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Growth Pattern of *Chlorella variabilis* in Untreated and Partially Treated Palm Oil Mill Effluent (POME)**Udawita, U.A.R.I., Balasooriya, B.L.W.K. *, Bandara, N.G.C.A.***Department of Biotechnology, Faculty of Agriculture and Plantation Management,
Wayamba University of Sri Lanka, Makandura, Sri Lanka***wajira.balasooriya@gmail.com***Abstract**

Palm oil extraction process generates a significant waste stream, namely Palm oil mill effluent (POME), which requires mandatory remediation to ensure proper treatment and disposal. The palm oil industry faces considerable challenges in the sustainable management of POME. Microalgae, *Chlorella variabilis* possess a significant nutrient removal and bio-sorption capacity, thus potential for bioremediation of POME. This study aimed to investigate the growth pattern of *C. variabilis* in untreated and partially treated POME. *C. variabilis* cultures were obtained from the Department of Biotechnology and cultivated in untreated (POME-U) and partially treated (POME-T) effluent samples (30% diluted) collected from a commercial palm oil mill in Galle, Sri Lanka. Mass cultures (1.5 L) were maintained under controlled conditions (pH 7.1-7.5, 30 °C ± 1 °C temperature, 2000 lux light intensity, 1.6 L/hr air flow rate) for 35 days. The growth pattern of *Chlorella* sp. in BG11 media indicated a 28 hr lag phase, an exponential phase (28-261 hr), a stationary phase (261-309 hr), and a death phase (309-333 hr). POME-U was characterized with 4.49 pH, 22,272 mg/L Total Suspended Solids (TSS), 0.0819% (w/v) Total Nitrogen (TN), 2,092.11 mg/L Total Phosphorus (TP), 74,170 mgO₂/L Chemical Oxygen Demand (COD), and 3.70 mg/L Phenolics while POME-T indicated 9.15 pH, 4164 mg/L TSS, 0.0437% (w/v) TTN, 0.38 mg/L TP, 2580 mgO₂/L COD, and phenolics were not detected. The cell density in both untreated and treated POME cultures indicated significant growth with time. After one week of culturing, the cell growth in POME-U was significantly (33.13%) lower than that in POME-T, which could be due to the strong brown color limiting light penetration. However, during the second week, the cell growth rate in POME-U increased in comparison with POME-T. Studies on the biotreatment potential resulted reduction of COD and TP by 84.14% and, 99.97% respectively in POME-U, whereas in POME-T, COD and TP decreased by 10.30% and 63.16% respectively. In both treatments, TN was completely (100%) removed. This research highlights the capacity of *C. variabilis* for biomass growth and removal of significant pollutants in both untreated and partially treated POME, offering a sustainable approach to managing palm oil mill wastewater.

Keywords: *Biotreatment, Chlorella sp., Microalgae, Palm oil mill effluent, Wastewater*