

more resistant to normal water treatments, hence polluting both water and soil ecosystems. Over the past few decades, extensive work has been carried out on employing microbes in cleaning up polluted environment called bioremediation.

This study is preliminarily based on screening and identification of efficient microorganism involved in bio remediation hydrocarbon waste or pollution and also determining the best condition for degradation process. Organisms obtained in this study were isolated directly from the contaminated sites near mechanical workshops. 2 pure strains of bacteria, including *Enterobacter sp.*(C2), *Pseudomonas Sp.*(T2), has been isolated and selected for biodegradation under in-vitro conditions. Optimization of Physio-chemical parameters for the degradation of used oil under stimulated conditions for each organism has been studied. From results it showed that oil dispensed distilled water media was more suitable for the microorganisms to attach on the oil surface and there by degrading it without short intervals of time. pH reduction must be further studied because in the was constant in MS media, whereas in oil dispensed media the pH has reduced consistently.

Comparative evaluation of the time course and extent of biodegradation of used oil in 2 different mediums was conducted with the above mentioned organisms. In which *Pseudomonas Sp.* C2 showed maximum reduction in oil weight about 40% within the period of 28 days under stimulated conditions compared with [12]. And the pattern of degradation was observed by GC analysis for it shows 90.8% degradation of hydrocarbon content in used oil after fermentation for 28 days in MS media and about 96% was degraded in Oil dispensed media. The results were comparable with [7] where the *Pseudomonas Sp.* showed 92% degradation in minimal media, whereas in the present work Oil dispensed distilled water medium containing used oil showed maximum results of above 96% degradation of hydrocarbons.

Heavy metals in the oil sample were analyzed using Energy dispersion Spectroscopy (EDS) over silica plate showed peaks indicating Lead in the sample though it was not degraded metallic components are dispersed in the oil in smaller particle size. And this dispersion of heavy metals characterized by Scanning Electron Microscope (SEM) at 500nm

6. Conclusion

The present study indicates that organisms isolated from the contaminated site have degradation potentials on used engine oil under stimulating conditions. The growth on oil media showed major degradation potential than in minimal media. GC analysis of used oil compared with control and after remediation indicated maximum percentage of degradation in oil dispensed media. The percentage area in hydrocarbon reduction showed adsorption of carbon molecules present in the oil. These potentials of the isolated microorganism confirm a promising efficiency in bio remediation petroleum hydrocarbon polluted sites, particularly in lakes, ponds etc.

7. Future Scope

The isolated strains can be fermented in different crude substrate mediums such as organic waste, forestry waste etc to enhance the efficiency of microbial degradation of very petroleum hydrocarbons and heavy metals.

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References

- [1] I. Anthony, "Biodegradation alternative in the cleanup of petroleum hydrocarbon pollutants" *Biotechnology and Molecular Biology* Vol. 1 (2), pp. 38-50, ISSN 1538-2273, June 2006
- [2] C. Singh and J. Lin "Isolation and characterization of diesel oil degrading indigenous microorganisms in Kwazulu-Natal, South Africa" *African Journal of Biotechnology*, Vol. 7 (12), pp. 1927-1932, ISSN 1684-5315 17, June 2008
- [3] O. C. Nwinyi, I. A. Kanu, A. Tunde, K. Oluseyi Ajanaku "Characterization of Diesel Degrading Bacterial Species from Contaminated Tropical Ecosystem" *Braz. Arch. Biol. Technol* Vol.57, n.5: pp. 789-796, ISSN 1516-8913, October 2014
- [4] A. E. Omotayo, O. A. Efetie, G. Oyetibo, M. O Ilori And O. O. Amund "Degradation of aviation fuel by microorganisms isolated from tropical polluted soils" *Int. J. Biol. Chem. Sci.* 5(2): 698-708, ISSN 1991-8631, April 2011
- [5] F. M. Ghazali, R. N. Zaliha A. Rahman, A. B. Salleh, M. Basri "Biodegradation of hydrocarbons in soil by microbial consortium" *International Biodeterioration & Biodegradation* 54, pp: 61 – 67, 2004
- [6] "Heavy metal contamination of soil in mechanic workshops" A. O. Ameh, I. Ali mohammed-dabo , S. Ibrahim, J. B. Ameh and J. O. Odengle *Int. J. Biol. Chem. Sci.* 5(5): 2103-2113, ISSN 1991-8631, October 2011
- [7] S. Chithra, N. Hema Shenpagam "Isolation and Identification of Oil Degrading Bacteria From Oil Contaminated Soil and Comparison of Their Bioremediation Potential" *Global Journal For Research Analysis* volume-3, Issue-8,ISSN No 2277 – 8160, August-2014
- [8] American Public Health Association (APHA) standard Methods for the examination of water and wastewater. Waldorf, Maryland 1999.
- [9] D. H. Bergey, G. Holt John, "Bergey's manual of determinative bacteriology", Baltimore: Williams and Wilkins 1994.
- [10] Dr. R. C. Dubey and Dr. D. K. Maheshwari, "Book on Practical Microbiology", Revised edition 2014
- [11] Teli Nikhil, Verma Deepa, Gavankar Rohan and Bhalerao Satish "Isolation, Characterization and Identification of Diesel Engine Oil Degrading Bacteria from Garage Soil and Comparison of their

Bioremediation Potential” *International Research Journal of Environment Science* ISSN 2319-1414 Vol. 2(2), 48-52, February 2013

- [12] W. Basuki, K. Syahputra, A. T. Suryani, and I. Pradipta “Biodegradation of Used Engine Oil by *Acinetobacter junii* TBC 1.2” *Indonesian Journal of Biotechnology*, Vol. 16, No. 2, pp.132-138, December, 2011
- [13] O. S. Obayori, L. B Salam and O. S. Ogunwumi “Biodegradation of Fresh and Used Engine Oils by *Pseudomonas aeruginosa* LP5”, *J Bioremed Biodeg* 5:1 2014, <http://dx.doi.org/10.4172/2155-6199.1000213>
- [14] S. Khodijah Chaerun, K. Tazaki , R. Asada And K. Kogure. “Interaction between clay minerals and hydrocarbon-utilizing indigenous microorganisms in high concentrations of heavy oil: implications for bioremediation” *Clay Minerals* 40, 105-114, 2005

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