UNIVERSITI TEKNOLOGI MARA

LANDFILL LEACHATE TREATMENT USING SINGLE AND MIXED FRESHWATER CYANOBACTERIAL ISOLATES

AINA YASMIN BINTI DAUD

Dissertation submitted in partial fulfillment
of the requirements for the degree of
Master of Science
(Applied Biology)

Faculty of Applied Sciences

May 2022

ABSTRACT

Increasing volume of waste disposal and improper management of landfill have been contributing to the heavily polluted leachate. Local freshwater cyanobacteria collected from a water feature located in a public school in Shah Alam, Selangor was screened for its morphology and ability to proliferate in a short period. It was then further identified based on polyphasic approach that combines both the morphological and molecular identification by the 16S rRNA gene sequencing method. The local cyanobacteria isolate (A1) was identified up to only the genus level, *Cyanobacterium* of the order Chroococcales. The A1 isolate was used with another identified cyanobacteria, *Anabaena* sp. to observe their effectiveness in remediating leachate pollution either as monoculture or in mixed culture. Prior to the phycoremediation, the characterization of Jeram Sanitary Landfill leachate had been carried out. The biological oxygen demand (BOD_5) and chemical oxygen demand (COD) determined were 22.37 mg/L and 58.33 mg/L, respectively. The pH value of the raw leachate was 7.84 while the concentration of ammonia-nitrogen (NH_3-N), nitrite (NO_2^-) and nitrate (NO_3^-) were 82.7 mg/L, 88.67mg/L and 89.43mg/L, respectively. The used of a single *Anabaena* sp. demonstrates the most effective in the removal of all contaminants exist in the leachate. The removal of COD was the highest at 105.71% followed by BOD_5 at 92.71%. Among the three nitrogen forms observed, the NO_3^- removal at 82.09% by *Anabaena* sp. was the highest. Meanwhile, the mixed isolates and A1 isolate did not show a great potential as contaminant removal except for NH_3-N at 85.08%. and 77.90%, respectively. This finding suggested that in order to achieve optimum removal of BOD_5, COD, NH_3-N, NO_2^- and NO_3^- content in leachate sample, treatment by *Anabaena* sp. should be applied.

ACKNOWLEDGEMENT

Firstly, I wish to thank Allah for giving me the opportunity to embark on my MSc and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor, Dr. Wan Razarinah binti Wan Abdul Razak and co-supervisor, Dr. Aziyah binti Abd Aziz for their help, guidance, and enthusiasm throughout the whole process of completing this thesis.

I would also like to thank Dr. Faradina Merican binti Mohd Sidik Merican (Universiti Sains Malaysia) for providing one of the cyanobacteria species, *Anabaena sp.* used in this study. In addition, my appreciation goes to the lab assistants and Madam Rafidah binti Rasol who provided the facilities and assistance during experimentation processes and sampling. Special thanks to my colleagues and friends with whom I worked closely and also provided for some much-needed humour and entertainment in what could have otherwise been a somewhat stressful laboratory environment.

Finally, I would like to thank both of my parents, Daud bin Shariff and Masridah binti Jarkase and my family for the vision and determination to educate me. Without their faith, support, encouragement, quiet patience, and love, I could never be where I am now. Their prayers for me were what sustained me this far. This piece of victory is dedicated to all of you. Alhamdulilah.

TABLE OF CONTENTS