UNIVERSITI TEKNOLOGI MARA

PRODUCTION OF MICROALGAE-DERIVED EXTRACT AND ITS RESPECTIVE HPLC ANALYSIS

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ABSTRACT

Microalgae have great potential in biopharmaceutical or medical application as they carries a lot of promising bioactive compounds such as carotenoids, vitamins and polyunsaturated fatty acids (PUFAs). Due to that, further study in Microalgae Research Laboratory (MRL) was conducted in order to develop a method to extract these microalgae compounds and generate the HPLC chromatograms to analyze these microalgae-derived extract (MDE). Two strains of microalgae in MRL were chosen based on the availability of their growth profiles from previous study and these microalgae were known as Z5 and Ku Lom 2 X_2. These microalgae were subjected to the solvent extraction. The solvents used were hexane, ethyl acetate and 80°C deionised water. Solvents with different polarities were chosen because polarity greatly affects the extraction process. Polar solvent can extract the polar compounds and non-polar solvent can extract the non-polar compounds. In this study, HPLC was used to generate the MDE chromatogram. The standard operating procedure (SOP) developed at Atta-ur-Rahman Research Institute for Natural Product Discovery (AURiND) was used and the column used was Phenomenex C18 Hydro 4 μm, 4.6 x 150 mm. Two mobile phase used were ultrapure water as mobile phase A and acetonitrile (ACN) as mobile phase B. Flow rate was maintained at 1 mL/min and each samples were ran for 30 min with post time of 5 min. The detectors used were diode array detector (DAD) and evaporative light scattering detector (ELSD). Hexane and ethyl acetate was capable of extracting these microalgae compounds since there were significant peaks shown in the MDE chromatograms. However, there was no significant peak shown in chromatograms generated from 80°C deionised water extract. The identities of the MDE are still unknown due to the unavailability of standard in this study. The standard need to be design so that by comparing the retention time (t_R), the identities as well as quantities of the compounds can be determined.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Microalgae (also known as phytoplankton) are single-cell organisms that lack roots, stems and leaves and come in various colours and forms (Brennan & Owende, 2010). Most of them are mobile and typically can be found in freshwater and marine systems. According to the report by National Renewable Energy Laboratory, there are hundreds of thousands of microalgae types.

Some of microalgae species such as *Neochloris oleabundans* and *Nannochloropsis* sp. absorb sunlight, water and carbon dioxide, converting them into natural oil as well as carbohydrates, proteins and other nutrients (Gouveia & Oliveira, 2009). By undergoing the photosynthetic activity, microalgae process more than 25% of annual inorganic carbon dissolved in oceans into carbohydrates that serve to feed the other levels of the trophic networks (Mimouni et al., 2012). Microalgae have high nutritional value and can be the alternative for the food and at the same time, substances such as antioxidant can help improving human's health (Lum, Kim, & Lei, 2013; Priyadarshani & Rath, 2012). Polyunsaturated fatty acids (PUFAs) are also exists in microalgae. As mammals are unable to synthesize essential PUFAs, these compounds need to be taken in through diet (Pereira et al., 2012). *Odontella aurita,* which is the diatom had already been commercialized as dietary complement that compete with fish oil for human nutrition (Mimouni et al., 2012). Besides, abiotic stresses such as UV irradiation, high irradiance, nutrient starvation, can trigger