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Determination of Suitable Poly Bag Diameter for Microalgae *Chlorella vulgaris* Cultivation for Algal Biodiesel Production

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Abstract

Consumption of fossil fuels is now widely accepted as an unsustainable solution to compensate the current energy demand. Fossil fuel is a depleting resource and its burning causes the accumulation of greenhouse gases in the atmosphere which has already exceeded the 'dangerously high' threshold of 450 ppm CO2-e. Hence, the solution is to find environmentally and economically sustainable energy production processes that are not only renewable, but also capable of sequestering atmospheric CO_2. Among different alternatives, production of bio fuel from micro algae is considered as a sustainable solution which can address the above criteria successfully. Through photo-bioreactors systems allow for better control of the algae culture environment, but tend to be more expensive. Therefore this study was carried out to determine the suitable diameter for poly bag reactors used for microalgae *Chlorella vulgaris* with referring to the resulting dry matter yield and the oil content. Using *Guillard & Ryther's* modified F medium, *Chlorella vulgaris* was grown in poly bag reactors with diameters of 5, 10, 15 and 30 cm under the same environmental condition for 14 days. Experimental design was Completely Randomise Design and the treatments were replicated three times. Algae were harvested by flocculation method using NaOH as a flocculation agent. Dry matter content (w/w) of each sample was measured and, the oil extraction was carried out by using Soxhlet method. Dry matter contents of *Chlorella vulgaris* in 5, 10, 15 and 30 cm diameter poly bag reactors were recorded as 0.0018, 0.00116, 0.0041 and 0.00065 gcm^{-3} respectively. The oil contents of 5, 10, 15 and 30 cm diameter poly bag cultures were 11.21%, 6.92%. 17.5% and 6.72% respectively. Higher Phosphate removal was observed in poly bag reactor with 15 cm diameter. The highest nitrate and phosphate contents were retained in 30 cm diameter poly bag reactor and recorded as 0.072 and 0.229 mg/l respectively. When the diameter exceeds 15 cm, algae growing rate was decreased due to limited light penetration. Results revealed that 15 cm is the best diameter of poly bag reactors for growing *Chlorella vulgaris*, as the recorded dry matter and lipid contents of *C. vulgaris* related to the same was significantly high. In addition, it is an economically viable solution under local conditions.

***Keywords*:** Biodiesel, *Chlorella vulgaris*, Dry matter content, Lipid content, Microalgae