

**CHARACTERIZATION OF LOCAL MICROALGAE
FROM SABAH FOR BIOFUEL PRODUCTION**

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ABSTRACT

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Microalgae are considered a potential source of biofuel due to their high specific growth rates, biomass and lipid yields as compared to conventional oilseed crops. Selection of the right species is the fundamental factor in microalgae-based biodiesel production as it leads to profitable yields and oil quality. In this study, a total of four freshwater microalgae and four marine microalgae were successfully isolated from fresh- and marine habitats in Kota Kinabalu, Sabah. The isolates were established in Bold's Basal Media (BBM) and Walne's media (WM), respectively. Based on their morphological characters and characterization of the ribosomal 18S region, the isolates were identified as *Ankistrodesmus fusiformis* (FW1), *Chlamydomonas monadina* (FW2), *Chlorella emersonii* (FW3), *Scenedesmus obliquus* (FW4), *Chaetoceros muelleri* (SW1), *Isochrysis galbana* (SW2), *Nannochloropsis oculata* (SW3) and *Tetraselmis chuii* (SW4). Growth rates, lipid accumulation and fatty acid (FA) profiles of the isolates were examined under laboratory growth conditions in order to screen for the best candidate species for biodiesel production. The isolates displayed higher cell densities in enriched media (BBM and WM) compared to non-enriched media (natural lake water and natural sea water). Biomass productivity, lipid content and lipid productivity of the isolates ranged from 0.11 – 0.78 g/L/day, 11 – 39 % dry weight and 21 – 252 mg/L/day, respectively. These results indicated differences between the isolates. GC-MS revealed that isolates with the highest C₁₄ – C₁₈ FAs were *A. fusiformis* with 94.7 % and *C. emersonii* with 93.4 %. Based on the selection criteria, isolates with biodiesel potential were *A. fusiformis*, *C. emersonii*, *C. muelleri* and *I. galbana*. Prior to mass culturing, the candidate species were optimized for their growth parameters viz. light intensity and nitrogen concentration. The results suggested that 135 $\mu\text{mol}/\text{m}^2/\text{s}$ light intensity and 5 g/L nitrogen concentration gave the highest growth. In the indoor mass cultures, *C. muelleri* and *I. galbana* produced the highest lipid concentration and showed highest increment in C₁₄ - C₁₈ FAs, and therefore was regarded as the best species for biodiesel production. Finding promising microalgae for biodiesel production is challenging as different species have different requirements. This study has identified two of the eight isolated algal species to have biofuel potential which can be further commercialized for large-scale production of biodiesel.