Markson and O. M banasor. (2008) Growth and Anatomy of AmaranthusHybridus as Affected by Diferrent Crude Oil Concentrations. American-Eurasian Journal of Scientific Research, , (1): 70-74.
9. Reynolds C.M. and Skipper H.D (2005) Bioremediation of contaminated soils. In: Principles and applications of soil microbiology. J. Furhmann and D.A. Zuberer, Eds.
10. Toogood, J. A. and Rowell, M. J (1977) 'Reclamation Experiments in the Field', in J. A. Toogood (ed.), The Reclamation of Agricultural Soils after Oil Spill. Part 1, pp. 34–64.
11. Udo, E. J. and Fayemi, A. A. A (1975) 'Effect of oil pollution of soil on germination growth and nutrient update of corn', J. Environ. Qual. 4(4), 537–540.