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Utilisation of Fermented Wheat Bran Extract Medium as A Potential Low-cost Culture Medium for *Chlorella ellipsoidea*

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ABSTRACT

Microalgae, *Chlorella ellipsoidea* is an excellent energy source for food and biofuel production. Nevertheless, the production cost of *C. ellipsoidea* using Bold's Basal Medium (BBM) is expensive, which led to the exploration of alternative low-cost medium for large-scale production. Low-cost fermented wheat bran extract medium (FWBEM), which has good nutritional properties, might be an alternative feedstock for mass production of *C. ellipsoidea*. The present study was conducted to evaluate the growth and production of *C. ellipsoidea* using different concentrations of FWBEM. Wheat bran was fermented at the concentration of 8.33, 6.66, and 5.00 g/L water labelled as T_2, T_3, and T_4, respectively. The BBM was used as the control medium (T_1). The growth and production of *C. ellipsoidea* were monitored for three days in terms of cell dry weight, specific growth rate, optical cell density, chlorophyll *a* content, and cell numbers. Those growth data revealed that *C. ellipsoidea* cultured at 6.66 g/L (T_3) did not vary significantly with the standard inorganic BBM. However, T_2 and T_4 showed substantially lower cell growth and chlorophyll *a* content than control and T_3. Compared to the BBM, a significant reduction in production cost was obtained in the FWBEM. Based on the cell biomass growth, pigmentation, and production cost, FWBEM at a 6.66 g/L could be used as an alternative medium. Therefore, FWBEM has excellent potential to be used for the low-cost production of *C. ellipsoidea*.

Keywords: *Chlorella ellipsoidea,* culture medium, low-cost production, microalgae, wheat bran extract

INTRODUCTION

Microalgae are considered the essential primary producer of the food chain, particularly in the aquatic ecosystem (De-Silva *et al.*, 2018). They are used to purify heavy metals and nutrient load from various types of wastewater, especially aquaculture wastewater (Munoz & Guieysse, 2006; Posadas *et al.*, 2017; Khatoon *et al.*, 2018; Cardoso *et al.*, 2021; Pavithra *et al.*, 2020). They are also used to produce biofuel, several valuable chemicals, and pharmaceutical products (Illman *et al.*, 2000; Spolaore *et al.*, 2006; Chew *et al.*, 2017). In addition, microalgae are important food sources for the human, animal, and aquatic organisms for their higher digestibility and nutrition status (Görs *et al.*, 2010; Hemaiswarya *et al.*, 2011). Therefore, microalgae are used as a vital feed ingredient and also as live food in the aquaculture industry for larvae of fish, molluscans, and crustaceans (Roy & Pal, 2015; Jusoh *et al.*, 2020).

Among several microalgae species, *Chlorella ellipsoidea* is regarded as one of the most excellent food sources for human and aquacultural species, especially for fish larvae and bivalves (Bai *et al.*, 2001; Kim *et al.*, 2002). *Chlorella ellipsoidea* is a ubiquitous single-celled green freshwater microalga belonging to the division of Chlorophyta. It contains all the nutrients necessary to sustain life especially protein, lipid, and minerals (Rahman *et al.*, 2005; Toyub *et al.*, 2007). In addition, it is also a rich source of polyunsaturated fatty acids and essential amino acids (Mondal *et al.*, 2005). *Chlorella ellipsoidea* is also well known for its antitumor, anticarcinogenic, antiviral, anticataract, antiulcer, and antioxidative properties (Shibata *et al.*, 2003). However, for