

# Evaluation of the properties on carrageenan bio-films with *Chlorella vulgaris* blending

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## ABSTRACT

Microalgae are multicellular species that exist individually or in groups which typically found in freshwater and marine systems and a good and highly potential source to produce bio-films. Bio-films with carrageenan possessed several drawbacks that needed to be encountered. The purpose of this study is to observe the number of microalgae cell influenced the performance of the bio-film obtained. Cultivation of free cell *C. vulgaris* microalgae was conducted in Bold's Basal Medium (BBM) for 16 days. Growth curve of the *C. vulgaris*, lipid extraction and FAMES determination was conducted on the alternate days of cultivation. 3 mL of *C. vulgaris* microalgae was added into the formulation of carrageenan at the alternate days of cultivation (D-0, 4, 8, 12, and 16). Results shows, the number of cell, percentage oil yield and FAMES amount of *C. vulgaris* at D-16 is the highest which  $1.19 \times 10^{10}$  cell/mL, 27.74% and 17.76 mg/g, respectively. Hence affect the tensile strength of the bio-film and the solution viscosity with 36.26 Mpa and 245.29 mpa/s, respectively. It also shows the lowest value of moisture content which increases the EAB of the biofilm with 10.99% moisture and 50.24% elasticity. With the high number of cell shows the film has the highest value of water contact angle with  $107.11^\circ$ . It also requires the highest activation energy (42.16 kJ/mol) to decompose (80.63%). This can be concluded that the higher the number of cell and percentage oil yield with high amount of FAMES, the better surface hydrophobicity of the bio-films obtained.

**KEYWORDS:** Carrageenan; growth curve; hydrophobicity; microalgae bio-film; thermal stability; trans-esterification

**DOI:** <https://doi.org/10.1080/00986445.2022.2103684>

## **FUNDING**

This study was supported by Universiti Malaysia Pahang for the project funding (PGRS200353 & RDU1803187) and providing facilities in undertaking this study.

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