UNIVERSITI TEKNOLOGI MARA

RHAMNOLIPID NR.22 GREEN DETERGENT BY PSEUDOMONAS AERUGINOSA NR.22

FATHIIN NABIILAH BINTI RAHMAN

Bachelor of Engineering (Hons) Chemical

July 2019

ABSTRACT

Washing detergent consisted of variety of components as example surfactants and enzyme. Green Alternative or biodegradable detergent has been introduced by using *Pseudomonas aeruginosa* NR.22 to produce green detergent rhamnolipid NR22. This research started with the preparation of rhamnolipid biodetergent and the chemical structures of the surfactants product was confirmed by Fourier Transform Infrared Spectrometer (FTIR). The results show 40% of foaming formation can be obtained and the foam could remain to 5 hours which qualified as the good stability product of biosurfactant. Absorption valleys at 3286.26 and 3308.81 cm^{-1} in commercial and produced biosurfactant respectively shows the O-H band bond as hydroxyl groups. Another broad absorption valley observed in the value of 2151.11 and 2159.97 cm^{-1} were demonstrated in stretching C-C bond which was in alkyl groups. Absorption at 1637.85 cm^{-1} for the commercial biosurfactant and 1634.89 cm^{-1} for the produced biosurfactant was characterized as stretching C=C bond of alkene groups. A bending of C=O bond at 1737.26 and 1365.16 cm^{-1} for produced biosurfactant were in a group of carboxylic acid. The wavelength of 1364.82 cm^{-1} for the commercial biosurfactant also came from the same group of carboxylic acid. The absorption at 1217.02 cm^{-1} for the produced biosurfactant consisted the stretching of C-O bond which in hydroxyl group. The percentage oil removal of 94.87% was excellent using the formulation of biodetergent which was nearly similar to the commercial detergent (99.5%) and mix of commercial detergent with biodetergent (96.6%). The trend of the graph of oil removal percentage versus temperature of washing medium shows as increasing in temperature of washing medium, the percentage of oil removal on the cotton cloth also increasing. Rhamnolipid NR22 have the capability and high potential as a good biosurfactant and detergent in comparing the images using Scanning Electron Microscopy (SEM).

ACKNOWLEDGEMENT

Firstly, I wish to thank Allah for giving me the opportunity to embark on my Degree and for completing this long and challenging journey successfully.

Foremost, I would like to express my sincere gratitude to my supervisor, Dr Nik Raikhan Nik Him for the continuous support of my Degree study and research, for her patience, motivation, enthusiasm and immense knowledge.

I would like to say thank you to both of my parents and family for their love, prayers and support that helped me in all the time of research and writing of this thesis. I appreciate for what they have done throughout finishing this thesis.

My completion of this thesis could not have been accomplished without support of my friends; Ashyraf, Farah, Sofia and Lutfi and also thank you to all UiTM's staffs that helping and guidance me in using their facilities and equipment.

TABLE OF CONTENT

CHAPTER ONE
INTRODUCTION

1.1 Research Background

Washing detergent consist of variety of components as example surfactants and enzyme. The major functions of surfactant are reducing surface tension between two different phases and interrupt the bonding, solubilize the dirty marks and lastly for preventing redeposit. Surfactants have several number of application besides apply it for daily use, surfactants also can be used in agriculture, health and in most industry (S. J. Varjani, 2017; Zhao et al., 2016). Other than surfactants, the contents inside of any type of detergent mostly are fillers, builders and some of the detergent consists of variation of supplementary materials based on the product itself and usability. The surfactants that found in washing detergent plays an important roles in removing dust, mark or smudge from cloth or textile by decreasing the interfacial tension (Khaje Bafghi et al., 2012).

The enzyme that contains proteases and lipases helps in improvising the function of washing detergent especially when eliminate some dirt or food stain that is hard to remove with the condition of mild washing (Ruchi et al., 2008). The previous study has stated that the problem of enzyme when washing process is that it needs to be done at temperature of 30-60˚C with a pH value of 9-12 which in alkaline. Even though the detergent could degrade fat and protein-based stain with the help of enzymes (lipases and proteases), the detergent is still not a good detergent because to have an excellence washing, the enzyme itself need to well suited with the temperatures and pH (Grbavcic et al., 2011). Fusant that produces extracellular proteolytic enzyme can be applied as potential additives in laundry detergent and it has been tested to have a good washing performance (Savitha et al., 2011).

Biosurfactants can be divided into two categories; low-molecular-mass-molecules and high-molecular-mass polymers. For low-molecular-mass-molecules, it is related to interfacial tension and lower surface which glycolipids and phospholipids are the example of surfactants used. While for high-molecular-mass polymers, it is suitable act as an agent to stabilize the emulsion. Biosurfactants can be applied in