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INVESTIGATION OF THE IMPACT OF CO_2 SUPPLY ON THE GROWTH RATE AND THE YIELD OF O*scillatoria* sp. DURING MASS CULTURING

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Cyanobacteria have received renewed attention for their potential role in establishing sustainable answers to global issues. Producing biodiesel from cyanobacteria is a scientifically and economically viable alternative solution to the prevailing fossil fuel crisis. Cultivating cyanobacteria on a large scale is an essential prerequisite to optimizing biodiesel production. However, inconsistent results of large-scale cultivation have consistently impeded the process. Moreover, the reduced growth affected by contaminants, make the process more challengeable, discouraging cultivators to continue the process. Therefore, establishing a comprehensive approach that encompasses growth optimization and the strategies to overcome challenges associated with mass cultivation is a current necessitate. Hence, this study was carried out as a preliminary step of large scale cyanobacteria cultivation, with the aims of maximizing biomass production of selected cyanobacteria by optimizing their growth, in terms of growth rate and productivity and devising an innovative method for mitigating contaminants. Pure culture of *Oscillatoria* sp. which was isolated from freshwater reservoirs in the Dry zone of Sri Lanka was chosen for the study. The same amount of inoculum of *Oscillatoria* sp. was cultured in two sets of 50 L, cleaned, and UV sterilized fish tanks (Tank set 1 and Tank set 2) with 40 L of $1/5^{th}$ strength of BG 11 culture medium with pH of 8.3, under greenhouse conditions. Both sets of tanks were provided with similar growth conditions (light intensity and temperature) and the normal air was continuously aerated at the same rate throughout the day. Only tank set 1 was further facilitated with CO_2 bubbling and it was daily provided with 3 bubbles of CO_2 (0.15 ml) other than normal aeration. Cultures of the two sets of tanks were daily monitored for possible contaminations using microscopic observations. The Optical Density of cultures was measured at regular intervals, at the wavelengths of 565 nm, 680 nm, 750 nm, and 770 nm. The growth curve of each set of cultures was plotted using the Optical Density values at 680 nm and their mean growth rates were statistically compared (p=0.05). Cultures were harvested at their maximum growth (5^{th} week of their growth) and the obtained amounts of dry biomass were compared. The mean growth rates of tank set 1 and tank set 2 were 0.074/day and 0.001/day respectively, while the mean harvested dry biomasses of tank set 01 and tank set 02 were 11.67 g and 10.20 g respectively. Consequently, the introduction of CO_2 bubbling has resulted in a substantial enhancement of the growth rate of the *Oscillatoria* culture in tank set 01 with an improved biomass productivity. Moreover, possible contaminants especially, the zooplanktonic growth was significantly controlled in tank set 01 compared to tank set 02. Thus, the current study demonstrated that the controlled, minute supply of CO_2 together with conventional aeration proves to be more effective in large scale cyanobacteria cultivation, allowing optimized growth in terms of growth rate and productivity with minimal contaminants.

Keywords*:* *Contaminants, Cyanobacteria, Growth, Large-scale cultivation, Productivity*
Financial assistance from Access Engineering PLC is gratefully acknowledged.