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Fatty Acid Profile of Microalgae Harvestingvia Immobilized Cell

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EXTENDED ABSTRACT

Microalgae are a group of microorganism that live in aquatic ecosystems. Microalgae are known as the alternative source of biodiesel production that can produce biomass, lipid, hydrocarbon and other complexed oil due to their simple unicellular structure and high photosynthetic efficiency. Microalgae have a lot of function and widely use in industries such as in health food, cosmetics nutrition, pharmaceutical industry and fuel production [1,2,3,4]. Harvesting of microalgae for biodiesel production has been a major challenge in the industry. The important process of harvesting microalgae for biodiesel production involves cultivation, harvestingand lipid extraction[5]. Microalgae harvesting is the process of separating the microalgae biomass from water.Immobilization microalgae cultivation is one of the current techniques in biotechnology. Sodium alginate is one of the preferably used matrix in immobilize technique because of its low toxicity and high transparency. The use of sodium alginate is to limit the freedom of microalgae movement [6]. The lipid extracted from immobilization method is highly potentialfor biodiesel production as it has similarity fatty acid profile with other oil bearing crops [6]. In this experiment, *Chlorella vulgaris*is selected as microalgae as this species is one of the microalgae species that be able to produce high lipidsthat have many strains and have been considered as a suitable species for commercial production of biodiesel due to the growth rate of microalgae.The substance in C. *vulgaris*contains a lot of benefits especially for cleansing, immune system support and in growth systems. C.*vulgaris*is a robust and one of the famous microalgae that widely used in the cultivation process. This species is a planktonic unicellular green alga and known as single cell microalgae and photosynthetic microorganisms which contains high chlorophyll. Then, it will allows them to absorb sunlight and converted into energy. This species have fast growth rate andalso contents a high protein [7,8]. This species is very usable and interesting regarding the production of secondary metabolites with health beneficial properties such as omega-3 fatty acids and carotenoids. Since the strain have high oils content and easy to growth, C. *vulgaris*is always used in the research [9]. Most common fatty acid found in biodiesel is oleic acid, linoleic acid, steric acid and palmitic acid. Different algal species will have differentfatty acids composition. The highest composition most likely found in C.*vulgaris*is linoleic acid [5]. This analysis also will show the complete profile molecules present in lipids.This research focus on media preparation of microalgae,cultivation of microalgae, harvesting method via immobilization and extraction of oil to obtain the lipid. The further process of converting microalgae oils into biodiesel fuel is followed by transesterification process. The aims of this research are to study the immobilization effect to the growth cell of microalgae, compare the lipid production of microalgae with free cell culture and identify the fatty acid methyl ester for biodiesel production. The growth curve of immobilized cell culture was determined using UV-Vis spectrophotometer and the lipid production of immobilized cell was evaluated by using different matrices at volume ratio of 1:1 and 0.3:1 and compared with free cell culture. The highest growth performance was obtained at volume ratio of 0.3:1 for the combination matric systems of SA + CMC while the highest growth

performance obtained at volume ratio of 1:1 for the combination matric systems of SA + CA + CMC. The oil extraction from C.*vulgaris*using sodium alginate at volume ratio of 0.3:1 showed highest results with the oil yield percentage of 46% compared with other matrices system studied. In this study, the main components of fatty acid methyl ester in the C.*vulgaris*werepalmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1), linoleic acid (C18:2) and linolenic acid (C18:3). The percentage of saturated fatty acid (C16:0 & C18:0) were higher than unsaturated fatty acid (C18:1, C18:2 and C18:3). Fatty acid profile making C. *vulgaris* biomass as a source for biodiesel production.

Fig. 1: Immobilization culture

Keywords: Microalgae; *Chlorella vulgaris*; Immobilization; Free cell culture; Fatty acid.

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