Comparison of Biodegradation of Lubricant Wastes by Scenedesmus vacuolatus versus a Microalgal Consortium

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Locally, the petroleum, aluminum and steel milling industries have expressed considerable interest in the utilization of bioremediation as a means for reducing their lubricant waste. The aim of this study was to determine the efficiency of microalgae Scenedesmus vacuolatus versus microalgal consortium (Chlamydomonas pitschmannii, Trebouxia australis and Pectinodesmus pectinatus) in the biodegradation of industrial coolant and spent lubricant waste products. To determine a biodegradation capability of the microalgae, dehydrogenase activity tests were carried out. Samples that indicated positive dehydrogenase activity where then analyzed weekly using gas chromatography-mass spectrometry, to track the biotransformation of hydrocarbons and confirm biodegradation of the total petroleum hydrocarbons. Statistical analysis with SPSS, $p<0.05$, indicated the microbial consortium to be better at degradation compared to Scenedesmus vacuolatus. Dehydrogenase activity for both the coolant rolling oil (0.058 ± 0.001 mg/mL), and the spent rolling emulsion (0.047 ± 0.002) was higher for the microbial consortium compared to S. vacuolatus, 0.046 ± 0.001 mg/mL (for both coolant and spent oil emulsions). Gas chromatography-mass spectrometry confirmed 100% biodegradation by both Scenedesmus vacuolatus and microalgal consortium after five weeks. This data can now be used to upscale the experiments and develop a bioremediation strategy to be used by local industries.

Biography

Stella has completed her MSc from University of KwaZulu-Natal, South Africa and currently a PhD candidate at University of KwaZulu-Natal, South Africa. She currently specializes in microbial biotechnology for bioremediation. Sumaiya is a microbiologist and academic at University of KwaZulu-Natal, South Africa. She specializes in environmental microbiology and microbial biotechnology.

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